Injury surveillance in a rural sub-Saharan setting: Results from a surveillance initiative in Nzega District, Tanzania

Laura Davis
Centre for Injury Prevention and Community Safety (CIPCS), Dar es Salaam, Tanzania

Alyssa Bechtold
Centre for Injury Prevention and Community Safety (CIPCS), Dar es Salaam, Tanzania

Marc Kaeraa
Centre for Injury Prevention and Community Safety (CIPCS), Dar es Salaam, Tanzania

Lukas Lacava
Centre for Injury Prevention and Community Safety (CIPCS), Dar es Salaam, Tanzania

Michael L. Wilson
Centre for Injury Prevention and Community Safety (CIPCS), Dar es Salaam, Tanzania

Centre for Injury Prevention and Community Safety, PeerCorps Trust Fund, 352/64 Makunganya Street, Co-Architecture Building, 4th Floor, P. O. Box 22499, Dar es Salaam, Tanzania

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Abstract

Introduction: Ninety percent of all injuries occur in low- and middle-income countries (LMIC) and most of these injuries are largely preventable. Most injury surveillance systems are focused in large urban settings, which largely ignore injury mechanisms in rural contexts which are critical settings for planning future prevention efforts.

Methods: Injury data was collected from July 1 to July 31, 2013 at Nzega District Hospital (NDH) in central Tanzania in the form of an injury questionnaire based off of the WHO's injury surveillance guidelines (Holder, Peden, Krug et al. 2011). One hundred patients were enrolled and asked questions about the location of their injury, cause of their injury, and many other contextual and demographic factors.

Results: Seventy-nine percent of participants were males and the most prevalent injury cause for all participants was road traffic collisions, making up 31% of the injuries. Violence was the second most prevalent cause, accounting for 28% of the injuries, and the number one cause of injuries for women. Twenty-three percent (n=7) of patients suffering from injuries due to road traffic collisions were given a prognosis of long-term disability of six months or more. Forty-four percent of all injuries occurred in the home setting.

Conclusion: The incidence rate of injuries overall of 346 per 10 000 per year is consistent with others studies conducted in LMICs and is higher than many infectious diseases that are already considered a pressing public health problem. Injuries create disabilities, which in turn creates an economic burden on the individual, health care system, and society as a whole.

Key words: Trauma, Injury, Road Traffic Collisions, Falls, Violence, Tanzania

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Introduction

Injuries, both intentional and unintentional, are a major problem of public health importance worldwide. This is especially felt in the low- and middle-income countries (LMICs) which are the setting for 90% of all injuries occurring worldwide. To get a better sense of the magnitude of the problem, consider road traffic injuries (RTIs), a preventable and widespread problem facing LMICs every day.

It is estimated that RTIs account for 1.2 million deaths each year. This figure is in the same league as tuberculosis, which accounted for 1.3 million deaths globally in 2012 as reported by the WHO (Borowy 2013; WHO, 2013). Moreover, in LMICs, deaths from RTIs are actually increasing, especially among pedestrians and motorcyclists. This has been estimated to be due to increased motorization, combined with poorly organized traffic environments, and weakly enforced traffic legislation (Bachani et al. 2012; Mohan, 2002; Odero 2010; Zimmerman et al. 2012). From this, we can conclude that not only are injuries a significant problem worldwide, they might also be an increasing problem in LMICs.

The standard response to combat injuries and reduce their health burden is to put prevention strategies in place. For instance when considering reducing RTIS, strategies include: policies aimed at reducing speeds, separating pedestrians from vehicle traffic, or enforcing the use of helmets and reflective clothing (Bachani et al. 2012). A meta-analysis from four studies found that helmet use for motorcyclists reduced the risk of fatal crashes by approximately 42% (Liu et al. 2009). However, in order to devise contextually relevant intervention programs such as these, it is necessary to obtain reliable information on the epidemiology of injuries through surveillance (Bartlett, 2002).

