



Traffic injuries: Health care services and clinical outcome of victims in central hospital, Sudan

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Abstract:

Back ground: Worldwide, the annual number of people killed in road traffic crashes is estimated at almost 1.2 million. (MVA) in Sudan is one of the major health concern and even a nightmare in some areas of the country where single two-direction high ways cross residential areas. **Method:** This is a cross-sectional study in which 621 of victims alive or dead attended and/or referred to Khartoum Teaching Hospital from October 2010 to December 2010. they were interviewed and followed till they discharged. **Results:** Most of involved victims were males aging 25 years and above. Driver mistakes accounted 505 (91.3%) of all accidents. Near two third of patients recovered completely, 195 victims recovered with disabilities, and 29 victims died at hospital. Pedestrians had large number of accidents. **Discussion:** Over speeding remains the main cause of accidents resulting in severe injuries with disabilities. Most of victims had educational level of primary school or even illiterate. Victims with severe trauma were 20 times higher risk of developing disabilities compared to mild trauma cases. **Conclusion:** Motor vehicle accidents in Sudan result in a significantly high mortality and morbidity rates that necessitate safety protocol including public health education, enforcing strict traffic and speeding rules, giving pedestrian priority in crossing road, improvement of pre- and post-hospital trauma care in terms of well-trained emergency care technicians and well prepared ambulance. Most of patients did not wear any type of safety measures so legislations should be enforced. Appropriate management of road casualties following accidents is a crucial.

Key words: Clinical outcome; Health care services; Khartoum Teaching Hospital; Motor Vehicle Accidents; Sudan

Introduction

Road traffic injuries are a major but neglected global public health problem, requiring

concerted efforts for effective and sustainable prevention. Worldwide, the annual number of people killed in road traffic crashes is estimated at almost

1.2 million, while the number of injured could be as high as 50 million. WHO African Region has the highest mortality rate, with 28.3 deaths per 100,000 populations [1].

Despite the fact that the cost of road trauma is larger than from cancer and cardiovascular diseases, the attention and effort paid by health policymakers and by the medical community, to trauma-related care and research has been disproportionately small so far. Morbidity and mortality due to injuries from (MVA) contribute considerably to human suffering amongst both victims and their relatives leading to tremendous socio-economic costs. Many victims belong to younger age groups resulting in many years of life either lost or crippled by severe disability [2]. Health consequences of (MVA) can be influenced by preventative actions before the crash (active or primary safety), during the crash (passive or secondary safety) and post-crash (rescue, treatment and rehabilitation). The appropriate management of road casualties is a crucial determinant of the chance and quality of survival [3].

The category of injuries worldwide is dominated by those incurred in road crashes. According to World Health Organization data, deaths from road traffic injuries account for around 25% of all deaths from injury. Around 85% of all global road deaths, 90% of the disability-adjusted life years lost due to crashes, and 96% of all children killed worldwide as a result of road traffic injuries occur in low-income and middle-income countries. Over 50% of deaths are among young adults in the age range of 15–44 years [4].

Estimates of the annual number of road deaths vary as a result of the limitations of injury data collection, analysis and problems of underreporting and differences in interpretation [5].

(MVA) was known as road traffic accident and it is defined as an accident, which took place on the road between two or more objects, one of which must be any kind of a moving vehicle [6]. Fatalities are deaths that occur within 30 days as result of a (MVA) [7], while disability is any restriction or lack of ability to perform an activity in the manner or within the range considered normal for a human being [8]. (MVA) results from a combination of factors related to the components of the system comprising roads, the environment, vehicles, road users, and the way they interact. Some of these factors contribute to the occurrence of a collision and are therefore part of crash causation [1].

(MVA) is caused by three main factors: Human factors (road users), road defect and vehicle defect. The concept of hospital trauma care involves the provision of appropriate treatment to patients with either minor or major injuries, the initial assessment or management of critically ill patient [9].

