

# Pattern of Orthopedic Injuries Related to Road Traffic Accidents Among Patients Managed at the Emergency Department in Black Lion Hospital, Addis Ababa, Ethiopia, 2021

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**Background:** Studies showed that each year people lose their life on the road and many people are disabled. The majority of this disability was caused by orthopedic injury related to road traffic accidents. However, in the context of Ethiopia, studies ascribed to orthopedic injuries related to road traffic accidents are limited. The study aimed to assess the pattern of orthopedic injuries related to road traffic accidents among patients managed at the emergency department of Black Lion Hospital.

**Methods:** An institutional-based cross-sectional study was conducted on 354 victims of road traffic accidents with orthopedic injuries who were visiting the Emergency department of Black Lion Hospital. Patient charts were selected by systematic random sampling technique and the data was entered into Epi-data version 4.4.2.2 and exported to the static package for social science window version 26, and descriptive statistics were used for analysis.

**Results:** The study reveals that males were mostly injured persons (71.7%) with the age group of 13–24 were the most injured. Passenger car accounts 36.3% of causes of injury followed by motorbikes (27.4%) and lower limbs were the most common anatomic site of injuries (47.9). Of all injury types, a fracture is the most common one with 71.1%, especially lower limb fracture (42.1%). More than half victims (59.5%) had open wounds, and almost half of the study subjects (51.8%) experience Road traffic accidents while they are crossing or walking along the way.

**Conclusion:** Orthopedic injuries related to road traffic accidents are the main cause of death and disability in many individuals, especially in reproductive age groups. Therefore, policy-makers should be aware of different patterns of orthopedic injuries associated with a victim of road traffic accidents to have an appropriate and sustainable capacity to manage the orthopedic injuries.

**Keywords:** orthopedic injury, pattern, road traffic accident

## Introduction

Injuries are classified as unintentional and intentional. Unintentional injuries contain most traffic injuries, fires, falls, poisonings, and drowning.<sup>1</sup> The Road Traffic Accident (RTA) is an accident that happens on a way or street open to public traffic; causing one or more people to be injured, and at least one moving vehicle involved. These accidents include collisions between vehicles, between vehicles and pedestrians, and between vehicles and animals or fixed objects. An orthopedic injury is any injury to the musculoskeletal system; commonly related to the bones, and joints as a consequence of an accident or trauma to the body.<sup>2</sup>

Half of the world's road traffic life losses happen among motorcyclists (23%), pedestrians (22%), and cyclists. Motor vehicle accidents are the top cause of death in adolescents and young adults globally.<sup>3,4</sup>

Every year 20 to 50 million people were being disabled by road traffic injuries. Approximately 16% of the people who were being injured become disabled for life. Orthopedic injuries are the most common type of injuries and the top

cause of disability, and from orthopedic injuries, musculoskeletal injuries are the main cause of disability especially femoral fractures, and open tibia fractures.<sup>5,6</sup> Road traffic accidents were the main reason for most fractures, especially in developing countries.<sup>7</sup>

Road traffic accidents are one of the top causes of injuries in Africa. Life losses from road traffic accidents in the African region are 40% greater than in all other countries. Low- and middle-income countries are about 50% greater than the world average. In developing countries, these injuries are significant but largely overlooked health issues.<sup>1</sup>

The loss of a limb or a digit (finger or toe) due to road traffic accidents is known as traumatic amputation. Amputations are often one of the most difficult injuries and are not as common as some other car accident injuries, reports showed that car accidents are the primary cause of traumatic amputations.<sup>8</sup> Of all traumatic amputations, 58.8% of them were caused by RTA.<sup>9</sup>

Nearly 1.3 million people die each year as a result of road traffic crashes and 93% of the world's fatalities on the roads occur in low- and middle-income countries. Children and young adults aged 5–29 years are the most vulnerable groups. Road traffic crashes cost most countries 3% of their gross domestic product.<sup>10</sup>

The estimated global economic cost of road traffic accidents was US\$1.8 trillion in 2015–30, which is equivalent to an annual tax of 0.12% on global gross domestic product. Although low-income and middle-income countries have the largest health burden, their share of the economic burden of road injuries is only 46.4% of the global loss.<sup>11</sup> Ethiopia costs around 36.3 billion birrs (estimated 1.3 billion US\$) in the past eleven years. On average, Ethiopia loses around 0.9% of the budget annually due to traffic accidents in the past eleven years.<sup>12</sup>

Even though there are significant Orthopedic injuries due to RTA in Ethiopia and the number of vehicles in Addis Ababa is getting high (from the entire number of cars found in Ethiopia 62% of them are found in Addis Ababa).<sup>14</sup> As far as our knowledge is concerned, there is a limited amount of study conducted on a pattern of orthopedic injuries related to RTA. Therefore, this study aimed to assess the pattern of orthopedic injuries related to road traffic accidents among patients managed at the emergency department of Black Lion Hospital.

