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INJURY EXPERIENCE IN TANZANIA- NEED FOR INTERVENTION

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ABSTRACT

Objective: To determine distribution of injuries and factors associated with mortality in six hospitals of Tanzania mainland.

Design: A Cross - Sectional hospital based study.

Setting: Data were collected from casualty departments of Muhimbili Orthopaedic Institute, Morogoro, Mtwara, Kigoma, Musoma regional hospitals and Korogwe district hospital.

Subjects: Patients who sustained injuries and attended in six involved hospitals between November 2011 and December 2012.

Results: Of the 9316 injury patients seen, 71.7% were males. Majority (55%) were between 18 – 45 years age group. Traffic crashes were the leading cause of injuries and accounted for 47.5% of all injuries. Fractures accounted for 49.2%, and injuries were severe in 1.2% as determined by the Kampala trauma score II (KTS II). Majorities 66.7% were admitted and 2.4% died at the casualty. Factors associated with mortality were; being unemployed ($P = 0.000$), using ambulances to the hospital ($P = 0.000$), receiving medical attention within 2 to 10 hours after injury ($P = 0.001$), road traffic crashes ($P = 0.000$), 18 - 45 years age group ($P = 0.003$), low KTS II score ($P = 0.000$) and sustaining head injury ($P = 0.000$).

Conclusion: Injuries in Tanzania are an important public health problem, predominantly in adult males, mostly due to traffic crashes. It is therefore important to reinforce preventive measures and pre-hospital emergency service is urgently needed.

INTRODUCTION

Injuries represent a significant cause of morbidity and mortality in both developed and developing countries (1). The Global Burden of Disease Study estimates that 10% of global deaths are due to injuries, and that if current trends persist, this burden will greatly increase in the next 20 years (2). It is generally acknowledged that this problem is growing rapidly in Sub-Saharan Africa (3), and it is projected that by the year 2020, injuries in Africa will rank third among causes of disability adjusted life years (4).

All age groups are affected; one study in South African reported injuries to be the commonest cause of death in those aged 5-14 years (5), whereas studies in Tanzania show that injuries mainly affect the productive age group (15-44 years), with males constituting a large majority of injury victims compared to females (6,7). The higher susceptibility of males to injuries has also been reported in other African countries (8,9). A number of studies in

different regions of Kenya have reported injuries to be major cause of surgical admissions, and also a significant cause of morbidity, mortality and serious permanent disability (10-12).

Road traffic crashes account for much of the injury burden worldwide, especially in low and middle – income countries and are currently ranked 9th globally among the leading causes of disease burden, in terms of disability adjusted life years (DALYs) lost (13-14). Tanzania is one of the countries most heavily affected by road traffic crashes. Between 1990 and 2000 the number of road traffic crashes in Tanzania raised by 44%, at the same time the number of associated injuries increased by more than 44% while related fatalities by more than 64% (15). Similar trend has been noted in other African countries, for example in Nigeria between 1977 and 1983 road traffic crashes increased by 43% with 110% increase in death rates (16). Road traffic related fatalities in Kenya increased by 578% and non-fatal casualties by 506% between 1962 and 1992 (17).

Although the consequences of these injuries can be minimized through development of effective intervention, they have received much less attention compared to malaria, HIV/AIDS and TB. Lagarde (2007) quoted WHO 1996 report which revealed that global research and development funding for road traffic injuries ranged from US\$ 24 to US\$ 33 million while over US\$ 900 million was set aside for HIV/AIDS alone (18).

The direct medical costs to hospitals that are already resource constrained and indirect costs of lost productivity on the national economy due to prolonged hospitalization explains need for injury prevention and control, but due to lack of data on injuries in general, little can be said about the need and nature of injuries prevention measures which should be developed in order to curb this problem. This study sought to provide information on distribution of injuries and factors associated with mortality in six hospitals of Tanzania mainland.

MATERIALS AND METHODS

Study Setting: This study was conducted at Muhimbili Orthopaedic Institute (MOI), Morogoro, Mtwara, Kigoma, Musoma regional hospitals and Korogwe district hospital. MOI is a tertiary level teaching hospital for orthopedic and neurosurgery for undergraduate and post-graduate students from Muhimbili University College of health and Allied Sciences. It is the only hospital with specialized neurosurgical care in the country. The other hospitals are secondary level hospitals with bed capacity ranging from 150 to 200 beds. Tanzania has no systematic pre-hospital emergence care, and patients with injuries are brought in by bystanders, relatives, and police or by ambulances which most of them have no proper equipments and trained personnel's.

