

**ORIGINAL ARTICLE****COMMON TYPES AND PATTERN OF BONE FRACTURES AMONG ROAD TRAFFIC INJURY VICTIMS SEEN IN ADDIS ABABA PUBLIC HOSPITALS**Adisu Asefa, MSc<sup>1</sup>, Girma Seyoum, PhD<sup>1</sup>, Biruk L. Wamisho, MD**ABSTRACT**

**Background:** Road traffic injuries are among the leading causes of preventable death and lifelong disability globally. We also see an increasing trend in such injuries in Ethiopia.

**Objective:** The objective of this study was to assess common types and patterns of bone fractures and their hospital prevalence among victims with road traffic injury.

**Methods:** We conducted a cross sectional study of two years' data collected retrospectively. Study sample size was 384 and patient charts were sampled from five of 11 public hospitals in Addis Ababa. Data were collected by using a structured questionnaire developed by using medical record numbers. Bivariate analysis was conducted and P-values were computed using the Chi-square test. A P-value <0.05 was set as level of significance

**Results:** Out of 13,526 road traffic injury victims who were seen at the five government hospitals in the capital over the study period, 384 were included in the study. Extremities and the head region were the most commonly injured areas, accounting for 45.1 % and 20.6 % respectively. Over 60% of the patients were pedestrians. The most common patterns of injuries 227 seen in (59.1%) were soft tissue injuries followed by fractures seen in 92 (24%) of the cases. There was statistically significant association between the age of road traffic injury and multiple site fractures (P=0.037).

**Conclusion:** Our study revealed the three commonly prevalent affected anatomic regions by RTI are extremities, head and chest, extremities being most affected. We observed that a typical victim of RTI is a young man who is a pedestrian with tibiofibular fracture. Besides fracture, soft tissue injuries were very common, demanding the care givers to be experts on this. Half of the fractured patients had an isolated/single bone fracture. Multiple regions were injured in about one fifth of the patients, indicating multidisciplinary team work is needed in hospitals handling such trauma.

**Keywords:** Road Traffic Injury (RTI), Fractures, Pedestrian Accidents, Polytrauma, STI

**INTRODUCTION**

Road traffic Injury (RTI) is defined as “a fatal or non-fatal injury incurred as a result of a collision on a public road involving at least one moving vehicle” (1). According to Safe Car Guide, RTI is defined as “an Injury that occurs on a way or street open to public traffic, results in one or more persons being killed or injured, and at least one moving vehicle is involved. RTI, therefore, is a collision between vehicles, between vehicles and pedestrians, between vehicles and animals, or between vehicles and fixed obstacles” (2).

Road traffic injuries (RTIs) are among the leading causes of death and life-long disability globally. Globally, RTIs are reported as the leading cause of death among young people aged 15–29 years and are among the top three causes of mortality among people aged 15–44 years (3,4).

The Institute for Health Metrics and Evaluation (IHME) estimated about 907 900, 1.3 million and 1.4 million deaths from RTIs in 1990, 2010 and 2013, respectively (5).

Human behavior factors, vehicle factors, and road factors contribute to the causation of road traffic crashes (6). Although the numbers of lives lost in road crashes in high-income countries indicate a downward trend in recent decades, for most of the world's population, the burden of road-traffic Injury in terms of societal and economic costs is rising substantially (7).

Statistics from many developing countries ascertain to these changes. In Mexico for example, as deaths from infectious diseases declined from 43% to 17%, deaths from injuries rose from 4% to 11% of all deaths, with RTIs contributing to most of the deaths (7).

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Road traffic deaths and injuries has therefore been the key public health and development challenges of the country and will continue to adversely affect the livelihood of community and the economy of the country unless effective measures are taken to control the problem (10).

## PATIENTS AND METHODS

### Study design:

This was a hospital-based analytical cross sectional study conducted among patients admitted to between July 2015 and July 2017 to the emergency and Injury units of five selected public hospitals in Addis Ababa, which were selected based on the high patient load they are serving.