## Methods and Materials

An institutional-based cross-sectional study was conducted from March to June 2021, at the emergency department of Black Lion Hospital which is located in Addis Ababa city. It gives service to more than 700,000 patients per year. It has more than 700 beds and it serves as a training center for undergraduate and postgraduate students. The Orthopedic department is one of the main departments in the Black Lion Hospital. It was established on September 25, 1987, as a premier orthopedic center in the country. It gives full orthopedic clinical service and offers specialty and subspecialty training.

The sample size of the study was determined using the single population proportion formula. Following this, a 95% confidence level, a 5% tolerable error and a 50% postulated variability of orthopedic injuries with road traffic accidents was assumed. As well, since the total population of the setting was less than 10,000 so the population reduction formula was used and 10% for missing charts was considered. As a result, the total sample size of the study was 354. A systematic random sampling technique was used to select the required sample size. The first patient chart was selected randomly and then every  $K^{\text{th}}$  patient chart was selected; that is  $K=N/n=2000/354=5.6\sim 6$ ; therefore, charts were taken every six intervals.

Among the Study Variable, the dependent study variable was Orthopedic Injuries due to RTA and the independent variables were age, sex, address of the patient, and type of vehicle. A standardized structured checklist which was adapted from the injury surveillance guidelines of the World Health Organization (WHO) was used with some modifications.<sup>15</sup> Data were collected by three nurses later on one day of training on how to extract the required information.

## Data Quality Control Measures

To assure the data quality, training was given to data collectors for one day on a method of extracting the needed information, how to fill the information on a checklist, and the aim of the study and the contents of the instruments. Five percent (5%) pretest was done before actual data collection, and there was ongoing supervision throughout data collection. The filled

checklist was checked visually for its completeness, missed values, and unlikely responses; that incomplete checklist was tried to be filled with data collector as much as possible otherwise it was omitted from the analysis.

## Operational Definition

**Injury:** Physical damage to the body intentionally or unintentionally. The pattern of injury: it is the characteristic of the object causing the injury, numerical representation of orthopedic injury due to road traffic accident; it may be bones, joints, muscles, ligaments, tendons, nerves, skin, and musculoskeletal system. **Pedestrian:** it is a person walking rather than traveling in a vehicle. **Passenger:** A person traveling/transport/by vehicle. **Vehicles:** is advice for carrying or transporting individuals or objects. **Chart with any missing information:** any chart that misses valuable information about the Patients' condition example diagnosis, which skeletal part was injured, and their treatment outcome. **Multiple fractures:** fracture at two or more places in a bone.

## Ethical Consideration

Ethical clearance was obtained from Addis Ababa University, College of Health Sciences, and Department of Emergency Medicine. An official letter was submitted to Black Lion Hospital and permission was taken from the concerned bodies. All collected data were confidentially kept and the names/or other personal information was not notified in any report and we have confirmed that our study complies with the Declaration of Helsinki.

## Data Processing and Analysis

The collected data was checked for its clarity completeness and consistency. Then the response was entered into the computer using Epi data version 4.4.2.2 statistical packages. Then the data was exported to windows of Statistical Package for Social Science (SPSS) version 26 for data analysis. During the process of analysis, descriptive statistics were used to provide an overall and coherent presentation and description of the data using tables and figures.

## Result

### Demographic Characteristics of Study Participants

A total of 354 participants were involved in the study. Of which, more than three-fourths (71.7%) of the study subjects were males. The mean age of the study population was 29. Of all age groups, 13–24 age groups were the most frequent victims (31.8%), and age groups greater than forty-nine and<sup>1–12</sup> were the least frequently injured age groups. Among study subjects, 217 (64.6%) live in Addis Ababa whereas the rest 119 (35.4%) live outside of Addis Ababa (Table 1).

### Pattern of Injuries

The commonly injured anatomic site was the lower limb 161 (47.9%), then multiple injuries 58 (17.3%) followed by upper limb 56 (16.7%), and the least one was chest area injury such as rib and clavicle fracture. Fractures were the most common type of injury 241 (71.7%) followed by Soft tissue injury 43 (12.8%) then dislocation 29 (8.6%).