Unfortunately, in many African countries, data on injury events and their contributing risk factors is rare, not routinely collected, or inadequate. One reason for this is that fewer resources for research are made available for injury prevention relative to other health concerns (Mukhopadhyay, Boniface, and Razek 2009). In Tanzania, there have been several recent studies on the epidemiology of injuries in urban centers such as Dar es Salaam and Mwanza (Moshiro et al. 2005; Kamala, Wilson, and Hasselberg 2011; Chalya and Gilyoma 2012). While informative, these studies all point to the current paucity of data characterizing rural regions of the country. The lack of both community and clinically-based studies hamper efforts to design interventions which take into consideration the unique features of rural settings. Thus the present study seeks to augment the present state of understanding, by focusing data collection efforts in a rural resource-limited setting in Tanzania's interior.

The present investigation was conducted with two aims. The first aim was to examine the efficacy of an injury surveillance tool for routine collection of data on hospital treated injuries in a rural setting. The second aim was to examine the incidence and patterns of injury over a one month period in a rural district hospital.

Methods

Setting

Nzega District is located on the central plateau of Tanzania with most of its area being 1100 and 1300m above sea level. The District has an equatorial climate with an average rainfall of 800mm per year. Administratively, Nzega District is bordered by Igunga District in the East, Uyui in the south, Kahama District in the West and Shinyanga rural District in the North. It has 4 divisions namely, Nyasa, Puge, Mwakalundi and Bukene. It has 37 Wards and

167 Villages with 1001-sub villages. As is the case in many other regions of Tanzania, it faces a great shortage of qualified health care personnel. The problem has increased in recent years with the implementation of the Primary health Services Development Program which has resulted in an increased number of health facilities (Nzega District Council, 2011).

Study Design

The Nzega Injury Surveillance Project (NISP) is a descriptive prospective study between July 1 and July 31, involving injury patients admitted to Nzega District Hospital (NDH). NDH is a government run hospital in central Tanzania, which serves an estimated population of 33,127 (Nzega District Council, 2011).

Study Instrument

After asking for participants' consent, individuals were surveyed using the "Nzega Trauma Survey" (See appendix). The survey focused on extracting both closed and open-ended answers based on the injury event, the environment, victim information, the activity the patient was performing during the injury, and the injured area of the body. Additional questions focused on follow-up treatment for the patient and contributing factors to the injury.

Study Population

The participants included all individuals who arrived at the NDH for treatment of an injury during a one month enrollment period between July 1 and July 31, 2013. Participants included patients of all ages and gender who consented for the study. Patients who did not consent or who were deceased before they arrived at the hospital were excluded from the study; one individual was excluded because she died prior to arrival. A total of n=100 patients were included in the study. Recruitment of patients to participate in the study was performed in the surgery ward of the hospital. The surgery ward acted as the treatment center for all injuries, regardless of severity.

Data collected

Data on both intentional and unintentional injuries were collected using a pre-tested, coded questionnaire. The pre-testing consisted of collection of injury cases for a 24-hour period prior to July 1. All data collected here was excluded from the larger survey. Since our tool has yet to be validated, the pilot served to experiment with the wording of our questions to see what type of information could be captured. Members of the hospital staff acted as third party translators for the Center for Injury Prevention and Community Safety (CIPCS) members. We consulted with a team of doctors and nurses before agreeing upon proper Swahili translations for our survey questions. Information on this questionnaire included demographic information (age, sex, education), information on how patients arrived at the hospital (how long did it take to get to the hospital, who accompanied the injured patient, by what means did they arrive) circumstances of the injury (time of injury, location of the injury, people present when the injury was sustained, influence of alcohol), outcomes of the injury (likelihood that the injury would result in long term disability) and characteristics of the injury (mechanism of the injury, body region affected, type of injury). Information collected and presented only includes individuals who arrived at the NDH for treatment. The full survey tool can be viewed in the appendix.

The study protocol and data collection received approval from the regional and local offices of the Nzega District Council Health Services Board and the District Medical Officer.

Data analysis

Data was analyzed using RStudio, an open source statistical package. Cross-tabulations were carried out with respect to demographic variables and responses pertaining to the injury event.

Ethics consideration

The study protocol and data collection received approval from the regional and local offices of the Nzega District Council Health Services Board and the District Medical Officer.