### Source and study population:

The source population was comprised of all RTI victims visiting the five hospitals: Tikur Anbesa Specialized Hospital, Zewditu Memorial Hospital, St. Paul's Hospital, Yekatit 12 Hospital and Menilik II Referral Hospital. The study population included all RTI victims of both gender and aged 15 years and above attending the selected hospitals during the two-year study period. RTI victims with incomplete records, those under the age of 15 years, those who died at the hospital on arrival, those who were referred from one of the study hospital to the other, and cases referred from outside of Addis Ababa (other parts of Ethiopia) were excluded from the study. The total sample size was set at 384. Sample size was calculated as follows:

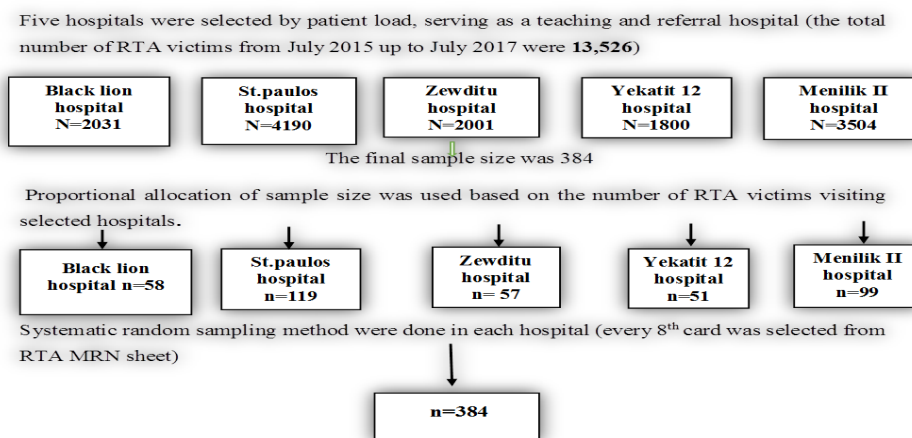


Figure 1. Schematic representation of sampling procedure in Addis Ababa Governmental Hospitals, 2017 G.C.

### Sampling Procedure:

The medical record numbers (MRNs) of RTI victims were selected by using a systematic sampling technique (every 8<sup>th</sup> case is selected), after identifying an initial starting card, by using a simple random sampling method (lottery method).

### Data Collection:

Data were collected by using a structured questionnaire developed for this purpose. The information about the patients admitted as cases of RTIs were ascertained from the emergency triage cards. Finally, based on the inclusion and exclusion criteria of the study, patient cards/charts were identified. Information related to the selected variable was collected from the information on the patient cards/charts.

### Data analysis and Interpretation:

The data were analyzed using IBM SPSS Statistics version 22.

The results were summarized in the form of proportions and frequency tables for categorical variables. Continuous variables were summarized using means, median, mode and standard deviation. P-values were computed for categorical variables using Chi-square ( $\chi^2$ ) test. Bivariate analysis using Pearson's correlation Coefficient ( $r$ ) was carried out to distinguish the relationship between dependent and independent variables.

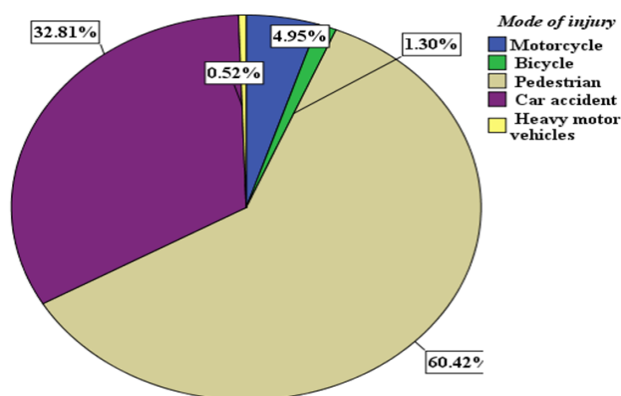
### Ethical consideration:

Ethical clearance was obtained from Department Research Ethics Review Committee (DRERC), Institutional Review Board (IRB) of St. Paul's Millennium Medical College and Addis Ababa Public Health Research and Emergency Management Core Process. The letter of ethical clearance as well as a letter of cooperation was sent for the selected governmental hospitals and consent was obtained.

## RESULTS

Out of 13,526 RTI victims, 384 were included in the study. The study participants comprised of 263 (68.5 %) men and 121 (31.5 %) women, resulting in a male to female ratio of 2.2: 1.

The majority of the injured victims were pedestrians (232, 60.4%), followed by car occupants (126, 32.8%) and the least injured victims were heavy vehicle occupants (2, 0.5 %).