The most common site of fracture is lower limb fracture 98 (42.1%) and multiple fractures 52 (22.3%) then pelvic fracture encounters eight percent (8%), and upper limb fracture (5.4%). The least one is a spinal bone fracture which accounts for 2 (0.9%).

A Compound fracture is the most common type of fracture 122 (52.4%) followed by a simple fracture 111 (47.6%). Shoulder 19 (5.7%) was the most common site of dislocation followed by elbow 14 (4.2%), whereas knee dislocation encounters the least 8 (2.4%). Among study participants, the majority of them had open skin wound 200 (59.5%) followed by closed skin wound (40.5%).

The Passenger car was the most common cause of injury (36.3%), followed by motorcycles 92 (27.4%), whereas pickup trucks were the least common cause of injury 24 (7.1%).

Around half of the victims were injured when walking on the roadside or crossing road 174 (51.8%), followed by falling from a moving vehicle 109 (32.4%), vehicle collision encounters 49 (14.6%), and the rest 4 (1.2%) injured when the parking car moves while they were under it or/and between tires (Table 2).

**Table 1** Sociodemographic Characteristics of the Study Population

Variables		Frequency	Percent
Age	1–12	46	13.7
	13–24	107	31.8
	25–36	98	29.2
	37–49	39	11.6
	>49	46	13.7
Sex	Male	241	71.7
	Female	95	28.3
Residency	Live in Addis Ababa	217	64.6
	Live out of Addis Ababa	119	35.4

**Table 2** Frequency Distribution of Study Subjects on the Pattern of Orthopedic Injury Related to RTA

<b>1.Region of the Body that was Injured</b>	Frequency	Percent
Upper limb	56	16.7
Lower limb	161	47.9
Pelvic area	25	7.4
Chest area	10	3.0
Head injury	26	7.7
Multiple injuries	58	17.3
<b>2.Type of vehicle that causes the injury</b>		
A Passenger car	122	36.3
Motorcycle	92	27.4
Bicycle	28	8.3
Bus	18	5.4
Pickup trucks	24	7.1
Others	52	15.5
<b>3.Type of fracture</b>		
Simple	111	47.6
Compound	122	52.4
<b>4. Site of dislocation</b>		
Shoulder	19	5.7
Elbow	14	4.2
Hip	12	3.6
Knee	8	2.4

(Continued)

**Table 2** (Continued).

<b>5. Situation of the victim during the accident</b>			
Walking on the roadside or crossing the road (pedestrian)		174	51.8
Falling from a moving vehicle		109	32.4
Vehicle collision		49	14.6
Others		4	1.2
<b>6. Patient condition and stabilization</b>			
Was treatment given Before arriving to ED	Yes	153	45.5
	No	165	49.1
	Unknown	18	5.4
Which type of treatment was given	First aid	17	5.1
	Resuscitation	21	6.3
	Medication	44	13.1
	All	69	20.5
	Other	6	1.8
Condition of the patient during arrival at the emergency department	Stable	234	69.6
	Unstable	98	29.2
	Died body on arrival	4	1.2
<b>7. Type of wound</b>			
Open wound		200	59.5
Closed wound		136	40.5

The majority of injured patients came with referrals from health institutions 174 (51.8%). Of all, most patients 69.6% were stable when arrived at ED. Of all arrived patients, 165 (49.1%) did not get any medical support before arrival whereas 153 (45.5%) got some management such as first aid and resuscitation.

## Discussion

Of all orthopedics patients who attend the Emergency department of Black Lion Hospital, almost half of them (49.7%) were due to RTA.<sup>16</sup> According to the HMIS report of Black Lion Hospital, there were a total of 3397 road traffic accident cases from January 1<sup>st</sup>, 2019, up to January 1<sup>st</sup>, 2021, and from this 2000 were orthopedic injuries.

According to the finding, the majority of the victims' age group was 13–24, and the mean age was 29. WHO report in 2018 that RTA was the first top cause of death for young people aged 15–29.<sup>13</sup> In a study conducted in Black Lion Hospital in 2007, the most affected age group with RTA was between 15–25 yrs (35.1%)<sup>17</sup> which is consistent with my result. Even if there is a time gap between studies, the victims are still adolescents and young adults. This might be due to a high number of drivers in this age group and it is the starting point of time for individuals to expose themselves to the external environment independently.

