



ORIGINAL ARTICLE

Road traffic accident clinical pattern and management outcomes at JUMC Emergency Department; Ethiopia[☆]Dereje Endale Mamo^{a,*}, Asmamaw Abebe^b, Temesgen Beyene^b, Filipos Alemu^a, Bayisa Bereka^c^a Department of Nursing, College of Health Sciences, Dilla University, Southern Nations, Nationalities and Peoples (SNNP), Ethiopia^b Department of Emergency Medicine, College of Health Sciences, Addis Ababa University, Addis Ababa, Ethiopia^c School of Nursing, Institute of health, Jimma University, Jimma, Ethiopia

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ABSTRACT

Background: Road Traffic Accident is an incident on a way or street open to public traffic. It becomes one of the most significant public health problems in the world especially in developing countries. In Ethiopia, it represents a significant risk for morbidity and mortality. It is also the major public health problem even though studies done on this topic in the study area is limited.

Objective: To assess clinical pattern, associated factors and management outcomes among road traffic accident Victims attending emergency department of Jimma University Medical Center.

Methods: Hospital based cross sectional study design was employed to review patients' chart visited the hospital from March to April 2021. A systematic random sampling technique was applied. The data were collected using pretested checklist and analyzed using SPSS version 26. Descriptive statistics and multivariate logistic regression were computed. Variables with $P < 0.05$ were considered statistically significant.

Results: About 49.6% were pedestrians injured of which motorcycle accounted 42.9%. More than half of victims never got any type of prehospital care. On arrival, 38.7% were classified as Red of which 71.4% of them were managed surgically. About 84.9% of victims were discharged with improvement whereas 12.6% were died. Victims with head injury (AOR= 16.61; 95% CI: 3.85, 71.71), time elapsed to reach nearby health facility (AOR= 3.30; 95% CI (1.13, 9.60), condition of patient at Emergency Department (AOR= 7.78; 95% CI: 2.33, 26.06), GCS at admission (AOR= 20.12; 95% CI: 7.23, 55.96) and days spent in hospital (AOR= 6.85; 95% CI 5.81, 8.06) were independent predictors of unfavorable outcome.

Conclusion: Road Traffic Accident represents a significant risk for morbidity and mortality in Ethiopia, of which head injury and multiple sites injury increase injury severity. Targeted approaches to improving care of the injured victims may improve outcomes. Thus, the clinician should take into consideration the clinical presentation and give due attention to the identified contributing factors in its management.

African Relevance

- Prehospital delay for victims of RTA in developing countries is under studied.
- Emergency medical care providers in Africa are low in number and inadequate pre-hospital care is reported.
- The mortality and disability from RTA are not well reported in Africa, and in Ethiopia too.

Introduction

A road traffic accident (RTA) is an accident occurring on a road or road open to public transport, resulting in the death or injury of one or more individuals and the presence of at least one moving vehicle [1]. According to World Health Organization (WHO), every day more than 3000 people die from road traffic accidents which constitutes almost 1.3 million people losing their lives each year [2]. By 2030, if an appropriate measure is not taken, it is predicted to become the fifth driving cause of death on the planet [2]. It triggers general medical problems in the regions, and worldwide. About 20 to 50 million people experience non-lethal wounds [3].

Motor vehicle accidents (MVA) are preventable and treatable if appropriate measures are taken before they occur and immediately following the accident [4]. Despite the attempts made to enhance road and law enforcement efforts, the motor vehicle accident rate rose by 0.3% from 2000 to 2012 globally. In one WHO reports, the proportion of road acci-

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dent fatalities to total deaths in the world has grown by 2.2% from 1.255 million deaths in 2012 [5]. Road Traffic Accident (RTA) is ranked ninth among the key causes of Disability Adjusted Life Years, and its ranking is predicted to increase to a third by 2020. In addition, 96% of all children killed worldwide are due to traffic collisions [6]. Injuries kill more people worldwide every year than HIV, Tuberculosis, and malaria combined in Sub-Saharan Africa [7].

RTA is currently becoming a global public health issue, particularly in countries with low and medium incomes. Ethiopia is one of the 50 countries with the world's deadliest roads, according to a WHO survey in 2015 [8]. Deaths arising from road traffic accidents are a major cause of death and injury with a disproportionate number occurring in African countries. In Ghana, studies have shown that road accidents are one of the major causes of death and injury [9]. Road traffic collisions are responsible for substantial morbidity and mortality which is a major health concern worldwide. It is the current leading cause of death for children and young adults (5–29 years), and the eighth for all age groups [10].