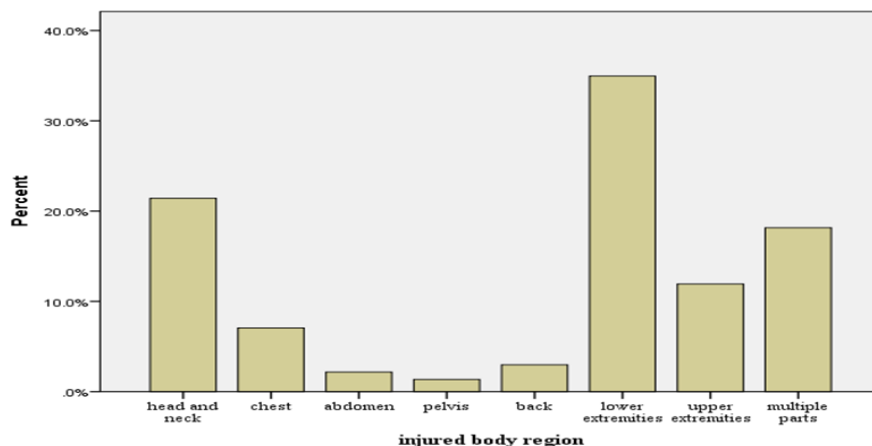


**Figure 1:** The mode of Injury of road traffic Injury victims visiting Addis Ababa public Hospitals, 2015-2017

Extremities and the head were the most common body regions injured, accounting for 45.1 % and 20.6 % of cases respectively. Musculoskeletal injuries commonly affected the lower limbs (33.6%) and upper limbs (11.5%). Isolated injuries occurred in 302 (78.7%) patients while two types of injuries happened in 15 (3.9 %) patients and 67 (17.4%) patients had multiple injuries.

The age group most commonly affected was the group 25-34 years of age, accounting for 127 (34.4%) injuries and the least injured age group were 75-84 years old: 3 (0.8%) injuries. There was no statistically significant difference (P=0.195) between the age groups and the injured body regions.

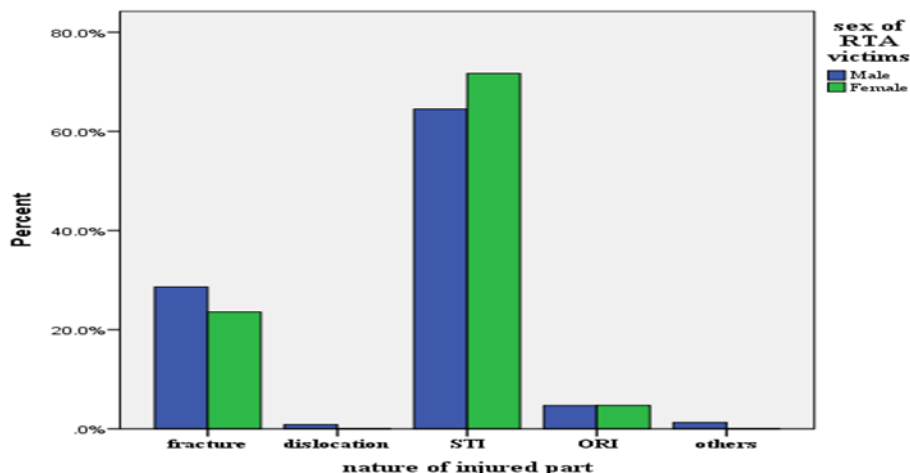
In pedestrian Injury, limb injuries (51.8%) were the most common injuries sustained while in car Injury (motorists) the common region injured were extremities (40.3%), head and neck (25.8%) and chest (12.1%).



**Figure 2:** The injured body regions of road traffic Injury victims visiting Addis Ababa Governmental Hospitals, 2015-2017.

Soft tissue injuries (STIs) including bruises, abrasions, lacerations, crush wounds, etc. accounted for 227 (59.1%). STI, fractures and combined STI and fractures were the most common RTIs, accounting for 227 (59.1%), 92 (24%) and 22 (5.8%), respectively.

Most STI were seen at St. Paul's and Minilik Hospitals whereas most complex fractures were seen at Black lion Hospital.



**Figure 3:** The nature of injured regions by gender in road traffic Injury Victims visiting Addis Ababa Governmental Hospitals, 2015-2017.

In total, 128 cases of orthopedic fracture accounted for 33.3% of road traffic Injury cases. The most common site of fracture was the lower limb which accounted for (55.6%) followed by upper limb (24.2%). In the lower limb, the majority of fractures were attributed to combined tibia/fibular fractures (60.6%).

In the upper limb and the axial skeleton (Tables 1 and 2), humeral fractures (32.6%) and ribs bone fractures (41.7%), respectively, accounted for the majority of the fractures.