Study Design: This was a cross-sectional study of patients who sustained injuries and seen at the casualty departments of six hospitals in Tanzania mainland between November 2011 and December 2012.

Data Collection and Management: Nurses working in the casualty departments of the involved hospitals were trained as research assistants for this study. The training took one week and mainly focused on how to get voluntary consent from patients, and how the

data collection form was to be filled. Apart from basic demographic characteristics, the data collection form included the nature of the injury, where the injury took place, mode of transport used to the hospital and history of alcohol use by the patient before occurrence of the injury. The extent of severity of the injury was also assessed using the Kampala Trauma Score 11 (KTS 11). Kampala Trauma Score is a scale for assessing severity of injury based on a combination of systolic blood pressure and respiratory rate on arrival, neurological status, seriousness of the injury and patient's age (19). It is simplified so that it can be determined in outpatient settings of hospitals with limited resources. Severe injury consisted of a (KTS 11) 0 -3, moderate injury 4 - 7, and mild injury 8 - 10. Data were collected in the casualty department during the initial management of the patient. Data were double-entered into Epi info version 3.5.1 (CDC, Atlanta, USA). Statistical analysis was conducted using STATA version 11 (Statacorp, College Station, USA).

Statistical Analysis: All variables were categorized and described using frequency distribution. The dependent variable mortality was categorized as a dichotomous variable (death or no-death). Bivariate associations were described using chi-square tests. A variable with ($p \leq 0.05$) with mortality was considered to be statistically significant.

Ethical Consideration: Ethical approval for the study was obtained from the Muhimbili University of Health and Allied Sciences Research Ethics Committee

RESULTS

A total of 9316 injury patients were seen between November 2011 and December 2012. The distribution of injury patients by hospital was MOI 49.4%, Morogoro 23.7%, Musoma 10.4%, Korogwe 7.5%, Mtwara 5.1% and Kigoma 3.9%. Majority were male 6675/9314 (71.7%) and 2639/9314 (28.3%) were female, with a male to female ratio of nearly 3:1. Almost 55% of the patients belonged to the productive age group (18 to 45 years). Alcohol use was recorded in 20.4% of the injured patients. Of the 9316 patients seen, 66.7% were admitted, 30.9% treated and sent home and 2.4% died at the casualty.

Cause of injury

Table 1
Causes of injuries in each age group

Age (years)	N (% total sample)	Causes	N (% of causes)
≤ 10	1609 (17.3)	Animal/Snake bite	83 (5.2)
		Assault	129 (8.0)
		Burn	216 (13.4)
		Falls	8253 (53.0)
		Road Traffic Crashes	328 (20.4)
11-20	1399 (15.0)	Animal/Snake bite	75 (5.4)
		Assault	222 (15.9)
		Burn	21 (1.5)
		Falls	495 (35.4)
		Road Traffic Crashes	586 (41.9)
21-30	2470 (26.6)	Animal/Snake bite	69 (2.8)
		Assault	593 (24.0)
		Burn	30 (1.2)
		Falls	319 (12.9)
		Road Traffic Crashes	1459 (59.1)
31-40	1785 (19.2)	Animal/Snake bite	56 (3.1)
		Assault	355 (19.9)
		Burn	17 (0.9)
		Falls	277 (15.5)
		Road Traffic Crashes	1080 (60.5)
41-50	847 (9.1)	Animal/Snake bite	33 (3.9)
		Assault	164 (19.4)
		Burn	7 (0.8)
		Falls	182 (21.5)
		Road Traffic Crashes	461 (54.4)
>50	1191 (12.8)	Animal/Snake bite	52 (12.8)
		Assault	151 (4.4)
		Burn	13 (1.1)
		Falls	472 (39.6)
		Road Traffic Crashes	503 (42.2)

p-value 0.000

The most common cause of injuries was road traffic crashes causing 47.5% of all injuries, followed by falls 27.9% and assaults 17.4%. The causes of injuries for the various age groups are in Table 1. Children under 10 years old had highest proportion of patients with falls followed by those who were older than 50 years. Road traffic crashes and assaults were most common among those aged 21 to 40 years. Passengers accounted for a greater proportional of Road traffic crash victims (38.2%) followed by Pedestrians (31.9%). Motorcycles accounted for 47.3% of all Road traffic crashes. 24.6% of road crash victims were under the

influence of alcohol. Males accounted for 74.2% of assault victims.

