

ORIGINAL ARTICLE**Severity of Injury and Associated Factors among Injured Patients Who Visited the Emergency Department at Wolaita Sodo Teaching and Referral Hospital, Ethiopia****Robera Olana Fite^{1*}, Mamo Mesele², Mathewos Wake³, Masresha Assefa⁴, Ayele Tilahun⁵****OPEN ACCESS**

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Affiliation and Correspondence:

¹Department of Nursing, College of Health sciences and Medicine, Wolaita sodo University, Wolaita Sodo, Ethiopia.

²Disease Prevention and Health Promotion Office, Konta Special Woreda, Ethiopia

³Humbo Woreda Health Office, Wolaita Zone, Ethiopia

⁴Department of Nursing, College of Health sciences and Medicine, Wolaita sodo University, Wolaita Sodo, Ethiopia.

⁵Department of Nursing, College of Health Sciences, Mizan Tepi University, Mizan Teferi, Ethiopia

*Email: rolana2000@gmail.com

ABSTRACT

BACKGROUND: An injury is a physical damage that occurs when the body is exposed to an excessive amount of energy. Physical agents, radiation, chemical agents, biological agents and physiological needs deprivation can cause injury. The study was aimed at assessing the severity of injury and identifying the factors associated with it among injured patients.

METHODS: A cross-sectional study was conducted among patients who visited the emergency department of Wolaita Sodo Teaching and Referral Hospital from January 1, 2012 - January 1, 2017. A total of 320 patient records were included in the study and selected using simple random sampling. Statistical association was done for categorical variables using Chi-square. Rank correlation was done for three ordered options independent variables, Chi-squared test for trend used for two options independent variables, and General Chi-square test of independence used for independent variables with not ordered three and above options. Multivariate multinomial logistic regression was conducted. A P-value <0.05 was taken as a significant association.

RESULTS: The study indicated that the majority (45.3%), 128(40%) and 47(14.7%) had minor, moderate and severe injury, respectively. Residence (AOR 0.462; 95%CI 0.268, 0.798), cause of injury (AOR 3.602; 95%CI 1.336, 9.714), night time injury (AOR 4.895; 95%CI 1.472, 16.277), afternoon time injury (AOR 8.776; 95%CI 2.699, 28.537), and chest injury (AOR 2.391; 95%CI 1.048, 5.454) were significant predictors of moderate injury. Afternoon time of injury (AOR; 4.683; 95%CI 1.137, 19.296) and head, neck and spinal cord injury (AOR; 4.933; 95%CI 1.945, 12.509) were predictors of severe injury.

KEYWORDS: Injury, Multinomial, Road Traffic Accident

INTRODUCTION

An injury is a physical damage that occurs when the body is exposed to an excessive amount of energy. Physical agents, radiation, chemical agents, biological agents and physiological needs deprivation can cause injury (1,2). This incorporates extreme temperature, electrical shock, trauma, poisons, drugs, and alcohol. Road traffic accidents (RTA), falls, fire, suffocation, drowning, and aspiration of foreign objects are common in all age groups (3-5). An accidental injury might be hospitalized and non-hospitalized injuries. The consequence in individuals who have not brought to the health institution is unfavorable (6).

An injury is a public health problem that accounts to over 6 million deaths globally. It is the third known cause of mortality (7,8). In Ethiopia, 3% of each household has a family member injured and 10% of them have died because of the injury. Approximately, 28% and 23% of the injuries occurred due to accidental fall and road traffic accidents, respectively (9). Furthermore, individuals aged 15-49 years are highly affected by injuries. This is the productive age group. Therefore, the incidence of injury has an impact on the socioeconomic status of developing countries (10,11).

Injuries are more common in Sub-Saharan countries (12). Since injuries have a significant impact on the life of individuals, their families, and community, it needs multifaceted intervention and comprehensive approach (13-15). Injuries are related to the underlying health-related problems, age-related physiological changes, and environmental hazards. In relation to urbanization and unsafe utilization of vehicles, the incidence of an accident is rising from time to time (16). Sometimes, people may be unable to recognize potentially hazardous conditions. For instance, engaging in strenuous activities may cause physical harm (17,18).

