

## Pattern of Injury and Associated Variables as Seen in the Emergency Department at Tikur Anbessa Specialized Referral Hospital, Addis Ababa, Ethiopia.

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**Background:** Traumatic injuries represent a significant and growing disease burden in the developing world, and now represent one of the leading causes of death in economically active adults in many low- and middle-income countries. This study was aimed at determining the pattern of injuries and variables associated among patients visiting Emergency Department (ED) due to injury at Black Lion Hospital, Addis Ababa, Ethiopia.

**Methods:** This was a prospective cross sectional hospital based study done with a systematic random sampling method. The study was done in Tikur Anbessa specialized referral hospital. The study was conducted in between February 1 to April 30, 2013. **Results:** A total of 3287 new patients were seen in the ED, of whom 989 (32.5%) reported to be injury victims, of them 321 patients were included in the study. The M: F ratio is 3.58:1. More than 41% of patients were aged between 20 and 29. The most frequent cause of injury was Road Traffic Accident (RTAs), 123(38.3%), followed by stuck/hit by a person or object, 101(31.5%), and fall accident 68(21.2%). Further analysis showed that the odds of injury of assault to be increased for males ( $P=0.037$ , AOR, 2.528, 95%CI (1.058-6.037)), patients with monthly income < 650 Ethiopian birr ( $P=0.002$ , AOR 2.91, 95% CI (1.493-5.705)), and age < 40 years old is significantly associated with injury of assault ( $P=0.004$ , AOR 3.27, 95%CI (1.451-7.375)). Injury of assault is 61% less likely to be occurred in rural areas than the urban dwellers ( $P=0.002$ , AOR 0.39%CI (.219-.707)).

**Conclusion:** Appropriate interventions to reduce the occurrences of injuries should be instituted by the local authorities and other responsible body. There is also a need to educate the community members particularly risk groups on how to prevent injuries.

**Key Words:** Injury, Variables associated with injury, Emergency department

### Introduction

The World Health Organization define injury as the damage caused by the acute transfer of energy, whether physical, thermal, and chemical or radiant that exceeds the physiological threshold of the body. Injury is related to many diverse causes and social activities, such as transport, work, violence, recreation, sports and the home situation<sup>1</sup>. It is the leading cause of death and illness among children in high-income countries. In addition, it is the leading cause of disability throughout the world, with great numbers of people having physical, mental and functional limitations as a result of injuries<sup>2-5</sup>. Despite the continuous commitment of governmental and non-governmental organizations of USA in preventing and reducing the burden of injuries, it still remains the leading cause of death for children and adults between the ages of 1 and 44 year<sup>6</sup>. More than 180 000 Americans died from injury in 2007; the number and age-adjusted rate of death has steadily increased since 2000<sup>6</sup>.

Traumatic injuries represent a significant and growing disease burden in the developing world, and now represent one of the leading causes of death in economically active adults in many low- and middle-income countries. Five of the top 15 causes of mortality in adults aged 15 to 29 years now result from injuries<sup>7</sup>. Reports from South Africa and Zimbabwe revealed that injury accounted for the large proportion of all deaths and morbidities<sup>8</sup>. Injury was cause for 14% of all death in South Africa, 73% were violence related, 13% were transportation related and the remaining 14% were due to other unintentional causes<sup>9</sup>. In Zimbabwe injury was reported to contribute for 15% and over 9% of the total recorded death in males and females respectively in 1998<sup>10</sup>. Studies in different regions of Kenya have documented the increasing importance of injury not only as a major cause of surgical admissions, but also a significant cause of morbidity, mortality and serious permanent disability<sup>11</sup>.

Likewise the economic impact of injuries in low-income countries for individuals and for society as a whole is disproportionately high. The total economic costs amount to as much as 65 billion US dollars, more money than low income countries receive in total assistance aid annually<sup>12</sup>. The cost-effectiveness of injury prevention and emergency treatment of injury in these resource limited settings is not yet well understood as the development of emergency care systems is in its nascence. Moreover, the lack of consistent reporting of injuries leads to significant underestimates of the morbidity and mortality in these settings. Poor mechanisms for reporting combined with inability to afford medical evaluation after an injury are likely important contributors to this phenomenon<sup>13</sup>.

In Ethiopia, like other developing countries, injuries are common but little attention is being given to this problem<sup>14</sup>. Injuries constitute around a half of all surgical emergencies<sup>15</sup>. In one study injury was the primary reason for an emergency hospital visit in Addis Ababa<sup>16</sup>.