(MVA) in Sudan is one of the major health concern and even a nightmare in some areas of the country where single two-direction high ways cross residential areas. The high rate of population growth, the large percentage of young drivers, dramatic and uncontrolled increase in the number of vehicles over recent years compounded with the absence of strict law enforcement and the poor road conditions have all contributed to the high accident rates [10]. Directorate General of Traffic Annual Statistical Books 1991-2009 reported a dramatic increase of (MVA) injuries from 19 in 2005 to 26 casualties per day in 2009 [11].

In 2008 there were 2,927 (MVA) victims attended (KTH) registered by trauma outpatient registries in discrepancy with police registries which accounted 3,105 victims at the same year [12]. With this large number of victims, little informations about their demographic features and services provided to them.

In Sudan, our knowledge about hospital services provided to (MVA) victims is still little. The needs for covering these dark areas are essential. However it's widely believed that the level of care offered to those victims is below standard. So this study attempts to fill the knowledge gap and to explore the stakeholder perceptions of barriers and facilitators of effective post-crash management and in order to organize information to design appropriate services in (KTH) and to provide base-line data for traumatic health services in (KTH).

The main objective of this study was to study health care services and clinical outcome of (MVA) victims presented to (KTH) in October-December 2010.

Materials and Methods

Study design:

This is a cross-sectional hospital based study in which 621 (MVA) victims attended (KTH) were interviewed and followed till they discharged from the hospital.

Study area:

Study area was (KTH), Sudan. It is a major tertiary referral center and teaching hospital in Sudan. It receives both direct trauma patients and inter-hospital trauma referrals. The hospital has a discrete Emergency Department (ED) with a resuscitation area and trauma theatre. The (ED) is manned by medical officers; residents from general surgery, orthopedics and trauma, medicine and pediatrics are on-site at the (ED) on a 24 hour basis.

Study population:

Study population comprised (MVA) patients either alive or dead attended, or admitted to the hospital in the study period and during the first 24 hours from the occurrence of the accident to exclude possible complications or other illness not arisen directly from (MVA).

We included all the consecutive patients arrived (KTH) in the study period (1st October 2010 – 31st December 2010).

Data collection tools:

We use a questionnaire for this study as a tool based on the national protocol of management of surgical emergencies, national protocol for basic life support for ambulance personnel, WHO guidelines for essential trauma care, international guidelines of advanced trauma life support (ATLS), similar previous studies and notes from consultant of anaesthesia, registrar of anaesthesia and two registrars of orthopaedics worked in (KTH). The questionnaire contained data on the demographics features of victims, accidents and injuries data, pre-hospital and in-hospital care, satisfaction of patients with the hospital services they received and clinical outcomes of victims. It was applied by trained doctors. Pre-test was done before the start of the study. Trained interviewers were post round-the-clock in the emergency departments to capture all included (MVA) cases. Data were collected from the injured patient where is possible, for died patients data were collected from his (her) relatives or attending medical staff. Data entry, verification and editing were done by investigators then transferred into SAS V9.2, where analysis was performed.

Limitation of the study:

We did not collect informations from the first hospital the patient attended, and possibly this would bias the interpretation of injuries sustained, particularly the objective assessment of head injury severity immediately post-crash, hence we choose only to report the Glasgow comma scale (GCS) for

those attending the hospital directly from the scene assessing the severity of injuries.

Ethical considerations:

Ethical clearance and authority to carry out this study was obtained from Sudan Medical Specialization Board (SMSB) and (KTH) to conduct the study.

Prior to any interview, the participant and /or his or her care taker were given an explanation on the purpose, nature and benefits from the study, if they agreed to participate, then written consent was taken. Confidentiality on data and privacy were rigorously protected. Researcher team was trained adequately in this aspect. Access to the confidential data would be limited to the researchers.