Results

Instrument efficacy

During the surveillance period, 100% of the surveys were complete, but some fields were not always "known." The survey was effective in capturing common injury mechanisms, such as: RTIs, violence, falls, and animal bites, but was less effective in capturing more unusual mechanisms. Fifteen percent of patients in the study sustained injuries from unusual injury mechanisms, such as the lodging of a foreign body in a patient's nasal cavity. As these injuries were unique in nature and were not likely to be a recurring injury among the general population, we recorded them as "other." But it was less effective in capturing the 15% of cases that landed in the "other" category. The "other" category included several cases of being injured due to aggressive farm animals. The trauma survey was also unable to objectively determine whether an injury resulted in a long-term disability. We could only rely on a "prognosis," since we were unable to provide follow-up to patients suffering from more severe injuries.

Demographic Data

A total of 100 injured patients were treated at NDH during the study period. The overall incidence rate for injury in the Nzega district was found to be 346 per 10,000 per year. The incidence rate was calculated using the population of the encatchment area of NDH (Nzega District Council, 2011). Of the 100 patients treated 79% (n=79) were male. The ages of patients ranged from 4 to 80 years of age, with a mean age of 27 years (see Table 1 for the average age for each injury mechanism). The average age for males and females were 27 and 24 years respectively.

Forty-two percent (n=42) of all reporting individuals were between the ages of 20 and 35. Forty-three percent (n=18) of the patients in this age range were injured through acts of violence (See Table 2). Acts of violence resulted in the highest frequency of injuries for this age range, as well as for individuals older than 55 years old (50%, n=4). For patients under the age of 11, 65% (n=11) were injured due to falls. See Figure 1 for a breakdown of injury mechanism by age range.

Mechanism of Injury

In Table 3, we report injury frequencies by mechanism. Road traffic collisions were the most frequent cause of all injuries, accounting for 31% (n=31) of all reported injuries. Acts of violence were the second most common mechanism, accounting for 28% (n=28) of injuries, followed by falls 23% (n=23). Males were more often injured in a road traffic collision than any other mechanism of injury, as traffic collisions caused 32% (n=25) of all reported injuries among males. The main cause of injury for females was social violence, accounting for 33% (n=7) of all reported injuries.

Road Traffic Collisions

Thirty-two percent (n=7) of all patients suffering from injuries due to traffic collisions had a prognosis for estimated long-term disability (See Table 4). Thirty-six percent (n=11) of patients suffered from lacerations, 23% (n=7) had multiple injuries, 16% (n=5) had fractures and 16% (n=5) had sprains/dislocations (See Table 5). The majority (61%, n=19) of injuries were located on the patient's extremities, with injuries to the head/neck (19%, n=6) being the second most common site of injury.

Acts of Violence

Acts of violence accounted for 25% (n=7) of all patients having a predicted hospital stay of longer than 72 hours (See Table 6 and Figure 2). This was higher than any other mechanism of injury (10% for traffic collisions and 9% for falls). Fourteen percent (n=4) of patients injured in an act of violence were expected to suffer from long-term disabilities due to their injuries. The majority of injuries (54%, n=15) were located on the head/neck or face, higher than any other cause of injury (26% for traffic collisions, 20% for other cause of injury, and 17% for falls) (See Table 7). Seventy-one percent (n=5) of all females injured in an act of violence suffered from injuries on their head/neck or face, compared to 48% (n=10) for men (See Figure 3). The majority of injuries (n=20, 71%) were lacerations.

Falls

The majority of falls (n=17, 74%) resulted in a fracture or sprain/dislocation. Seventy-eight percent (n=18) of all patients involved in a fall sustained injuries to their extremities. The majority of patients (n=19, 86%) were predicted to stay at the hospital for less than 24 hours, with no patients expected to suffer from long-term disabilities.

Circumstances of Injury

The most common setting where injuries occurred was at home (See Table 8). Forty-four percent (n=44), of all reported injuries were sustained in or around the home of the patient. The highway/street was also a common setting for injuries, with 33% (n=33) of injuries being sustained in a roadway. Injuries infrequently occurred at school, with only 2% (n=2) of patients having reported an injury at school. The majority of injuries sustained by females happened at home (67%, n=14), compared to 38% (n=30) of male injuries happening at home.