Injury is becoming a serious threat to the health and well-being of Ethiopians. The magnitudes of road traffic injury and case fatality rates were 946 and 80 per 10 000 registered vehicles respectively and account for over a third of all injuries. In 2007/2008 nearly 19 000 road traffic accidents occurred in Ethiopia claiming over 2500 lives and property worth US\$ 56 million<sup>20</sup>. Homicide and injury purposely inflicted by other persons (not in war) are the second leading cause of outpatient visit for females and the fourth among all the population in this country<sup>21</sup>. Violence is also a major reason for the high burden of injuries and would require the strengthening of pre-hospital and injury care. About 10% of the Ethiopian population has disabilities. Less than 10% of those in need of rehabilitation have access to appropriate services. Ownership and capacity in designing and implementing prevention programs remain ill-defined.

Considering the increasing contribution of violence, injury and medical emergencies to the burden of disease, the Ethiopian Health Sector Development Program clearly gives more attention to injuries and violence among other non-communicable diseases. To materialize this, the Ministry of Health has prepared a National Multi-Sectoral Strategic Plan in coordination with various sectors. Road traffic injury, fire burn, falls and other work related injuries are priorities in the plan. The plan emphasizes the importance of well-organized emergency medical system in reducing the severity and consequences of injuries and violence. However, there is paucity of comprehensive data on the magnitude and pattern of injury in Ethiopia. Without reliable information, health care planners at all levels are unable to allocate resources so as to achieve the greatest impact in preventing injuries, treating and rehabilitating injured persons<sup>22</sup>.

Therefore, this research is intended to fill the knowledge gap by providing data on pattern of injury and associated factors in patients visiting the Emergency Department of Tikur Anbessa Specialized Hospital which is the biggest national hospital of Ethiopia.

### **Patients and Methods**

This was a prospective cross sectional hospital based study done using a systematic random sampling method. The study was done in Tikur Anbessa specialized referral hospital. It is the largest of all hospitals in Ethiopia which provide a tertiary level referral treatment with 24 hours of emergency services. The hospital has about 560 inpatient beds and serves close to 80,000 out patients every year. The study was conducted in between February 1 to April 30, 2013 over a period of three months. The study population included all patients who came to Emergency Department(ED) during the study period and fulfilled the inclusion criteria.

A single population proportion formula is used to determine the sample size and the following assumptions was made: A confidence level of 95% and absolute precision or margin of error being 5% and the prevalence is 27% (35), Considering a 10% non-response rate would result in calculated

sample size of 334. A systematic random sampling technique using the entry point to the triage seat of injured patients as sampling frame was used.

Data collection tool was adapted from injury surveillance guideline document of WHO developed in 2001 by experts (36). In addition, this tool was pre-tested to identify potential problem areas, unanticipated interpretation and cultural objections to any of the questions. Hence 10% of the tool was pre-tested in the Tikur Anbessa Emergency Department before two weeks of the actual data collection. Data was collected by five trained triage nurses and supervision was made by investigators on daily base for its completeness and consistency.

The dependent variable was injury and the independent variables included the socio demographic characteristics, intent of injury, place of occurrence, nature of injury, mechanism of injury, place of residence, alcohol use, psychoactive substance use, severity of the injury, disposition of the patient, mode of transport, context, and risk factors.

Data was analyzed using SPSS for windows version 20.0. Frequency distribution and percentage calculation was made to describe socio demographic characteristics. The pattern of injuries was examined by mechanism, intent, place, and other measures of descriptive statistics. Odds ratio with its corresponding 95% CI was determined to look into associations between variables. Binary logistic regression was also employed and p value <0.05 was accepted as statistically significant.

Ethical clearance was obtained from the Research and Ethics Committee at College of Health Science, Addis Ababa University prior to commencement of the study. Permission was obtained from the Head Nurse of the Emergency Department of the Hospital to conduct the study and written consent was obtained from each sample subjects to conduct the interview.

## Results

A total of 3287 new patients were seen in the ED, of whom 989 (32.5%) were injury victims. Out of the 989 trauma patients, 334 were sampled for this study and 321 (32%) agreed to participate in the study (response rate of 96.1%). Among the studied patients 251 (78.2%) were males and 70 (21.8%) were females giving a M: F ratio of 3.6:1. The most commonly affected age group, accounting for 41%, was the 20-29 years followed by 30-39 years (18%). Ethnic distribution showed that majority were Oromo (37.4%) followed by Amhara (34.6%). Most injury patients were Orthodox Christians (71.3%) followed by Muslim (15.9%).