Various studies conducted in Ethiopia have shown that the country's trend in RTA morbidity and mortality has risen from year to year. It also leads to poverty by causing loss of productivity, harm to materials, injury, disability, sorrow, and death. RTA is also one of the top three causes of death for people between the ages of 5 and 44 [11].

Even though RTA was one of the most common causes of morbidity and mortality among almost all age groups, clinical pattern, and management outcome is not well cited. In addition, the management outcome of RTA may be varied from place to place and time to time due to different factors. Moreover, there is no study in the South Western part of Ethiopia including the study hospital. Therefore, this study will have a great contribution to exploring the existing trends regarding patterns and management outcomes. The result of this study finding will help clinicians, the traffic law enforcer, and researchers. This study result will ultimately have its implication in the reduction of morbidity and mortality secondary to RTA.

Methods

Study area and period

A hospital-based cross-sectional study was conducted at Jimma University medical center (JUMC) from March to April 2021. It is located in Jimma Town in the Southwest of Ethiopia at 352 km from the capital city, Addis Ababa. There are five hospitals in the Town; two governmental and three non-governmental ownership. JUMC is the only teaching and referral hospital in the southwestern part of the country, providing services for approximately 15,000 inpatients, 160,000 outpatient attendants, 11,000 emergency cases, and 4500 deliveries in a year coming to the hospital from the catchment population of about 15–20 million people.

Population

All records of road traffic accident victims who visited the hospital were the source population. A selected record of RTA patients visiting the Emergency department, surgical and orthopedic wards of JUMC from March 15, 2020 to April 15, 2021 was study population. Single population proportion formula was used to estimate 357 desired samples included in the study. To reach these 357 victims, after all RTA patients' record were obtained from the patients' registration logbook, a systematic random sampling technique was used in which every 3rd card was selected. Incomplete records (absence of major variables in the chart) and records lost from data room were excluded from the study and replaced by others cards.

Data collection method and quality control

The data were extracted from each victim's medical record by using a checklist adapted from WHO injury surveillance guidelines [12]. Content and construct validity of the instruments was done by consulting senior professionals from the school of Nursing and further modification was done. The researchers then, pre-tested the questionnaire at Shenan Gibe Hospital on 18 patients for evaluation and refining. A reliability test was done and chrombach's alpha coefficient was 0.74. Since the data were collected from medical records, to decrease misinterpretation of data, the data collectors were trained on how to extract appropriate data and there was close daily monitoring and supervision at the data collection site. For a single victim's medical card, there were two data collectors and they cross-checked the data collected by one data collector by comparing it with the information on the medical records.

Data processing and analysis

After data collection, it was checked for completeness, coded, and entered into Epi Data statistical software package version 4.6. Then, the data were exported to SPSS version 26 and analyzed. Descriptive statistics was used to describe the distribution of variables under study. Those variables having P -value < 0.25 in the bivariate analysis were transferred to the multivariable analysis and those variables having P -value < 0.05 at 95% confidence level were considered as statistically associated with management outcome of RTA.

Ethical considerations

An ethical issue was considered while conducting the study. Primarily, an official letter with Ref. No EM/SM/2016/2021 was obtained from Research Ethical Review Committee of Addis Ababa University followed by Jimma University. Finally, approval was gathered from JUMC. The objective and purposes of the study were explained to staff members of the record office. Then, for retrieval of individual record and confidentiality of information, a written consent was given to the record office of the hospital. After completion of data collection, medical records were returned back to their original place properly. This study was conducted in accordance with the Declaration of Helsinki. The collected data were utilized only for research purposes.

Operational definitions

Disposition outcome: is an outcome after the victim is seen by the Emergency Physician at the Emergency department and planned to be discharged with improvement, admitted, referred, or Against medical advice(AMA).

Favorable outcome- is a positive outcome (improved and discharged) of RTA victims attended at JUMC.

Unfavorable outcome- is the negative result (referred to other hospitals died or left against medical advice) of an RTA victim visited at JUMC [20].

The severity of injury: We were not able to measure injury objectively because we used chart review. Injury is classified into three categories based on the extent of the injury and the treatment required.

Minor injury: Superficial injuries (bruises and lacerations).

Moderate injury: Injuries beyond subcutaneous tissue but not including the visceral organs requiring some skilled treatment.

Severe injury: Injuries requiring intensive surgical and/or medical treatment [21].