Road Traffic Collisions

Injuries from traffic accidents occurred evenly throughout the day with 29% (n=9) of accidents occurring in the morning, 29% (n=9) in the afternoon and 32% (n=10) in the evening (See Table 9). Only 10% (n=3) of all injuries from traffic collisions occurred during night hours. Sixteen percent (n=5) of patients had consumed alcohol within 6 hours of the injury.

Acts of Violence

The majority of intentional injuries (57%, n=16) occurred at home. The most common time of day these injuries were sustained was during night hours, with 43% (n=12) of all intentional injuries happening during this time (See Figure 4). A majority of patients (61%, n=17) who sustained an injury from social violence said they were doing nothing when the incident took place. Eighteen percent (n=5) of patients had consumed alcohol within 6 hours of sustaining the injury. This was the highest rate of alcohol consumption among all mechanisms of injury.

Falls

The majority of falls (61%, n=14) happened at home and during evening hours (43%, n=10). The majority of injuries from falls (61%, n=14) were sustained while playing sports and 52% (n=12) happened in the presence of a friend.

Discussion

The first aim of the present study was to examine the efficacy of a surveillance instrument for routine injury data collection in a rural hospital. Although our instrument was adequately able to collect circumstantial information surrounding the injuries that were presented at NDH, we faced challenges gathering data related to long-term disabilities. Since we did not have the resources to follow-up with patients six months from the date of their injury, we posed a question to the attending physician to forecast the likelihood of a disability resulting from the injury. In certain instances the physician was unsure if a disability would develop or not. In these circumstances, the physician had to rely on their estimates. Also like Mutto et al. (2011) we faced challenges capturing the occurrence of poisonings and drownings within the injury surveillance period. Mutto et al. (2011) cited a triage issue for why poisonings are under-reported. Poisonings were likely to go directly to a medical department, and not a surgical ward where the injury surveillance was occurring. We faced a similar challenge, and therefore would frequent other wards on a daily basis to see if an injured case was reported elsewhere. Cases of poisoning or drowning also are likely to never make it to a hospital setting.

The second aim of this study was to gather information on the incidence and patterns of injuries in the rural region of Nzega, Tanzania in order to help create injury prevention programs. This study revealed that the incidence rate is 346 per 10 000 per year. This figure is consistent with similar studies done in Pakistan (413 per 10 000 per year) and Tanzania (327 per 10 000 per year) (Ghaffar, Hyder, & Masud, 2004; Moshiro et al., 2005). Noteworthy about this incidence rate is that it is higher than rates of infectious diseases already considered to be of pressing public health concern in Tanzania. For example, the incidence rate of hospitalization for malaria in Malawi in 2006 was 95 per 10 000 per year, whereas the incidence rate of RTIs in Dar es Salaam was found to be 330 per 10 000 per year (Zimmerman et al. 2012; Kazembe, Kleinschmidt, and Sharp 2006). These results help to highlight the importance of injuries relative to other public health concerns.

In terms of patterns of injuries, this study revealed that the major mechanisms for injuries include RTIs, acts of violence, and falls. This result is consistent with other studies (Ghaffar et al., 2004; Moshiro et al., 2005). Three more particular patterns emerge for our data.

First, RTIs affected mostly males. This is likely due to the large number of males who use motorcycles and bicycles as taxis for their livelihoods. RTIs were also found to be the most likely injury mechanism to result in long term disability. Many motorcyclists and bicyclists do not wear helmets and drive recklessly. Passengers who do not wear helmets run the risk of sustaining head or neck injuries. It is also common in many settings in Africa and other LMICs for cars, bicycles, livestock, and pedestrians to be competing for space on narrow roads in need of maintenance (Borowy 2013).

Second, acts of violence were found to be the number one cause of hospital attended injury for women and occurred mostly in the home environment. This evidence hints at domestic violence which is not uncommon but a very neglected and taboo topic in Tanzania (Laisser et al. 2011). Acts of violence also often resulted in patients who suffered injuries to the face or head which could mean the intent to kill (Chalya and Gilyoma 2012).