The commonest occupation was farmer (20.9%) followed by civil servant (19.9%) and students (15%). Most of the patients were urban dwellers (68.5%). Marital status showed that 158 (49.2%) were never married, 129 (40.2%) married, 23(7.2%) separated or divorced and 11 (3.4%) widowed. Regarding educational level, 43.6% had primary education and 23.4% never go to school and 22.1% completed secondary education. From those who were illiterate, majority were farmers (48%) followed by daily laborer (14.6%) and 13.3% were unemployed. Looking in to their income, 117 (36.4%) did not known their monthly income. (Table1)

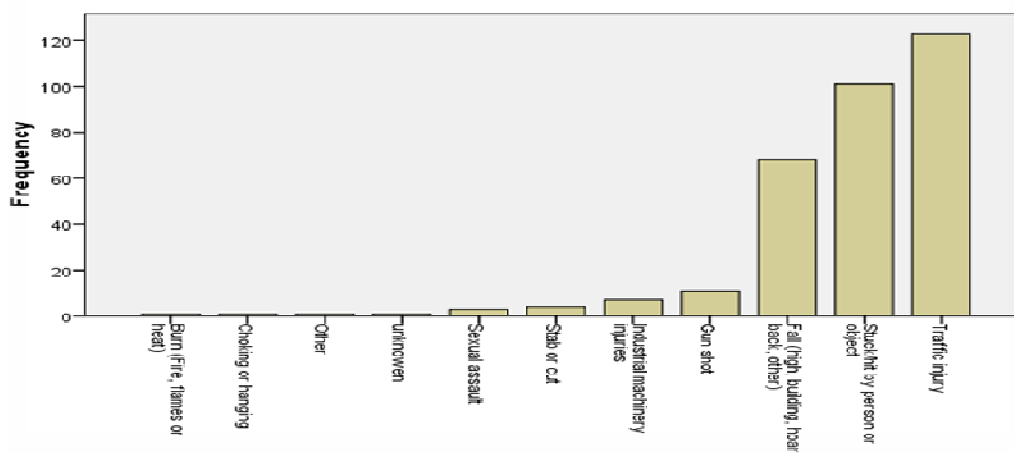
### *Mechanism of injury*

Unintentional injuries were the primary cause for the majority of patients seen in ED. It accounted for 235 (73.2%) patients. Unintentional injury highly affects the civil servant (81.25%), students (75%), and farmers (53.7%). Intentional injuries occurred among 86 (26.8%) of the study subjects of whom farmers were 36%, of civil servant 12.8%, and students 9.3%. The most frequent cause of injury was Road Traffic Accident (RTAs), 123(38.3%), followed by stuck/hit by a person or object, 101(31.5%), and fall accident 68(21.2%). Other less common causes of injury were gunshot 11(3.4 %), industrial machinery injury 7(2.2), stab 4(1.2%) and Sexual assault 3(1%). The rest (1.2%) were due to burn, choking, hanging or undetermined causes.

Among those who was injured because of Stuck/hit by a person or object, 72 (22.4%) were due to interpersonal violence (assault) which occurred predominantly in farmers (43%), civil servants (15.3%) and students (11.1%). The instrument used for assault was specified in only 33 (45.8%) patients, of them stick was used in twelve patients followed by stone in 10, knife and machete in 8 and fire arm in only three patients. A higher proportion of fall has occurred among farmers (23.5%), followed by students (19.1%), and unemployed (16.2%) patients. Other less recorded causes of injury were burn, choking or hanging and industrial machinery injuries (Figure 1).