Results

This study reports on the nature of crashes and patterns of injuries occurred among (MVA) patients presented to emergency departments of (KTH) from October 2010 to December 2010. Victim's characteristics and in-hospital health care services of categorical variable were identified and reported in terms of proportions (Table 1 - 4). Both univariate and multivariate analysis were conducted to explore the association between (MVA) in terms of morbidity and victims characteristics (Table 6 and 7). Most of involved victims were males aging 25 years and above. Driver mistakes accounted 505 (91.3%) of all accidents. The majority of accidents (80%) occurred inside Khartoum state. Only 29 victims were using safety belt. Mild trauma represented the majority of cases 529 (85.8%). Most of victims 592 (95.3%) did not receive any form of care before they reached the hospital. Among the respondents we found 487 (78.4%) had educational levels ranging from primary school to post graduate, while 134 (21.4%) were illiterate. Employee constituted the maximum number of cases 502 (80.8%) while only 119 (19.1%) were students. Regarding to in-hospital services we found that about one quarter of patients had received tetanus prophylaxis, (23.8%) of them received wound dressing, (20%) of them had wound suturing and (14.8%) of them were given crystalloids. Most of patients (72%) did X rays, (21.1%) did CT scan, and (4%) did laboratory tests. Most of patients 575 (92.6%) were satisfied with services provided to them.

Table 1: Demographic characteristics of study cohort (n=621)

	Characteristics	N (%)
Gender	Males	470 (75.7 %)
	Females	151 (24.3%)
Age	25 and above	376 (60.6%)
	Below 25 years	245 (39.5%)
Occupation	Student	119 (19.2%)
	Employed	502 (80.8%)
Socioeconomic	High	138 (22.2%)
	Low	483 (77.8%)
Education	Educated	487 (78.4%)
	Illiterate	134 (21.6%)

Table 2: Characteristics of the accident/injury and satisfaction with health service (n=621)

Characteristic		N (%)
Place of the accident:	In Khartoum state	497 (80%)
	Outside Khartoum state	124 (20%)
The victim:	In car or Motorized Wheels (passenger)	375 (60.4%)
	Pedestrian	246 (39.6%)
Cause of the accident:	Driver negligence, alcohol, over speed	505 (91.3%)
	Lacking road safety measures	116 (18.7%)
Time:	AM	260 (41.9%)
	PM	361 (58.1%)
Safety measures:*	Safety measure (belt/helmet)	29 (7.7%)
	No safety measure	346 (92.3%)
Evacuation:	Ambulance	141 (22.7%)
	Other	480 (87.3%)
Injury type:	Single injury	362 (58.3%)
	Multiple injury	259 (41.7%)
Severity of the trauma	Mild:	529 (85.2%)
	Severe:	92 (14.8%)
Outcome:	Complete recovery	397 (63.9%)
	Disability	195 (31.4%)
	Death	29 (4.7%)
Satisfaction with the health care services:	Satisfied	575 (92.6%)
	Unsatisfied	46 (7.4%)

*Pedestrians were not included for safety measures (not applicable) (621 – 246 = 375 patients).

Table 3: Use of safety measures by (MVA) victims interviewed in (KTH) in October-December 2010.

Use of Safety measures	Frequency	Percent
Safety belt	25	4%
Crash helmet	4	0.6%
None	346	55.7%
Not applicable(pedestrians)	246	39.6%
Total	621	100%

Table 4: Possible cause of accidents occurred to (MVA) victims interviewed in (KTH) in October-December 2010 as reported by road user attending the accident.

Possible cause of the accident	Frequency	Percent
Over speed	273	44%
Driver error and negligence	117	18.8%
Unsafe overtake	55	8.9%
Low compliance with traffic accident	13	2.1%
Violation of signals in intersections	11	1.8%
Road safety	22	3.5%
Vehicle condition	17	2.7%
Fault of pedestrians	94	15.1%
Alcohol	19	3.1%
Total	621	100%