Third, falls mostly affected children of younger ages and happened during play. This finding is consistent with the literature (Kobusingye, Guwatudde, and Lett 2001). In keeping with the existing literature, we suspect several factors are at play here. Firstly, precarious and unsafe play environments might contribute to the likelihood of injury by offering a range of

possible dangers (Khan et al. 2013). Secondly, in Tanzania, as is common in other African settings, supervision by less experienced caregivers, such as older siblings, is common. The implication of this may be that a child's risk profile is increased by the lack of supervision (Poudel-Tandukar et al. 2006). Thirdly, children and toddlers have a larger head to body ratio, this means that they are physiologically more prone to falls (Kemp and Sibert 1997). Unlike in high-income countries (HICs), there were very few older patients who suffered from falls. This could be due to a younger population overall and lower life expectancy in Tanzania. One unexpected result worth addressing about our findings is the similarity between Nzega as a rural community and urban studies. The injury patterns in Nzega resemble urban areas where RTIs are found to be most common mechanism of injury. A plausible explanation of this is that because Nzega has both a large number of two wheeled vehicles (e.g., bicycles, motorcycles, scooters) and is a transit point for major mining and construction activities in the area, the road traffic volume will be on average higher for a rural community and thus so too will the risk for RTIs.

Successful implementation of a prevention program for injuries lies in using evidence-based practices. Data should guide the direction of the prevention program to ensure that the program reaches those most affected. A literature review by Liu et al. (2009) collected information on the use of helmets by motorcycle riders. They found that the use of helmets reduced head injuries by 69% and reduced death by 42% (Liu et al., 2009). We believe that the data from this research can be used to create a successful prevention program for injuries.

Implications

There is an obvious requirement for more detailed research on injuries in the Nzega District, with a specific focus on RTIs, violence and falls. There are several implications from our study which can be used in further research, as well as future intervention programs.

The hospital environment in this case was a useful setting to screen for intimate partner violence, since much of the violence at home is happening to women. From this we could create a prevention program that focuses on the safety of women in the home. This should be pursued with further research.

It is also important to note that injuries are costly to both individuals and the health care system. Hospital bills are financially costly to the individual both because of the lost income from days off and the substantial costs associated with hospital stays. The hospital and health care system lose because valuable resources and staff time are diverted to treat inquiries. In a study on RTIs in Bangladesh it was found that approximately 33% of patients in hospitals were injury-related patients (Mashreky et al. 2010). Prevention of one third of hospital patients would alleviate financial and time burdens, allowing resources to be reallocated to more pressing concerns.

Finally, it is significant to note that injuries contribute significantly to the poverty cycle in LMIC settings (Gosselin et al. 2009). In this cycle, an injured child will often not return to school which results in a situation where they have no formal education in which to lift themselves out of poverty.

With more research into injuries in the Nzega District and globally it will be possible to create prevention strategies in order to prevent injuries. This in turn will reduce costs to individuals, hospitals and society and will contribute to breaking the poverty cycle.

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Limitations

Language difficulties, such as translating the survey in a culturally appropriate manner, could be considered a limitation of this study. In order to minimize language and cultural barriers we trained English speaking hospital staff to translate the survey in Swahili to patients. Also, this study only looked at one hospital that covered a small area in the Tabora Region. This, along with the short one-month data collection period resulted in a small sample size. Another limitation was our inability to capture injuries of individuals who did not report to NDH, or those individuals who died as a result of their injury and never made the trip to NDH. Future research should capture injury demographics over a 12-month period. Seasonal variations between the dry and wet seasons could have an impact on the results. Also, our study period overlapped with Ramadan. Nzega has a large Muslim population (30%) and during Ramadan they may have been less likely to encounter exposures during economic or other activities which have the potential to result in injury. We feel that the limitations of this study did not affect the quality of data we received.

Conclusion

This study describes the incidence and patterns of injuries in Nzega, including their demographic factors. We found that there was a high incidence of injuries in Nzega with the major mechanisms as RTIs, acts of violence, and falls. The information revealed in this study is important for contributing to future injury prevention programs in the region. However, a more complete surveillance effort is called for in order to create successful prevention programs.