**Table 1:** Appendicular skeleton fractures in road traffic Injury victims, Addis Ababa Public Hospitals, 2015-2017.

Fractured bone	Frequency	Percent
<b>Upper limb fracture (24.2%)</b>		
Humerus	14	32.6
Clavicle	10	23.2
Scapula	3	7.0
Radius	10	23.2
Ulna	5	11.6
Carpal	1	2.4
<b>Lower limb fracture (55.6%)</b>		
Hip bones	10	10.1
Femur	20	20.2
Tibia	33	33.3
Fibula	27	27.3
Patella	1	1.0
Tarsal bones	4	4.1
Metatarsal Bones	1	1
Phalanges	3	3

**Table 2:** Axial skeleton fractures in road traffic Injury victims, Addis Ababa Public Hospitals, 2015-2017.

Axial bone fracture (20.2%)	Frequency	Percent
Skull	5	13.9%
Facial bones	8	22.2%
Vertebral bones	8	22.2%
Ribs	15	41.7%

Single bone fracture was present in 50.8% of cases while multiple fractures were seen in 49.2% the cases. Simple fractures accounted for 109 (85.2%) of bone fracture cases while compound fractures comprised 17 (4.4%) and both types of fractures in 2 (0.5%) cases. The present study also revealed specific patterns of fractures.

Out of 128 fractures recorded, eight (6.3%) were transverse, 4 (1%) oblique, 7 (1.8%) comminuted and 1(0.3%) spiral fractures while 108 (28.1%) were unspecified fractures, pattern not documented.

There was statistically significant difference ( $r = +0.264$  and  $P= 0.037$ ) between the age of RTI victims and multiple site bone fractures.

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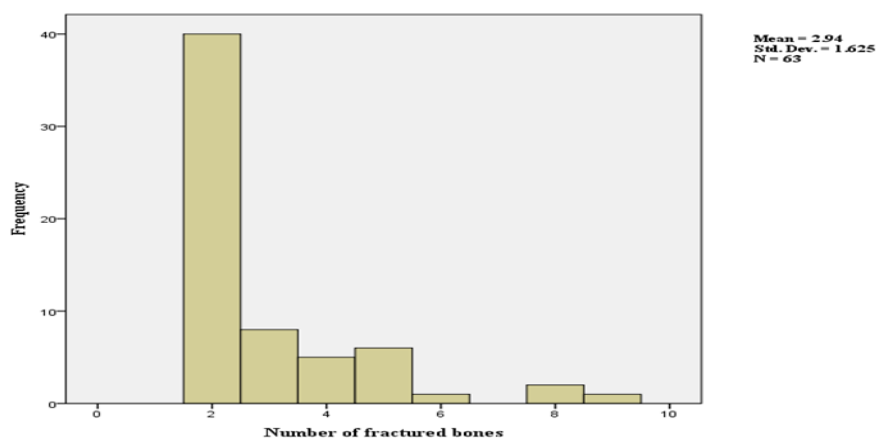


Figure 4: The frequency of multiple fractures among road traffic Injury victims visiting Addis Ababa Public Hospitals.

**Table 3:** Number and type of fractured bones in different regions of the body in road traffic Injury victims visiting Addis Ababa Governmental Hospitals.

Injured regions	Number of fractured bones			P- value
	Single	Multiple	Total	
Head and neck	6	2	8	0.021*
Chest	0	5	5	
Abdomen	0	0	0	
Pelvis	1	0	1	
Back	3	3	6	
Lower extremities	26	26	52	
Upper extremities	16	5	21	
Multiple regions	9	16	25	

\*Results were significantly associated at  $P < 0.05$ .

## DISCUSSION

Road traffic Injuries constitute a major public health problem all over the world. In the present study, the majority of RTI victims were young adults in their most reproductive and productive years. In the current study most the RTI victims were males (68.5%) with male to female ratio is 2.2:1. Similar high prevalence of RTIs in males have been reported in a study conducted in Ughelli Nigeria (10). The reason for the high prevalence of RTIs in males may be attributed to their high activity levels and linkage in high-risk activities such as recklessness driving/riding, over-speeding and drunken driving. In addition, males have greater exposure on streets (12-14). The highest number of RTIs (65%) were observed in the 15 to 34 years' age group. This age group represents the most productive and reproductive age group and therefore economically and socially active, participating in higher levels of economic and high-risk activities.

Pedestrians accounted for the majority of road traffic Injury victims (60.4%) in this study. This finding is consistent with other earlier studies (15,16). However, other investigations have reported that the majority of road traffic Injury victims were passengers (17,18). The high prevalence of RTIs observed in pedestrians, in the present study, may reflect the low level of community awareness on road traffic safety and road use. In addition, the absence of pedestrian walkways in most of the roads in Addis Ababa, Ethiopia, may have contributed to the higher vulnerability of pedestrians to motorized vehicles.