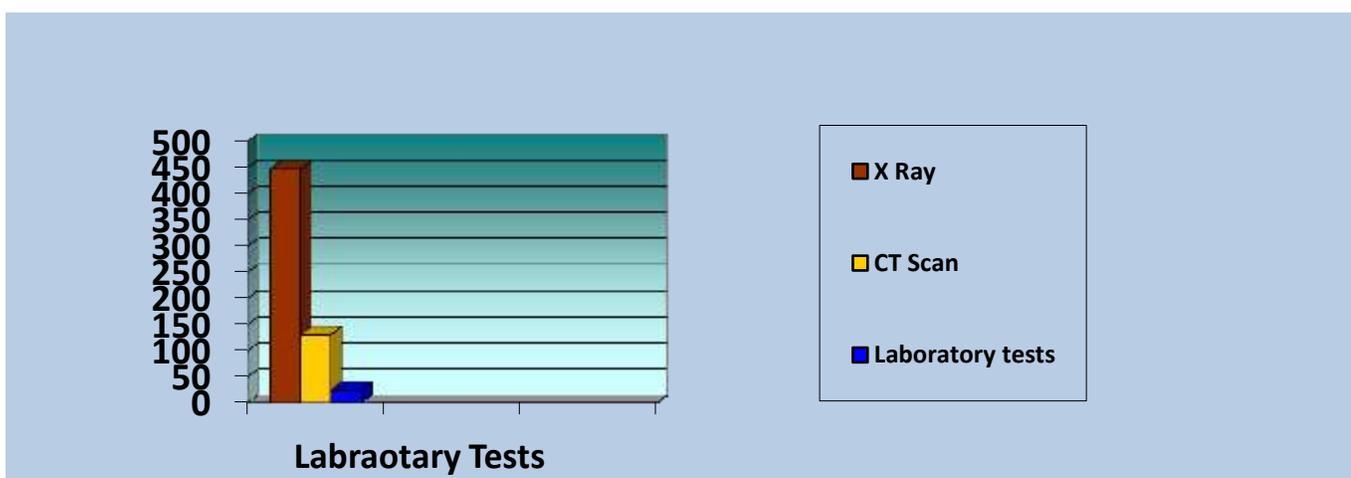
Figure 1: In-hospital investigations done to (MVA) victims interviewed in (KTH) in October-December 2010.

Table 5: In-hospital services received by (MVA) victims interviewed in (KTH) in October-December 2010 (n=621)

In-hospital services (Procedures and treatment)	Frequency	Percentage
Basic immobilization (sling, splint)	8	1.3%
Operative wound management	7	1.1%
External fixation	33	5.3%
Internal fixation	1	0.2%
Spinal injury immobilization	21	3.4%
None surgical management(clean and dressing)	148	23.8%
Minor surgical management(clean and suture)	124	20%
Tetanus prophylaxis	155	25%
Manual manoeuvres (chin lift and jaw thrust)	28	4.5%
Insertion of oral or nasal airway	26	4.2%
Use of suction	20	3.2%
Assisted ventilation	14	2.3%
Endotracheal intubation	2	0.3%
Administration of oxygen	18	2.9%
Chest tube insertion	8	1.3%
Assessment of shock (GCS)	38	6.1%
Peripheral percutaneous intravenous access	137	22.1
Monitoring	24	3.9%
Crystalloids	92	14.8%
Blood transfusion	7	1.1%
Conservative management	290	46.7%

Near two third of patients 397 (63.9%) recovered completely, 195 (31.4%) recovered with disabilities, and unfortunately there were 29 victims died at hospital. We found evidences of significant association between disability and; location of accident, age, educational level, socio-economic status, severity of trauma, evacuation of victims and provision of pre-health care at scene. Results revealed that disability rate was higher when accident outside Khartoum state compared to accidents occurred inside Khartoum State (OR 2.3 p-value 0.007). Victims of age 25 years and older developed more disability compared to youngest (OR 2.9 p-value 0.0009). Disability was more when victims were pedestrian compared to in-car (passenger) (OR

1.9 p-value 0.01). Patients with low socioeconomic class showed more disabilities in comparison with high socioeconomic victims (OR 2.3 p-value 0.007). Victims received pre-hospital care developed more disability compared to those did not receive pre-hospital care at the accident scene (OR 5 p-value 0.0001). Victims with severe trauma were 20 times higher risk of developing disabilities compared to mild trauma cases (OR 20 p-value 0.0001). Both gender and number of injuries showed borderline significance values. Males were more than females to have disability as a result of accident (1.7 p-values 0.07) and those with multiple injuries were more than single injuries to develop disability (OR 1.5 p-value 0.06).