Occupation

Unemployed people accounted for the biggest proportion 48.1%, followed by students/pupils 28.4%, business owners 11.9%, and employed people 11.5%. Falls was the leading cause among students/pupils 47.9%. In other occupations traffic was the commonest cause: business owners 64.9% employed 73.4% and unemployed 48.2%. Unemployed accounted for 62.5% of assault victims.

Table 2
Time from injury to receiving medical attention

Hospital	0-1 hour	2-10 hours	>10 hours
MOI	662 (17.9)	1903 (51.5)	1131 (30.6)
Morogoro	310 (14.1)	1711 (77.7)	180 (8.2)
Mtwara	285 (61.3)	151 (32.5)	29 (6.2)
Korogwe	372 (57.5)	216 (33.4)	59 (9.1)
Kigoma	84 (62.7)	45 (33.6)	5 (3.7)
Total	2066 (25.8)	4407 (55.1)	1524 (19.1)

p-value 0.000

Duration from injury to receiving medical attention: The majority of patients (55%) received medical attention in two to ten hours after injury (table 2). Of the 1524 patients who received medical attention after 10 hours, 30.6% were attended at Muhimbili Orthopaedic Institute. Majority of patients who died at the casualty (48%) were attended within two to ten hours after injury.

Table 3
Injury Severity as measured by the Kampala Trauma Score, by hospital

Hospital	Severe	Moderate	Mild
MOI	42 (0.9)	240 (5.3)	4287 (93.8)
Morogoro	1 (0.05)	4 (0.2)	2200 (99.8)
Mtwara	37 (7.8)	39 (8.2)	400 (84.0)
Korogwe	22 (3.2)	34 (4.9)	632 (91.9)
Kigoma	6 (1.6)	79 (21.5)	283 (76.9)
Total	115 (1.2)	421 (4.5)	8734 (94.2)

p-value 0.000

Injury severity: The severity of injury was generally low (Table 3). Very few patients (1.2%) had severe injuries. 94.2% had minor injuries, and 4.5% had moderate injuries. MOI had higher number of severely injured patients, followed by Mtwara regional hospital. Majority of severely injured patients

(56.5%) sustained head injury. Fractures were the most common type of injury 49.2% (Table 4), particularly among patients who were attended at Muhimbili Orthopaedic Institute. MOI did also attend higher number of patients with head injury.

Table 4
Nature of injury by hospital

Nature	Korogwe N(%)	Mtwara N(%)	Kigoma N(%)	MOI N(%)	Morogoro N(%)	Musoma N(%)
Cut/Open wound	301 (43.3)	187 (39.5)	92 (25.0)	179 (3.9)	458 (20.8)	303(31.4)
Sprain / Strain / dislocation	135 (19.4)	72 (15.2)	50 (13.6)	305 (6.7)	265 (12.0)	119(12.3)
Fractures	161 (23.1)	119 (25.1)	100 (27.2)	3171(69.1)	821 (37.2)	206(31.4)
Head Injury	38 (5.5)	64 (13.5)	84 (22.9)	904 (19.7)	266 (12.0)	202(20.9)
Chest/ Abdominal injury	34 (4.9)	21 (4.4)	33 (8.9)	28 (0.6)	208 (9.4)	75 (7.8)
Burn	27 (3.9)	11 (2.3)	9 (25.0)	0 (0.0)	188 (8.5)	59 (6.1)
Total	696 (100)	474 (100)	368 (100)	4587 (100)	2206 (100)	964 (100)

Mode of transport to the hospital: Most patients (44.4%) used ambulances to the hospital, 25.8% used private vehicles, 18.2% used bicycle/ motorcycle and 9.5% were brought in by police. Few patients (2.1%) walked. Majority of patients who died at the casualty used ambulances 42.7%, followed by those who used private vehicles 24.2%.

Factors associated with mortality: Factors associated

with mortality (Table 5) were; being unemployed ($P = 0.000$), those who used ambulances to the hospital ($P = 0.000$), and who received medical attention in within two to ten hours after injury ($P = 0.001$). Being involved in road traffic crashes ($P = 0.000$), 18 to 45 years age group ($P = 0.003$) and sustaining head injury ($P = 0.000$) were more likely to die than others. Majority of severely injured patients (67%) with KTS score of 0 – 3 died at the casualty ($P = 0.000$).