Appendix:

Table 1: Average Age By Injury Mechanism

Cause of Injury	Average Age
Traffic Collision	32
Act of Violence	34
Fall	16
Animal Bite	6
Other	24
Total	27

Table 2: Distribution of Mechanisms of Injury according to Age Range

Age Range	Road Traffic Collision	Act of Violence	Fall	Animal Bite	Other	Total
<11	1 (6%)	0 (0%)	11 (65%)	2 (12%)	3 (17%)	17 (100%)
12-19	7 (35%)	3 (15%)	5 (25%)	1 (5%)	4 (20%)	20 (100%)
20-35	14 (33%)	18 (43%)	6 (14%)	0 (0%)	4 (10%)	42 (100%)
36-55	6 (46%)	3 (23%)	0 (0%)	0 (0%)	4 (31%)	13 (100%)
>55	3 (37%)	4 (50%)	1 (13%)	0 (0%)	0 (0%)	8 (100%)

Figure 1.Injury Mechanism by Age Range

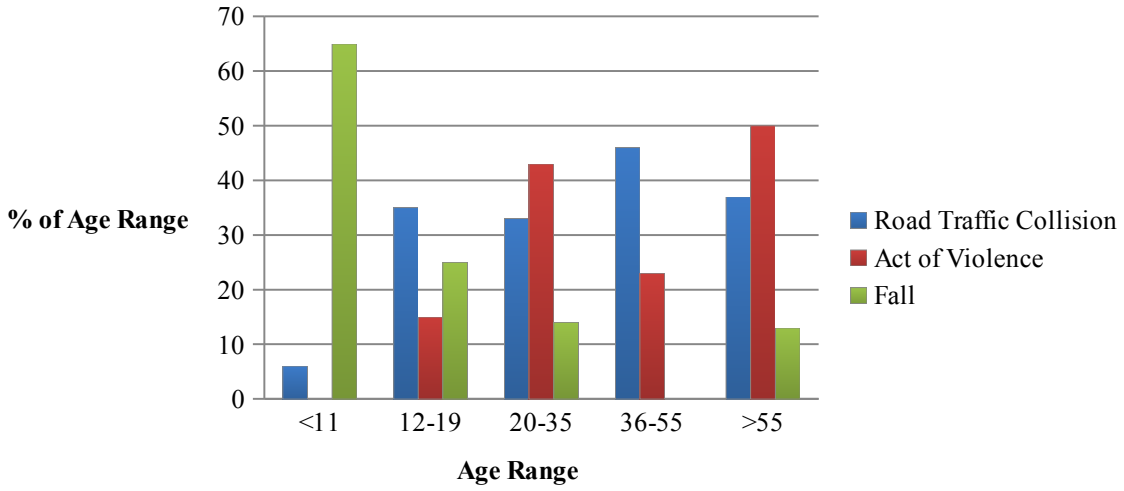

Table 3: Sex Distribution According to Mechanism of Injury

Cause of Injury	Male	Female	Total
Traffic Collision	25 (32%)	6 (29%)	31 (31%)
Act of Violence	21 (27%)	7 (33%)	28 (28%)
Fall	17 (22%)	6 (29%)	23 (23%)
Animal Bite	2 (3%)	1 (5%)	3 (3%)
Other	14 (18%)	1 (5%)	15 (15%)
Total	79 (100%)	21 (100%)	100 (100%)

Table 4: Expected Long Term Disability According to Mechanism of Injury

Cause of Injury	Expected Long Term Disability	Not Expected to Have Long Term Disability	Did Not Know
Traffic Collision	7 (23%)	22 (74%)	1 (3%)
Act of Violence	4 (14%)	24 (86%)	0 (0%)
Fall	0 (0%)	23 (100%)	0 (0%)
Animal Bite	0 (0%)	3 (100%)	0 (0%)
Other	0 (0%)	15 (100%)	0 (0%)

Table 5: Type of Injury According to Mechanism of Injury

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Mechanism of Injury	Lodged Foreign Body	Sprain/ Dislocation	Laceration	Fracture	Soft Tissue Damage	Multiple Injuries	Other	Total
Traffic Collisions	1 (3%)	5 (16%)	11 (36%)	5 (16%)	2 (6%)	7 (23%)	0 (0%)	31 (100%)
Act of Violence	0 (0%)	0 (0%)	20 (71%)	0 (0%)	1 (4%)	7 (25%)	0 (0%)	28 (100%)
Fall	0 (0%)	7 (30%)	4 (17%)	10 (43%)	1 (4%)	1 (4%)	0 (0%)	23 (100%)
Animal Bite	0 (0%)	0 (0%)	2 (67%)	0 (0%)	0 (0%)	0 (0%)	1 (33%)	3 (100%)
Other	3 (20%)	2 (13%)	9 (60%)	0 (0%)	0 (0%)	0 (0%)	1 (7%)	15 (100%)