Table 6: Univariate analysis of favorable outcome (recovery) and unfavorable outcome (disability) associations (n=592)*

Characteristics		Disability	Recovery	P-value
Place:	In Khartoum	121 (25.5%)	353 (74.5%)	0.0001
	Out Khartoum	74 (62.7%)	44 (37.3%)	
Age:	≥ 25 year	148 (37.7%)	245 (62.3%)	0.0006
	<25 year	47 (23.6%)	152 (76.4%)	
Gender:	Females	34 (23.6%)	110 (76.4%)	0.0062
	Males	161 (35.9%)	287 (64%)	
User:	In car (passenger)	113 (31.2%)	249 (68.8%)	0.2629
	Pedestrian	82 (35.7%)	148 (64.4%)	
Occupation:	Employee	167 (35.2%)	308 (64.8%)	0.0207
	Student	28 (23.9%)	89 (76.1%)	
Education:	Educated	143 (30.5%)	326 (69.5%)	0.0133
	Illiterate	52 (42.3%)	71 (57.7%)	
Marital status:	Married	88 (35.5%)	160 (64.5%)	0.2633
	Single	107 (31.1%)	237 (68.9%)	
Socioeconomic:	High	23 (17.2%)	111 (82.8%)	0.0001
	Low	172 (37.6%)	286 (62.5%)	
Accident time:	Day	82 (33.1%)	166 (66.9%)	0.9561
	Night	113 (32.9%)	231 (67.2%)	
Safety measure:	Not using safety	189 (33.6%)	374 (66.4%)	0.1501
	Using belt/helmet	6 (20.7%)	23 (79.3%)	
Injury:	Single	99 (28.37%)	250 (71.6%)	0.0046
	Multiple	96 (39.5%)	147 (60.5%)	
Evacuation:	Ambulance	70 (53 %)	62 (47%)	0.0001
	Other	125 (27.2%)	335 (72.8%)	
Pre-hospital care:	Received care	109 (64.9%)	59 (35.1%)	0.0001
	None	86 (20.3%)	338 (79.7%)	
Traumas severity:	Mild	138 (26.1%)	390 (73.9%)	0.0001
	Severe	57 (89.1%)	7 (10.9%)	

*Total cases are (621) died cases are (29) analysis done to the remainder (621 - 29 =592 cases)

Table 7: Multivariate analysis of disability associations (n = 592)*

Characteristics	OR	95%CI	P-value
Place Outside vs. inside Khartoum state	2.26	1.25-4.09	0.0073
Age ≥ 25 year vs. <25 year	2.89	1.54-5.40	0.0009
Gender Males vs. females	1.66	0.95-2.92	0.0764
User Pedestrian vs. passenger)	1.88	1.14-3.09	0.0133
Occupation Student vs. employee	1.09	0.52-2.27	0.8212
Education Illiterate vs. Educated	1.12	0.64-1.93	0.6969
Marital status Single vs. married	1.09	0.65-1.83	0.7366
Socioeconomic Low vs. high	2.32	1.26-4.29	0.0072
Accident time Night vs. day	1.22	0.78-1.91	0.3926
Safety measure Not used safety vs. used	1.87	0.59-5.87	0.2850
Injury Multiple vs. single injury	1.53	0.98-2.38	0.0601
Evacuation Ambulance vs. other	1.50	0.87-2.60	0.1448
Pre-hospital care Received care vs. none	5.11	3.10-8.43	0.0001
Traumas severity Severe vs. mild	19.19	8.02-45.92	0.0001

*Total cases are (621) died cases are (29) analysis done to the remainder (621 - 29 =592 cases)