<b>Table 1. Socio-economic Characteristics of Victims of Injury, Emergency Department, Black Lion Hospital, 2013</b>			
<b>Characteristics</b>		<b>Number</b>	<b>Percentage(%)</b>
<b>Age</b>	<20	53	16.5
	20-29	134	41.7
	30-39	59	18
	40-49	31	9.6
	50-59	21	6.5
	>59	25	7.7
<b>Sex</b>	Male	251	78.2
	female	70	21.8
<b>Ethnicity</b>	Oromo	120	37.4
	SNNP	70	21.8
	Amhara	111	34.6
	Tigra	16	5.0
	Others	4	1.2
<b>Religion</b>	Orthodox	229	71.3
	Protestant	37	11.5
	Muslim	51	15.9
	Others	4	1.2
<b>Marital status</b>	Single	158	49.2
	Married	129	40.2
	Divorced /Separated	23	7.2
	Widowed	11	3.4
<b>Educational level</b>	Educated	232	72.3
	Uneducated	89	27.7
<b>Income</b>	<650	55	17.1
	>651	266	82.9
<b>Occupation</b>	Trader	32	10.0
	Farmer	67	20.9
	Civil servant	64	19.9
	Student	48	15.0
	Construction worker	22	6.9
	Day labourer.	40	12.5
	Unemployed	48	15.0
<b>Residence</b>	Urban	220	68.5
	Rural	101	31.5
<b>Total</b>		321	100%

**Figure1. The mechanism of injury in patients visiting the Emergency Department of Black Lion Hospital (N=321), 2013**



#### **Mode of transport and pre hospital care**

Eighty seven (27.1%) used taxis, followed by Minibus 85 (26.5%), Ambulance 59 (18.4%), and Private Cars 30 (9.3%). Among those injury patients who live in urban area, 71.3% used taxi, 54% used a minibus and 59.3% used ambulance. Patients from rural community commonly used minibus (46%), taxi (29%), or ambulance (40.7%). Ambulances were used by the urban people more frequently as compared to the rural people (Figure 2). Ninety (28 %) of patients received no treatment before arrival to ED. It was only 2.5% of patients who has got first aid at the scene; the rest 19% and 50.2% received medical assistance at health center or district hospitals respectively.

#### **Outcome of the injury**

One hundred thirty three (41.4%) patients had Fracture followed by cuts, bites or open wound in 84(26.2%), Organ system injury in 60(18.7%), amputation in 7(2.2%) and the rest had sprain, strain, dislocation, bruise, superficial injury, burns and others. The most frequent locations of the injury were head, neck and face (43.6%). Of the remaining patients, 23.1% had injuries to lower extremity, 17.1% to the upper limbs, and 10.3% to the spinal cord. Majority of patients, 228 (71%), had moderate injury requiring some sort of skilled treatment such as fractures stabilization and suturing of wounds. The rest 47 (14.6%) and 34(10.6%) had severe injury requiring intensive medical/surgical management (e.g. internal hemorrhage) and Minor or superficial injuries (e.g. bruises, minor cuts) respectively.

**Figure 2: Mode of transportation used by injury victims to come to the Emergency Department of Black Lion Hospital (N=321), 2013**

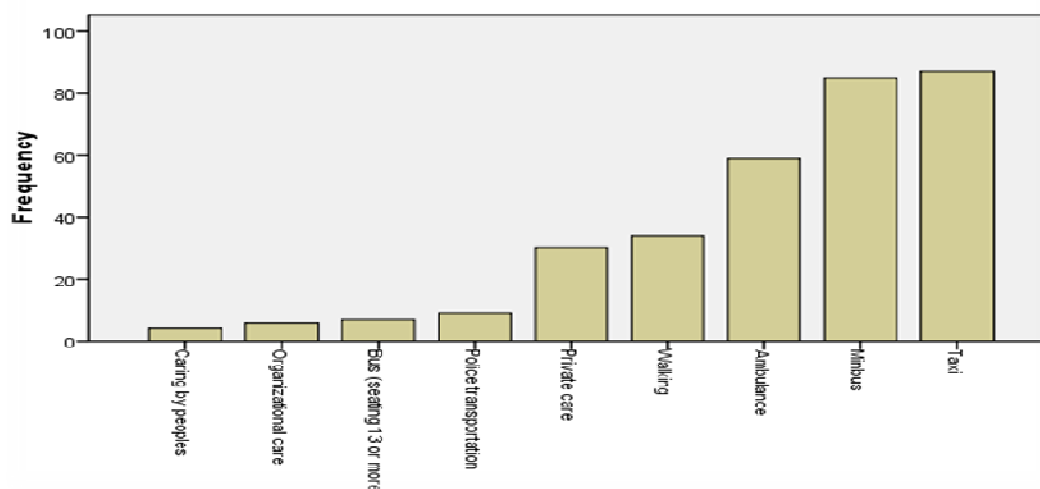


Figure 3: The activity of trauma victims in the Emergency Department of Black Lion Hospital during the time of the injury (N=321), 2013.