Results

Socio demographic characteristics

A total of 357 trauma victims' registries were reviewed and included for analysis. The mean and (SD) of the age of the victims was $27 \pm$

Table 1

Socio-demographic characteristics of RTA victims who visited JUMC from March 2020 to April 2021, Jimma, Ethiopia (n = 357).

Variables	Category	Frequency	(%)
Age	≤ 15 years	75	21.0
	16-30 years	150	42.0
	31-45 years	99	27.7
	46-59 years	24	6.7
	≥ 60 years	9	2.5
Sex	Male	270	75.6
	Female	87	24.4
Occupation	Government	57	16.0
	Student	147	41.2
	Farmer	54	15.1
	Merchant	39	10.9
	Housewife	60	16.8
Address	Rural	231	64.7
	Urban	126	35.3

13.7 years. Of all victims who visited the hospital, the most commonly affected age group was between 16-30 years old, accounting for 150 (42.0%) followed by age 31-45 years 99 (27.7%). This study also identified the sex of victims, 270 (75.6%) were male and 87 (24.4%) were female respectively with male to female ratio of 3.1 to 1. Nearly two-thirds (64.7%) of the victims were from rural residence (Table 1).

Clinical patterns of road traffic accidents

Among 357 cases reviewed, 141 (39.5%) of them sustained multiple injuries followed by lower limb injuries, 108 (30.3%) in which closed wounds accounted for 219 (61.3%). Nearly two third (60.5%) of victims developed fracture 216 (60.5%) followed by blunt abdominal injury which accounted for 54 (15.1%). On the other hand, among the victims affected 177 (49.6 %) were pedestrians followed by passenger 93 (26.1 %). The majority of the MVAs occurred during the day, 228 (63.9%) whereas the remaining 129 (36.1%) occurred at night time. About 153 (42.9%) of injuries were caused by Motor cycle followed by Minibus 69 (19.3%). Regarding the mechanism of injury, more than one-third (40.4%) of the victims reported that they collided with the other vehicle followed by falling down from the moving vehicle (23.5%). In addition, the largest proportion of victims (34.5%) was transported to their nearby health facility using a private vehicle whereas only 93 (26.1%) of them used the Ambulance. The time it takes to reach the initial health facility was in greater than 1 hour, 180 (50.4%). Almost half (47.9%) of the victims were come to JUMC after visiting other health institutions followed by those from the scene (40.3%). Nearly half 174 (48.7%) of the victims sustained severe injury followed by moderate injury which accounted for 132 (37%) (Table 2).

Management and its outcomes

More than one-third (42%) of the victims never got any type of treatment before arriving to this referral hospital. Regarding the condition of the victim at the ED, 180 (50.4%) were unstable and six (1.7%) were dead on arrival. Furthermore, nearly half (48.7%) of them were resuscitated and about 37% were given analgesia. On triage paper, more than one-third (38.7%) of the victims were classified as Red and more than two-thirds (71.4%) of them received surgical treatment among which 22.8% were admitted to ICU. In addition, almost half (48.1%) of the patients who were admitted had mild GCS followed by moderate GCS 132 (37%) on admission. Almost two-thirds (62.2%) of patients admitted stayed in this hospital for less than two weeks followed by those who stayed between 15 to 24 days (20.2%) (Table 3).

About three fourth (71.4%) of the victims were admitted and 87 (24.4%) of them were sent home. However, about 12.6% of victims ad-

Table 2

Pattern and injury severity among RTA victims who visited JUMC from March 2020 to April 2021, Jimma, Ethiopia (n = 357).

Variables	Category	Frequency	(%)
Anatomic part of the body injured	Upper Limbs	37	10.4
	Lower Limbs	108	30.3
	Pelvic Area	15	4.2
	Chest Area	5	1.4
	Head Injury	51	14.3
	Multiple injuries	141	39.5
Characteristics of injury	Fracture	216	60.5
	Dislocation	6	1.7
	Laceration	22	6.2
	Abrasion	59	16.5
	Blunt abdominal injury	54	15.1
Types of wound	Open wound	87	24.4
	Closed wound	219	61.3
	Comminuted	51	14.3
Classification of the Victims	Pedestrian	177	49.6
	Driver	84	23.5
	Passenger	93	26.1
	Assistant Driver	3	0.8
	Night time	129	36.1
Time of Accident	Day time	228	63.9
	Isuzu	42	11.8
Type of vehicles	Motor Cycle	153	42.9
	Public Bus	27	7.6
	Minibus	69	19.3
	Bajaj	66	18.5
	Fall down	129	36.1
Mechanism of injury	Roll over	84	23.5
	Collision	144	40.4
	Ambulance	93	26.1
Mode of Transportation	Commercial Vehicle	63	17.6
	Police vehicle	42	11.8
	Private vehicle	123	34.5
	Carried by people	36	10.1
	≤ 1 hour	177	49.6
The time it takes to initial HF	> 1 hour	180	50.4
	Scene	144	40.3
Place where the patient comes	Hospital	171	47.9
	Health Center	27	7.6
	Private institution	12	3.4
	Self	3	0.8
	Minor injury	51	14.3
The severity of injury	Moderate injury	132	37
	Severe injury	174	48.7

mitted with RTA had lost their lives including those who died on arrival (Table 4).