Table 6: Length of Hospital Stay According to Mechanism of Injury

	<24 Hours	25-48 Hours	49-72 Hours	>72 Hours	Total
Traffic Collisions	20 (67%)	5 (16%)	2 (7%)	3 (10%)	30 (100%)
Act of Violence	18 (64%)	2 (7%)	1 (4%)	7 (25%)	28 (100%)
Fall	19 (86%)	1 (5%)	0 (0%)	2 (9%)	22 (100%)
Animal Bite	3 (100%)	0 (0%)	0 (0%)	0 (0%)	3 (100%)
Other	14 (93%)	1 (7%)	0 (0%)	0 (0%)	15 (100%)

Figure 2. Length of Hospital Stay by Injury Mechanism

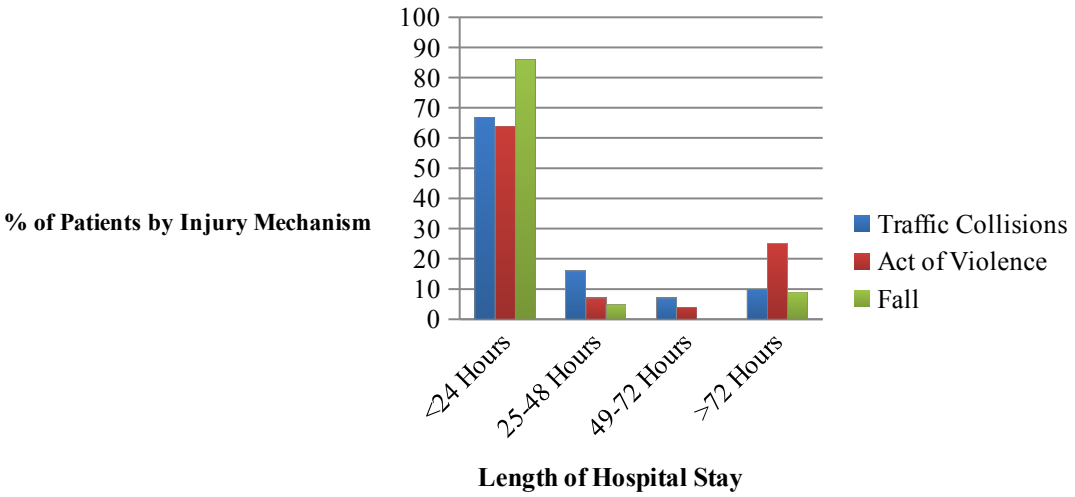
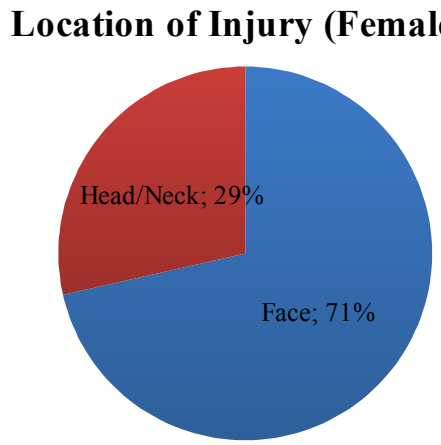


Table 7: Location of Injury According to Mechanism of Injury

Mechanism of Injury	Face	Head/ Neck	Chest/ Abdomen	Extremities	Back	Other	Multiple	Total
Traffic Collisions	2 (6%)	6 (19%)	0 (0%)	19 (61%)	0 (0%)	2 (6%)	2 (6%)	31 (100%)
Act of Violence	3 (11%)	12 (43%)	1 (4%)	10 (36%)	0 (0%)	0 (0%)	2 (7%)	28 (100%)
Fall	1 (4%)	3 (13%)	0 (0%)	18 (78%)	0 (0%)	1 (4%)	0 (0%)	23 (100%)
Animal Bite	0 (0%)	0 (0%)	0 (0%)	2 (67%)	1 (33%)	0 (0%)	0 (0%)	3 (100%)
Other	2 (13%)	1 (7%)	1 (7%)	11 (73%)	0 (0%)	0 (0%)	0 (0%)	15 (100%)