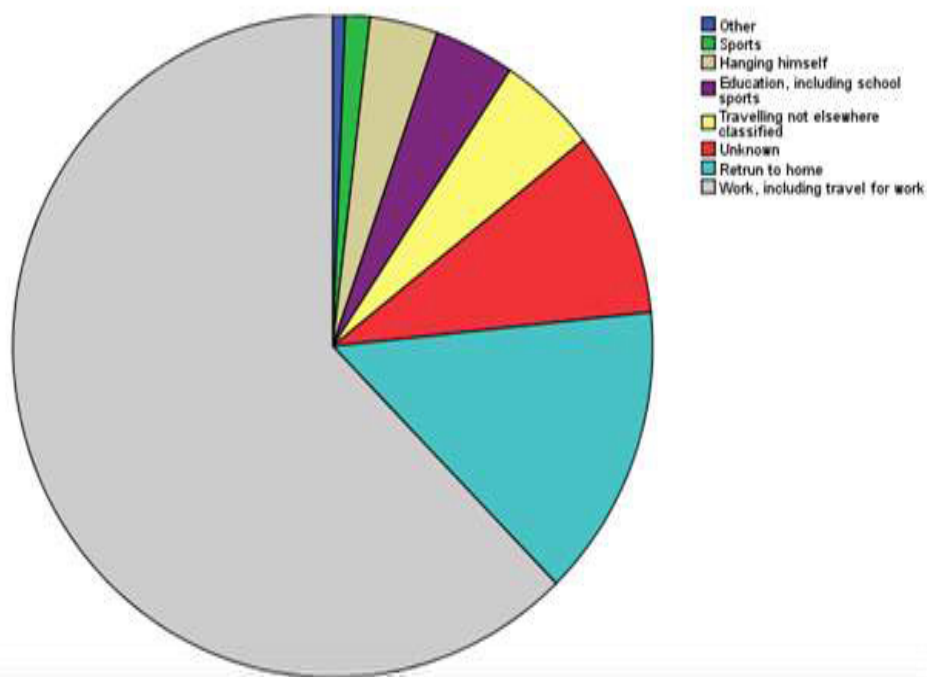
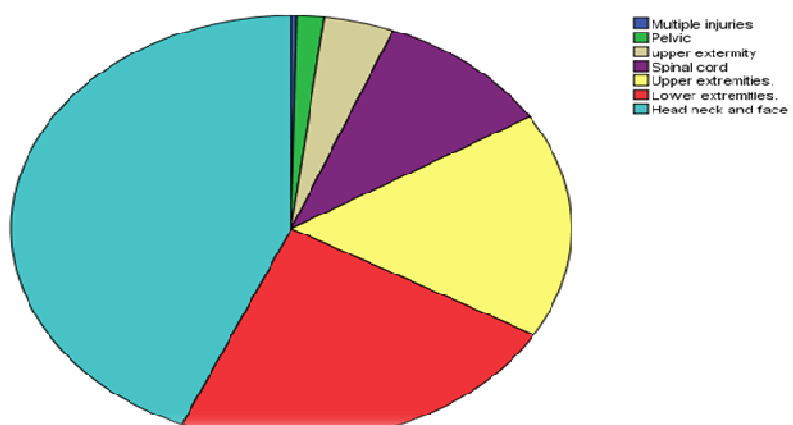


Figure 4: The part of the body which is affected for the injury victims of the Emergency Department of Black Lion Hospital (N=321), 2013