On multivariate analysis, anatomical sites, mechanism of injury, time to reach an initial health facility, time of the day, condition of a patient at ED, type of treatment given, GCS at admission, and days spent in hospital were independent factors associated with unfavorable outcomes. Anatomical sites (head injury) (AOR= 7.72; 95% CI:1.29,46.13), fall down injury (AOR= 0.23; 95% CI: 0.08, 0.68), the time elapsed to reach nearby health facility (AOR= 3.30; 95 CI (1.13, 9.60), time of the day (AOR= 2.79; 95% CI: 1.06, 7.34), condition of a patient at ED (AOR= 7.78; 95% CI: 2.33, 26.06), GCS at admission (AOR= 20.12; 95% CI: 7.23,55.96) and days spent in hospital (AOR= 6.85; 95% CI 5.81, 8.06) had statistically proved associations with unfavorable outcome (Table 5).

Discussion

Road Traffic Collisions have become a major public health and economic problem worldwide [13]. Many studies have revealed that there has been a rapid increase in the number of road traffic accidents in many developing nations including Ethiopia over the last several decades [14]. This study indicated that out of 357 RTA victims, the most commonly affected age group was 16-30 years, (42.0%) and more than three fourth (75.6%) of patients were male victims. This may be due to increased

Table 3

Condition of the patient, management given, and average number of days the patient stayed in the hospital from March 2020 to April 2021, Jimma Ethiopia, 2021 ($n = 357$).

Variables	Category	Frequency	Percent
Treatment at initial HF	Yes	207	58.0
	No	150	42.0
Type of treatment given initially	Basic FA	36	10.1
	Resuscitation	57	16.0
	Analgesia	81	22.7
	Antibiotics	39	10.9
Condition of the patient at ED	Stable	171	47.9
	Unstable	180	50.4
	Died on arrival	6	1.7
The care given in ED	Resuscitation	174	48.7
	Analgesia	132	37.0
	Wound care	21	5.9
	Antibiotics	30	8.4
Place where patient kept at ED	Triage	129	36.1
	Red area	138	38.7
	Front evaluation	63	17.6
	Other*	27	7.6
Type of treatment given	Conservative	33	9.2
	Surgical	255	71.4
	Medical	69	19.3
Type of Ward	Orthopedics	85	33.3
	Surgery	112	43.9
	ICU	58	22.8
Mental status (GCS) of the victim	13-15	174	48.7
	9-12	132	37
	3-8	51	14.3
Length of Hospital stay(in days)	≤14	158	62.2
	15-24	52	20.2
	25-34	32	12.6
	≥35	13	5

*Others: Those victims who were kept in waiting areas and had yellow category.
Note: HF; Health facility, ED; Emergency department, FA; First Aid, GCS; Glasgow Coma Scale.

daily movement for work, and the increased level of participation in high-risk activities. Regarding the type of injury, a musculoskeletal fracture was the most frequent type of injury (60.5%) due to the fact that the majority of the study participants were motorcycle drivers and passengers who sustained collision injuries. Almost half (49.6%) of the victims were pedestrians in this study.

Table 4

Disposition and discharge outcome of RTA patients at JUMC from March 2020 to April 2021, Jimma Ethiopia, 2021.

Outcome	Category	Frequency	Percent
Disposition Outcome	Sent home	87	24.4
	Admitted	255	71.4
	Referred	6	1.7
	Died on arrival	6	1.7
Discharge outcome	Against Medical Advice	3	0.8
	Died	45	12.6
	Improved	303	84.9

In multivariable logistic regression, the chances of unfavorable outcomes among patients who sustained a head injury were 17 times more than those who experienced other body injuries. This finding agrees with the study done in Saudi Arabia where the OR was 17 compared to this study (AOR=17.4) [15]. Prehospital delay > 1 hour before reaching the initial health facility increased the odds of unfavorable outcomes more than three times as compared to their counterparts. This study is lower than the study done in Shanghai, China where the OR was 34 compared to this study (AOR 34.4) [16]. This showed delay to visit nearby health institutions after injury increases the risk of complication and death due to heavy blood loss and damage of major organs. The collisions happening in dark conditions were almost three times more likely to cause unfavorable outcomes than those happening in daylight. This might be due to the fact that an accident that happens during night time is usually associated with severe injuries because the driver may get into sleep, substance use, and speed of the vehicle. Therefore, prehospital delays and the severity of injuries sustained at night point need for systems and infrastructure changes in Ethiopia.