Figure 3. Location of Injury by Acts of Violence



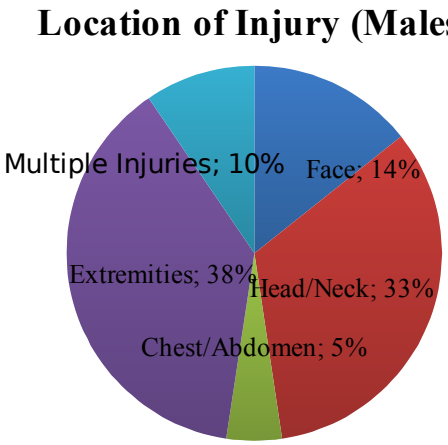


Table 8: Sex Distribution According to Place of Injury

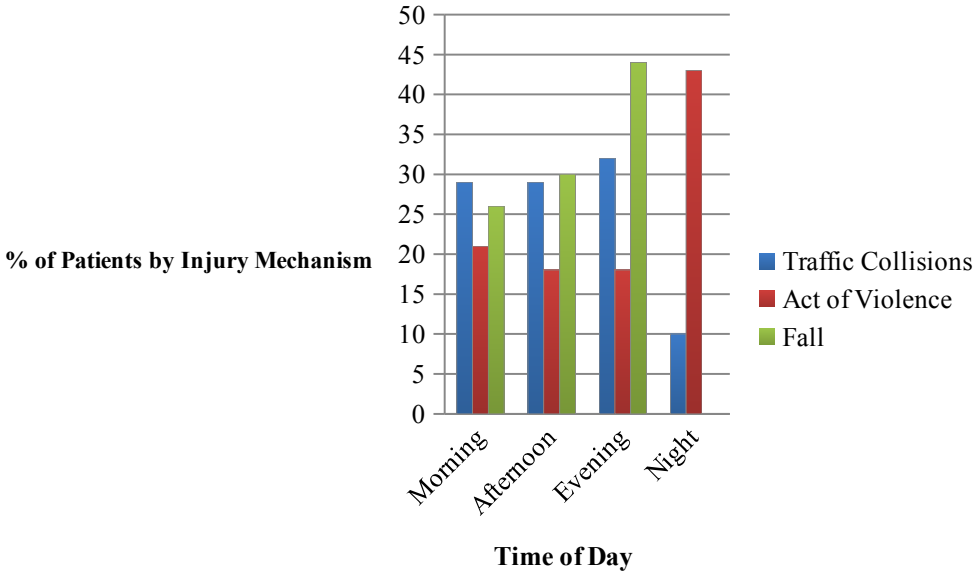
Place of Injury	Male	Female	Total
Home	30 (30%)	14 (14%)	44 (44%)
School	2 (2%)	0 (0%)]	2 (2%)
Workplace	11 (11%)	0 (0%)	11 (11%)
Highway/Street	26 (26%)	7 (7%)	33 (33%)
Other	10 (10 %)	0 (0%)	10 (10%)
Total	79 (79%)	21 (21%)	100 (100%)

Table 9: Time of Injury According to Mechanism of Injury

Mechanism of Injury	Morning	Afternoon	Evening	Night
Traffic Collisions	9 (29%)	9 (29%)	10 (32%)	3 (10%)
Act of Violence	6 (21%)	5 (18%)	5 (18%)	12 (43%)
Fall	6 (26%)	7 (30%)	10 (44%)	0 (0%)
Animal Bite	2 (67%)	1 (33%)	0 (0%)	0 (0%)
Other	4 (27%)	5 (33%)	4 (27%)	2 (13%)

Morning: 06:01 – 12:00
Afternoon: 12:01 – 18:00
Evening: 18:01 – 24:00
Night: 00:01 – 06:00

Figure 4. Injury Mechanism by Time of Day



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