### Risk estimate analysis

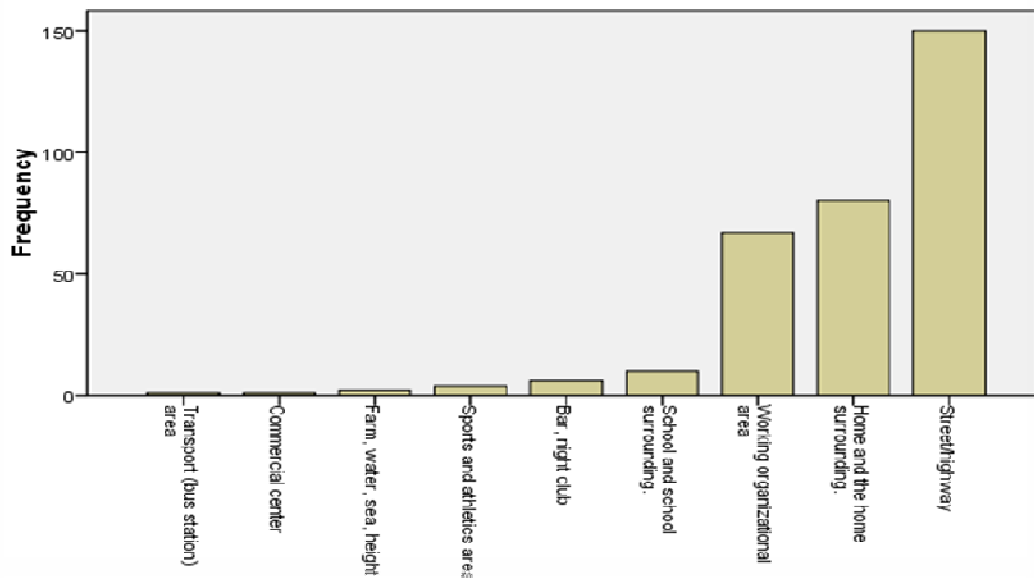
Factors with significant association with risk of injury were gender type, place of residence, monthly income, and some behavioral factors. Males were found three times {OR:3.145, 95% CI: 1.371-7.215} more likely to be involved with injury than females. Similarly, personal behaviors like chewing Khat, regular alcohol drinker were significantly associated with injury. Regular alcohol drinkers were three time more likely to have assault injury than non-drinkers {OR: 3.183, 95% CI : (1.714-5.911)}. Additionally, those individuals with monthly income of < 650 birr were three times more likely to have an assault injury than individuals with monthly income of >651 birr {( OR:3.185 ,95 CI:(1.714-5.911)} .



In the multivariate analysis, characteristics that were significantly associated with injury of assault include patient sex, age, and income, living in rural area and being a pedestrian. It was found that odds of injury of assault to be increased for male {(P= 0.037, AOR, 2.528, 95%CI (1.058-6.037)}. Patients with a monthly income less than 650 Ethiopian birr were significantly associated with injury due to assault {(P= 0.002, AOR 2.919, 95% CI (1.493-5.705)}. Similarly, those reporting their age as under 40 years old were significantly associated with injury of assault {(P= 0.004, AOR 3.271, 95%CI(1.451-7.375)}.

In those peoples living in rural area, injury due to assault was 61% less likely to occur than urban dwellers {(P= 0.002, AOR 0.39395% CI (.219-.707)}. Similarly, being a passenger had 89% less likelihood of having RTAs than being a pedestrian {(P=0.033, AOR 0.109 95% CI (0.014-.833)} (Table2). Those people who were illiterate had one more times likely to have RTAs than the educated one. Age > 40 is similarly associated with RTAs (P=0.031, COR 1.766, 95%CI, 1.054-2959) and age <40 is also associated with fall accident {(P=0.008, COR, 2.194, 95% CI (1.230-3.913)}. (Table 2).

**Figure 5: Place of occurrence of the injury for the injury victims of the Emergency Department of Black Lion Hospital(N=321), 2013**



**Table 2: Result of multivariate analysis for the selected behavioral and environmental factors related to injury of assault.**

Variable		Injury of Assault		COR	AOR
		Yes	No		
Sex	Male	65	186	3.145 (1.371-7.215)*	2.528 (1.058-6.037)**
	Female	7	63		
Age	<40	62	181	2.33(1.130-4.803)*	3.271 (1.451- 7.375)**
	>40	10	68		
Income	<650	23	32	3.183(1.714 -5.911)*	2.919 (1.493- 5.705)**
	>651	49	217		
Residence	Rural	34	67	2.43(1.415-4.174) <sup>x</sup>	0.393 (0.219- 0.707) <sup>xx</sup>
	Urban	38	182		
RTAs	Passenger	1	35	11.612(1.562-86.303) <sup>x</sup>	0.109 (0.014-0.833) <sup>xx</sup>
	Pedestrian	71	214		

\*\*Significantly associated, <sup>xx</sup>less likely associated.