This study shows that among injured individuals, males encounter the higher proportion (71.7%). A study conducted in Taiwan (59.4%) and India (83%) found that males were the major injured persons.<sup>18,19</sup> Similarly, a study was done in Uganda (83%) and Tanzania (72.7%) that supports this finding.<sup>20,21</sup> Another study was done in Minilik Specialized

hospital that showed males (73.5%) were the most injured individuals.<sup>22</sup> The finding of the mentioned study coincides with my finding. The reason why males account for the larger proportion of road traffic injuries might be due to the nature of the job since most drivers were males and more exposed to the external environment.

In this study, the most common orthopedic injury was fracture, especially lower limb fracture (29.2%). A study conducted in Nepal, Taiwan, Tanzania, and Uganda coincides with this finding. When comparing findings of the common anatomic site of fracture with a study conducted in Taiwan, skull bone and upper limb fractures were the commonest (17.9% and 12.2% respectively).<sup>19</sup> In India, lower limb fracture was the most common one followed by upper limb fracture (43.4% and 19% respectively).<sup>18</sup> Fractures of both extremities were common in the study conducted in Tanzania (44.1%),<sup>21</sup> and Uganda (48.5%).<sup>20</sup> Another study was done in Hawassa comprehensive specialized hospital (HUCSH) that showed both extremities fracture accounts for 27.9%. And a study in Black Lion Hospital in 2013 shows fracture accounts for 78% from which lower limb fracture was the commonest (36.2%).

The finding of this study also showed that extremity fracture encounters 48.8% (lower limb 42.1% and upper limb 7.7%). This finding was high as compared to the study conducted at HUCSH. The reason behind this could be the cause of injury which was different in the two-study area (in HUCSH Motor bicycle was the most common cause of RTA which accounts for 49% of all-cause, unlike my finding which is a passenger car (36.3%)).

This study also revealed that a majority of the injured patients had open wounds (59.5%). A study in Uganda showed that open wound injury account for around 40.2%.<sup>20</sup> Another study done in Black Lion Hospital in 2010 showed that open wound injury accounts for 56.5%.<sup>23</sup> This is almost consistent with my finding.

The finding of this study reveals that most victims were pedestrians (51.8%). Another study on Hawassa showed that pedestrian victims account for only 18.8%.<sup>24</sup> The wide difference between the two findings might be due to high road crowdedness and high flow of pedestrians around the road in Addis Ababa.

The study also showed that the most common vehicle that causes injury was a passenger car (36.3%), followed by motorcycles (27.4%). A study done in India on the pattern of injury stated that most road traffic accidents are caused by motor vehicles (73.5%).<sup>25</sup> Another study was done in Arbaminch city, Wolaita, and Hawassa that showed the most common cause of injury was motorcycle crashes, which account for 40%, 31.2%, and 49%, respectively.<sup>24,26,27</sup> The discrepancy in the cause of injury might be the majority of people who live in Addis Ababa use a Passenger car as a means of transportation as compared to people living in Arbaminch city and Wolaita that use motor-bicycle as a means of transportation and also 62% of national cars found in Addis Ababa.<sup>28</sup>

## Conclusion

The study showed that orthopedic injuries related to road traffic accidents are the top cause of death and disability for many individuals. Reproductive age groups were most vulnerable to road traffic accidents and the major cause of orthopedic injuries related to a road traffic accident was passenger cars. Overall, policy-makers should be aware of different patterns of orthopedic injuries associated with victims of road traffic accidents to have an appropriate and sustainable capacity to manage orthopedic injuries.

## Abbreviations

HUCSH, Hawassa University Comprehensive Specialized Hospital; RTA, Road Traffic Accident; WHO, World Health Organization.

## Data Sharing Statement

All data supporting the study are available with a reasonable request.

## Ethical Approval

Ethical clearance was obtained from Addis Ababa University, College of health science, department of Emergency medicine research review ethical committee (date = 17/3/21 and Ref. No = EM/2002/2021), and permission was obtained from Black Lion Hospital administrative to conduct the study.



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## Author Contributions

All authors made a significant contribution in the conception, study design, execution, acquisition of data, analysis and interpretation; or in all these areas; took part in drafting, revising or critically reviewing the article and gave the final approval of the version to be published; have agreed on the journal to which the article has been submitted, and to be accountable for all aspects of the work.

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## Disclosure

The authors declare that they have no competing interests.

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