Various studies have reported different patterns of body injuries resulting from road traffic crashes. The variations in patterns may probably be due to difference in types of vehicle used, level of industrialization and economic advancement of the country including the state of the roads, safety consciousness and the use of safety gears.

In the current study, injuries of the extremities and head were the most common body regions injured accounting for 45.1% and 20.6% of the cases, respectively. This finding is in agreement with the reports of other previous studies carried out elsewhere (17-21).

The high prevalence of injuries of lower extremities could be attributed to the large number of pedestrians in our study population. Pedestrians easily suffer from hit by cars body to their lower limbs (22). In the lower limb we have seen equal number of multiple and single site injuries. This may be due to increasing number of high energy injuries (like with trucks) and needs further look.

In the current study, soft tissue injuries (STIs), fractures and combined STIs and fractures were the most common types of injuries. Similar findings have been reported based on an investigation designed to study Injury characteristics and outcome of road traffic crash victims at Bugando Medical Center in Northwestern Tanzania (23). Conversely, studies on RTIs conducted in china have documented results which were contradictory to those observed in the present study (24). This difference might be the effect of economic growth, which may be associated with decreased travel and exposure to a hazardous traffic environment.

In this study the prevalence of bone fractures among road traffic Injury victims was 33.3%. This finding is lower than the study conducted in India which was 49.33%, the high prevalence of fracture in the Indian study may be attributed to a greater congestion of human and motor traffic as well as large numbers of RTI victims as a result of rapid expansion in road network and urbanization (11).

Fractures resulting from RTIs occur in bones of different regions of the body. The commonest site of fracture, in the present study was the lower limb which accounted for (55.6%) followed by the upper limb (24.2%) and bones of the axial skeleton (20.2 %). Similar order in location of fractures occurring as a result of RTIs have been observed in studies conducted in Nigeria (10) and Tanzania (23). The reason for the occurrence of fractures in the highest frequency on lower extremity may be due to high number of pedestrians in our population. However, other studies have reported that the highest number of bone fractures occurred in the upper limbs followed by lower limbs and facial bones (25). There are also other studies which have shown that the commonest site of Injury due to RTIs was fracture of bones of the head and face and closely followed by the lower extremity (26).

In the lower limb, the tibia and/fibula were the most frequently fractured bones. These findings are in agreement with the findings of similar investigations conducted in Nigeria (27) and Tanzania (22). These observations make sense considering the fact that their vulnerable respective anatomical location and in the case of the tibia/ and fibula their subcutaneous location may be another predisposing factor.

In the current study, the most common fractured bone in the upper extremity was the humerus. This finding is in agreement with the finding of similar investigation conducted in Black Lion Hospital, Addis Ababa (28). The upper extremities play an essential role in mobility and control especially with the use of motorcycles. Extensive contractions of the muscles of the arm have been shown to be responsible for fractures which occur in this region of the body (28). This finding in the current study is consistent with that of the report of investigation conducted in Tanzania (22).

One sided bone fractures were more common compared to both sided fracture. The frequency of single bone fractures and multiple bone fractures were similar. These findings were similar with the findings of other investigations in West Africa (10), but higher than the Black lion study (28).

In most patients, the fracture type is not specified in detail. The most frequent pattern of bone fracture specified is a transverse. Comminuted and oblique type fractures follow. The least common pattern of bone fracture was spiral fracture. This finding contradicts with study done in Ughelli Nigeria (10), but is in agreement with a study from Tikur Anbessa Hospital, where trasvers pattern is 55% (28).

## CONCLUSION

RTI still poses preventable danger on the public. The current investigation adds information for future studies. In this study, the young adult male was the most affected victim. These are breadwinners to the family and engage in the economy, making the loss great. The majority of the victims were pedestrians. The extremities and the head were the most common body regions injured accounting for 45.1 % and 20.6 % of cases. The age group that is most frequently involved in RTIs was the 15-34 years old group. The most common site of fracture was the lower limb followed by the upper limb. In the lower limb, combined tibial and fibular fractures contributed to the majority of the fractures, typical pedestrian injury.

The findings of the current investigation reflect that road traffic Injury is a major public health problem. We have seen a poor documentation of specifying the general type/pattern of a fracture. As these are legal documents, such details have to be documented. This needs improvement as knowing fracture pattern helps in planning management. From the known specific fracture types, transverse fracture pattern is common. Knowing this helps to plan what type of treatment options the patients need.

In our study, occurrence of multiple injuries is higher. For example than the Tikur Anbessa study, this needs further exploration. The present study has given an additional insight into the magnitude of the problem of RTI and provided some information for future detailed studies.

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