Victims who were unstable during presenting to ED were eight times more chances of developing unfavorable management outcomes than their counterparts. This is associated with the severity of injury and multi-organ damage in these patients as manifested by derangement in vital signs. This study is in line with the study done in Dar es Salaam, Tanzania [17]. Moreover, the likelihood of death among patients who had low GCS or were in a deep coma during admission was twenty times more as compared to patients with mild GCS. This study is lower than the study done in Guinea where the OR was 39 compared to this study (AOR 38.7) [18]. The difference might be due to the fact that the study participants included in the later study were patients with traumatic

Table 5

Factors associated with management outcome of injury related to RTA at JUMC, Jimma, Southwest Ethiopia, 2021.

Variables		Victims' outcome (%)		AOR (95% CI)	P-value
		Favorable	Unfavorable		
Anatomical sites	Extremity	44.7	7.7	1	0.03
	Pelvic area	5.3	7.7	7.72(1.29,46.13)	
	Head injury	13.2	23.1	16.61(3.85,71.71)	<0.01
Mechanism of Injury	Fall down	17.9	38.5	0.23(0.08,0.68)	0.01
	Roll over	22.6	30.8	0.31(0.10,0.95)	0.14
	Collision	38.7	15.4	1	
Time of accident	Night	65.1	53.8	2.79(1.06,7.34)	0.04
	Day	34.9	46.2		
The time it takes	≤ 1 hour	54.7	15.4	1	0.03
	> 1 hours	45.3	84.6	3.30(1.13, 9.60)	
Condition of a patient at ED	Stable	54.7	15.4	1	<0.001
	Unstable	45.3	84.6	7.78(2.33,26.06)	
Type of Rx given	Conservative	8.5	15.4	1	
	Surgical	75.5	38.5	0.23(0.07,0.81)	0.02
	Medical	16.0	46.2	1.15(0.31,4.19)	0.84
Mental status (GCS) on admission	Mild	51.9	23.1	1	<0.001
	Moderate	38.7	23.1	1.50(0.55,4.07)	
	Severe	9.4	53.8	20.12(7.23,55.96)	
Days spent in hospital	≤ 14 days	39.6	23.1	6.85(5.81,8.06)	<0.001
	> 14 days	60.4	76.9	1	

brain injury secondary to motor vehicle accidents. This study is in line with the study done in Malawi compared to this study (AOR 39) [19]. This result suggests that patients with low GCS are highly liable for a bad outcome that could be due to major organ failure, especially severe head injury. Thus in patients who arrive at ED with lower GCS, clinicians should have a high index of suspicion for deterioration.

Conclusion

RTA represents a significant risk for morbidity and mortality in Ethiopia, of which head injury and multiple sites injury increase injury severity. The anatomical site, mechanism of injury, time to reach an initial health facility, time of the day, condition of a patient at ED, type of treatment given, GCS at admission, and days spent in the hospital were among independent predictors of management outcome. Targeted approaches to improving the care of the injured victims may improve outcomes. Thus, the clinician should take into consideration the clinical presentation of RTA and give due attention to the identified contributing factors in the management of RTA. Besides, law enforcers should also give emphasis on the identified type and mechanisms of accidents.

Dissemination of Results

The result of the study was submitted to Addis Ababa University, College of health science, school of Medicine, and Department of Emergency Medicine and Critical Care. It was also disseminated to JUMC, Jimma Zone Health Office, and other concerned and interested organizations. Finally, the result will be published in a renowned journal for public use.

Authors' contribution

Authors contributed as follows to the conception or design of the work; the acquisition, analysis, or interpretation of data for the work; and drafting the work or revising it critically for important intellectual content: D.E. contributed 50%; A.A. 20%; T.B., F.A., and B.B. contributed 10% each. All authors approved the version to be published and agreed to be accountable for all aspects of the work.

Declaration of Competing Interest

The authors declared no conflicts of interest.

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