Table 5
Factors associated with mortality

Factor	death N(%)	No - death N(%)	P-value
Sex			
Female	58 (25.6)	2574 (28.4)	0.347
Male	169 (74.5)	6489 (71.6)	
Total	227 (100)	9063 (100)	
Occupation			
Businessman	12 (10.3)	707 (12.2)	0.000**
Driver	18 (15.4)	403 (6.9)	
Students	15 (12.9)	1627 (28.1)	
Unemployed	61 (52.1)	2582 (44.5)	
Employed	11 (9.4)	490 (8.4)	
Total	117 (100)	5809 (100)	
Transport to hospital			
Ambulance	48 (39.7)	2457 (42.2)	0.000**
Bicycle/Motorcycle	10 (8.3)	1117 (19.2)	
Foot	1 (0.8)	158 (2.7)	
Police	33 (27.3)	552 (9.5)	
Private vehicle	29 (23.9)	1536 (26.4)	
Total	121 (100)	5820 (100)	
Time to treatment			

0 – 1 hour	75 (37.5)	1987 (25.5)	
2 – 10 hours	96 (48.0)	4301 (55.3)	0.001**
> 10 hours	29 (14.5)	1492 (19.2)	
Total	200 (100)	1492 (100)	
Cause of injury			
Animal/Snake bite	6 (5.1)		
Assault	23 (19.3)	1030 (17.8)	
Burn	10 (8.4)	159 (2.7)	0.000**
Fall	8 (6.7)	1661 (28.7)	
Road Traffic Crash	72 (60.5)	2708 (46.8)	
Total	119 (100)	5784 (100)	
Road user category			
Driver	37 (28.5)	1135 (27.4)	
Passenger	49 (37.7)	1580 (38.2)	
Pedestrian	40 (30.8)	1322 (31.9)	0.956
Unknown	4 (3.1)	101 (2.4)	
Total	130 (100)	4138 (100)	
Age (Years)			
< 18	15 (12.4)	1503 (25.8)	
18 – 45	85 (70.3)	3349 (57.5)	0.003**
> 45	21 (17.4)	973 (16.7)	
Total	121 (100)	5825 (100)	
Nature of injury			
Burn	9 (7.5)	156 (2.7)	
Chest/Abdominal	16 (13.3)	187 (3.3)	
Cut/Open-wound	12 (10.0)	845 (14.8)	0.000**
Fractures	21 (17.5)	2940 (51.5)	
Head injury	62 (51.7)	950 (16.6)	
Sprain/Strain/Dislocation	0 (0.0)	636 (11.1)	
Total	120 (100)	5714 (100)	
KTS II Score			
0 – 3	27 (22.5)	13 (0.2)	
4 – 7	21 (17.5)	237 (4.1)	
8 – 10	72 (60.0)	5541 (95.7)	0.000**
Total	120 (100)	5791 (100)	

**P-value \leq 0.05

DISCUSSION

The findings of this study describe the situation in Tanzania but reflect the problem faced by other African countries and low income countries elsewhere.

The vast majority of the injured patients were males, with a male to female ratio of nearly 3:1. This is similar to other studies in Africa and elsewhere, where young men are reported to be largest consumers of the hospital emergency trauma services (7, 10, 19-21). The higher susceptibility of males to injuries is recognised to be due to risk taking behaviors. In the city of Dar-es-Salaam for example, it is not unusual to see young men boarding and disembarking from moving city public buses.

Like what has been observed elsewhere (10, 11, 17, 22-24), results from this study show majority of injury patients to be predominantly individuals in the economically active group of 18 – 45 years who were also more likely to die than patients in other age groups. This is depleting the economically productive population, which bears a direct impact on the productivity of individuals, families, communities and the country at large.

Road traffic crashes were the leading cause of injury in this study, accounting for 47.5% of all injuries and were associated with mortality. This is within the range of previous studies in Kenya, Uganda and Ghana reported as 39.1, 50 and 33% respectively (25-27). This is likely related to increased motorisation in the setting of inadequate transportation infrastructure maintenance, traffic law enforcement and road user education. Apart from the increased motorisation, a number of other factors have back sighted to explain the tremendous increase in road traffic crashes now being seen in Tanzania and other low income countries. In analysing common causes of road traffic crashes, the Tanzania Police attributed 51.6% of the crashes to reckless/dangerous driving, defective motor vehicles accounting for 15%. Furthermore, 7% was attributed to careless pedestrians, 3% to careless motorcyclists and 7% to pedal cyclists (15). This analysis points to a tendency for victim blaming as the Ghanaian say "The Dead are Always Wrong" seem to imply because the nature of roads in low income countries with no side pavement for cyclist and pedestrians leaves no choice but for all road users both motorised and non-motorised to crowd on the road.