Discussion

Our objective is to study (MVA) in (KTH), Sudan and to assess both provided health care and clinical outcome (favorable and unfavorable) hoping to explore this public health problem and come with some recommendation that assist in controlling morbidity and mortality of (MVA). In general, we found that most of accidents were due to road user fault including over speeding, driver error and

negligence, unsafe over take, alcohol, low compliance with traffic laws and violation of signals in intersections. Over speeding remains the main cause of accidents resulting in severe injuries with disabilities. These results are in accordance with evidences generated from different studies conducted in different areas around the globe (13, 19, 22, 25)

There was Involvement of large number of males in (MVA). Similar results found (13, 16, 19,

20, 22, 25). And this is probably due to the nature of their work which exposes them to the risk of accidents.

Most of victims were ageing 25 years and above similar findings were generated from different studies (20, 21-24) and there is association between age and disabilities resulting from (MVA) which means that people of the most active and productive age group are involved in (MVA) which adds a serious economic loss to the community.

Pedestrians had large number of accidents this fact is consistent with results obtained from previous studies [5-13].

Employees constituted the maximum number of cases and this may be due to fact that most employees work as daily workers and most of them were pedestrians. Employees had most severe injuries and worse outcomes and this can be explained by fact that most of them had low socioeconomic and more prone to accidents regarding to the nature of their work. Socioeconomic status is well known to be a risk factor for injury generally, and (MVA) is no exception [13, 14, 16, 17]. Studies found that individuals from low socioeconomic groups or living in poorer areas are at greatest risk of being killed or injured as a result of (MVA), even in high-income countries [18]. In this study most of victims were of low socioeconomic status. Most of victims had educational level of primary school or even illiterate, similar results were observed in many studies [6, 13-15]. There is significant association between educational level and disabilities of (MVA) victims, high educational level victims had good outcomes and this is may be due to very precautions usage of the road, uses of safety measures during driving, and more adherence to rules and medical advices. There were a relatively large number of (MVA) patients from the outside Khartoum state admitted to (KTH) and this is due to the fact that severe cases prefer to be referred and managed at (KTH) because of accessibility and availability of emergency services. But unfortunately this can lead to overload (KTH) with negative impacts on the quality of health care services.

Multiple injuries constituted near half of all cases and also similar results found in other relevant study [21]. Multiple injuries lead to severe cases and hence worse outcome. We found that half of cases which developed disabilities had severe injuries, similar results are found [20, 23]. The reasons may be due to fact that; multiple injuries need involvement of multi-disciplinary team compose of (general surgery, neurosurgery, ENT, and

orthopedics) which is not available in all times in (KTH).

Few patients were using crash helmets and safety belts. Lack of road safety measures uses also found in previous studies [18, 23]. Despite the presence of legislation mandating safety belts and bicycle helmet in Sudan, still use of safety measures is limited.

Only few cases reached (KTH) with ambulance, most of victims were brought to (KTH) by their relatives or bystanders. Similar results were found and reported [19]. This reflects lack of emergency services at interstate highways and lack of trained personnel that could provide first aid at scene.

It is known that many fatal injuries may be prevented or their severity reduced by adequate pre-hospital trauma care [20]. But many cases reached (KTH) without any form of pre- hospital care resulting in worse outcome. Regarding to the health care services received by victims in (KTH) we notice that there were many services done to them either investigations (X rays, CT Scan and other laboratories tests) or treatments (drugs and operations) so this reflects again the burden of (MVA) and its economic effects on health system.

Summary and Conclusion

(MVA) continue to be a growing menace, incurring heavy loss of valuable man-power, human resources and increase the burden on health system.

To prevent (MVA) and its health consequences there should be a combination of behavioral change, enforcement, road changes, speed limits, enforcements, and vehicle changes besides improvements of hospitals services. There is a need to Improving safety of pedestrian and to establish health education program to them.

These results delineate the burden on (KTH) so there is a need to establishing proper trauma centers for treatment of (MVA) cases outside Khartoum state.

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Conflicts of interest

The authors declare that there is no conflict of interests.

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