## Discussion

The study showed that the magnitude of injury in patients visiting ED of Black Lion hospital during the study period was 32.5% which is higher than the study done by Catherine J. et al<sup>31</sup> in Cameroon, (28%), and Erica R. et al<sup>32</sup> in Tanzania (11.5%). Similar to other studies<sup>23, 25, 26, 27, 28, 30, 31, 32, 33</sup> males and people aged 20-29 years are predominantly affected. This signifies the possible economic impact of injury as the productive age group of the society is primarily affected. Majority of the injuries were unintentional (73.2%) which is similar to studies done by Erica et al<sup>32</sup> and Wolde et al<sup>35</sup> (76.4%). However in a report made from the previous work of the same study site showed lesser prevalence (64%)<sup>37</sup>. Another study conducted in Jimma University Hospital reported more intentional injuries (51%)<sup>34</sup>.

The common cause of injury reported were RTAs (38.3%) followed by stuck/hit by a person or object (31.5%) and fall (21.2%). A similar study done in Jimma showed that blunt assault (30.9%) is the commonest cause followed by RTAs (30.3%) and cut by sharp tool (13%). This may be explained by the fact that Addis Ababa is an urban area bordered by big highways with a number of inters sub-city roads and trans-border routes. However a similar study done in other African countries<sup>24, 25, 27, 28, 31, 32, 37</sup> shows similar finding. Analysis for the site of injury showed that street/high ways, home and home environment were the primary sites of injury for RTAs and fall accidents respectively. This is also supported by the report made from the state of Qatar in 2012<sup>25</sup>, Tikur Anbessa Hospital<sup>36</sup>, and Jimma University Hospital<sup>34</sup>.

The findings of this paper also showed that Moderate injury requiring some skilled treatment was the leading outcome of injury (71%), followed by severe injury requiring intensive medical/surgical management (14.6%). However, according to a study done in Jimma,<sup>34</sup> 2.7% were classified as having severe, 41.3% as moderate and 26.0% as minor injury. The difference between these two could be explained by possible difference used to define moderate or severe injury in the respective studies. Analysis made among the possible causes of severe injuries showed that 38.3% were due to RTAs and 27.6% were due to stuck/hit by a person. A similar finding was noted by Kifle et al<sup>34</sup> which was 49.7% was caused by RTAs, 12.5% by stab injury and 11.4 % by cut by sharp tool. A study done on similar topic in Cameroon<sup>24,31</sup> in 2007 showed that the most frequent locations for injury were face, eye and ENT (51%) and injuries involving the lower limbs (39%). This finding compares with the finding of 43.6% where the most frequent locations for injury were also head, neck and face. Of the remaining patients, 23.1% had injuries to lower extremity, 17.1% to upper limbs, and 10.3% to spinal cord.

Looking at the outcome of injury, fractures (41.2%) were the leading outcomes followed by bruise or skin laceration (36.7%), internal organ injury (9%), sprain or dislocation, (5.1%) and cut or bite (4.6%). Unlike this, a survey done in USA by Matthew et al<sup>23</sup> showed laceration as the most common injury (27%) followed by contusion or abrasion (25%) and fracture (16%). A study done by Phillippo et al<sup>30</sup> in Mwanza in north-western Tanzania, found that bruises laceration, abrasion and contusions in 96.2% and fractures in 28.9% injuries.

The findings of this work support the view that most injuries occurred in the most economically productive age group 20-39 years, who represented 60% of all injury cases, of whom young adults aged 20-29 years comprised 42%, while those aged 30- 39 years comprised 18%. This findings is in line with a hospital-based study of trends and characteristics of injuries in the state of Qatar<sup>25</sup> in 2012, which reveals that almost half of injuries occurred in the <30 years age group (47.6%) followed by those in the 30-44 years age group (38.2%) and in a study of injury surveillance conducted at Viet Duc hospital, Vietnam, over 7 months in 2006 that reports the highest proportions of patients were between 20 to 50 years of age. The highest categories of morbidity were among students and farmers who accounted for 22% and 25%<sup>24, 25</sup>.

## Conclusion



In conclusion, this study has tried to show that injuries are one of the major causes of morbidity in Ethiopia. There for every attempt should be made to create awareness among the community and decision makers about the consequence of injuries so as to design and implement effective preventive measures. Hence, appropriate preventive strategies should be designed and implemented against RTAs, assault, and fall accidents. On top of these, further investigation of specific factors for higher incidence of intentional injuries, higher prevalence of injury among males, farmers, civil servants and students is needed. Factors associated with road traffic accident also need to be identified. Eventually, it is expected that teaching hospitals should serve as data providers and research centers. Data from hospital sources can corroborate with community based data and can help practitioners, researchers, program managers and policy makers at different levels identify populations at risk, implement and evaluate prevention programs.

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