Drinking and driving appeared to be among contributing factors to the road traffic crashes in this study, as 24.6% of the road traffic crash victims were under the influence of alcohol. It is an open secret that drivers drink and drive with impunity. Not uncommonly most of the accident victims including drivers, passengers and pedestrians are admitted in gross intoxicated alcohol situation levels. However, there is no mechanism for measuring blood alcohol

content in Tanzania and few breath analysers routinely used by Tanzanian Police are under-utilised and this could be a source of under reporting. In Zambia, it was found that 30% of killed drivers, pedestrians and cyclists had unacceptable level of alcohol in the blood (28).

Motorcycles accounted for 47.3% of road traffic crashes in this study. These data suggest a potential increasing burden of motorcycle related road traffic injuries as their use increases. This calls for enhanced development of appropriate regulations, legislation, training and enforcement of traffic rules for the protection of general public and loss of assets.

Falls were the second leading cause of injury accounting for 27.9% of all injuries, especially among children under ten years. This may reflect high risk environments for children, such as lack of playing facilities for children or inadequate supervision. In other developing countries falls are an important cause of injury of boys and young males (29). Male accounted for 74.2% of assault victims; this can be attributed to predominance to male domination of most hazardous occupations and social activities such as alcohol consumptions.

Unemployed people accounted for the biggest proportion of injured patients (48.1%), and were more likely to die than others. This is contrary to the study done in Kampala in which the largest occupational category of the injured were students (27), in South Africa the majority of injured persons were workers (20). This is a group where risk taking is highest and many of them were probably victims of mob justice due to criminal activities, as 62.5% of assault victims in this study were unemployed.

Only 25% of injury victims were seen within one hour in this study. The majority of patients (55%) received medical attention in two to ten hours after injury and almost 20% were not seen for more than ten hours. The golden hour is recognised as the time interval when life is saved. This delay minimises the chance of survival for the severely injured patients which means that many patients who warrant hospitalisation are not included in this study. Trauma/Injured patients in Tanzania and other developing countries face several problems/challenges. Firstly lack of pre-hospital emergency care system and ambulance services means that injured patients are likely to be picked by Samaritan motorists. Furthermore, the request of public notification before one is sent to a hospital has a tendency to delay patient further. Thus, many patients with severe injuries must be dying without medical care in Tanzania. This is an area where efforts have to be directed if the severely injured patients are to survive.

Majority of patients had minor injuries 94.2%. This suggests that most patients could have been treated in the primary level health facilities such as health centers. There should be a triage system

to match injury severity to level of care, in order to minimize overcrowding of injury patients in secondary and tertiary care services. Most of the severely injured patients sustained head injury and was associated with mortality, this point to the need for coordinated neurotrauma services for head injury patient's management in the country, as currently it is only Muhimbili Orthopaedic Institute which has specialised neurosurgical care.

Ambulances were the leading mode of transport to the hospital (44.4%), and majority of patients who died at the casualty used ambulances (42.7%). This may be because majority of severely injured patients (46.1%) used ambulances, but also most of the ambulances in Tanzania don't have proper equipments and trained personnel's to handle injury patients.

In considering the findings of this study it is important to bear in mind the following limitations: firstly, this was a hospital based study involving six public hospitals only, it may not reflect what is happening in other hospitals, public health centers and the general community. Secondly, data collectors may not have collected all data, and so some data could be missing. Thirdly there is no evidence that alcohol contributed to severity of injury or mortality. This may be due to the fact that we did not have clinical means of assessing alcohol use and also the severe injuries that may have been associated with alcohol did not survive to be included in this study.

CONCLUSION

The results of this study provide valuable insight into the nature of injuries that are prevalent in Tanzania hospitals. Many severe injured patients are not surviving to be seen at the hospitals and many minor injured patients are being cared for in hospitals. This provides an overview of the injuries that place the most burdens on emergency rooms in Tanzania hospitals. This information is important for policy makers so that appropriate triage can be organized. There is also a need for pre-hospital emergency care to ensure that severely injured patients arrive at hospitals within the golden hour. The public in general needs to be aware in order to develop more effective interventions for all major causes of injuries in Tanzania.

CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

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