In elders, injury is common due to falls and instable gaits. Globally, 8 million fractures occur in individuals above 60 years. Furthermore, hip fracture is common in the 75 years and older age group. In women, physical abuse, assault, and

spousal violence are common causes of the injury (19,20).

Injuries have adverse consequences. Acquired defects may occur. One of the long term-sequels of injury is immobility and post-traumatic stress disorder. Moreover, people may become depressed because of an injury. Therefore, medical, surgical and psychological interventions are required to manage the problem. Rehabilitation is also an integral part of the care (20,21).

Management of accidents requires frequent hospital admissions, emergency department visits and appointments (22). Knowledge of the factors contributing to injury severity is essential in combating the problem. Most of the accidental injuries can be prevented with simple and easy safety precautions (23). The study was conducted to identify the severity of injury and associated factors among injured patients. Considering minor injury as a reference, multinomial logistic regression is employed to describe the factors related to major and moderate injury. Therefore, the finding from this study will enable policy-makers and other stakeholders to consider the magnitude and associated factors in controlling the problem.

METHODS

Study area, period and design: Wolaita Sodo University Teaching and Referral Hospital is found in Wolaita Sodo Town, Ethiopia. The hospital has 255 beds. The Surgical department provides peri-operative and trauma management services. The hospital's Emergency Department gives services for more than 15,000 patients per year. The study was conducted from March 1 to April 30, 2017. A cross-sectional study design was employed.

Population and eligibility criteria: The source population was all injured patients who visited the emergency department of Wolaita Sodo Teaching and Referral Hospital during the period from January 1, 2012 – January 1, 2017. The study population was all sampled injured patients who visited the emergency department of Wolaita Sodo Teaching and Referral Hospital during the period from January 1, 2012 - January 2017.

Sample size: The required sample size was determined by using single population proportion formula with the following assumptions: 32.5% proportion (24), Z-value at 95% confidence level (1.96) and 0.05 margin of error. The final sample size was 368. The patient records were selected using simple random sampling method. Patient card numbers were used to identify the patients' records.

Study variables: The dependent variable was severity of injury. The independent variables were sex, age, residence, cause, place of injury, time, condition on admission, anatomical location of injury, mode of transportation, and activity during the injury.

Data collection procedures: Data were collected through a checklist developed after reviewing different literatures (10,13,16,17,24). The data was collected from documented patient charts, which is taken from the registered book in emergency department. Three data collectors and one supervisor were used. Training was given to the data collectors and supervisor regarding the aim of the study, the data collection tool and the procedures.

Data quality control: Training was provided to data collectors and the supervisor. The principal investigator and the supervisor conducted supervision. The supervisor and principal investigator checked each checklist for completeness. Each checklist was given a unique code by the principal investigator.

Data processing and analysis: Data were first checked manually for completeness, then coded, and entered in to EpiData version 3.1. The entered data were transferred to SPSS version 20. The data were cleaned by visualizing, calculating frequencies and sorting. Frequencies and proportions were computed for description of the study population. Statistical association was done for categorical variables using Chi-square. The guideline for using chi-square was that 80% of the cells in the table should have expected frequencies greater than 5, and all cells should have expected frequencies greater than 1. Rank correlation was done for independent variables with three options that are ordered. Rank

correlation was done for independent variables with three ordered options. Chi-squared test for trend was used for independent variables with two options. General Chi-square test of independence was used for independent variables with not ordered three and above options. Normality of the data for age was assessed using a normality plots with tests. Median was used because the skewness was 1.170. Selected variables were entered into the multivariate multinomial logistic regression. It was employed for moderate and sever injury in reference to minor injury. A confidence interval of 95% was used. A p-value less than 0.05 was considered as a significant association. Finally, the results were presented in the form of tables, figures, and sentences.

The following operational definitions are used

Severity of injury: We were not able to measure injury objectively as we used chart review. Injury is classified into three categories based on the extent of injury and the treatment required (16, 26).

Minor injury: Superficial injuries (bruises and laceration)

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

Severe injury: Injuries requiring intensive surgical and/or medical treatment

Ethical considerations: An ethical issue was considered while conducting the study. Ethical clearance was obtained from the Research Committee of Department of Nursing, College of Health Science and Medicine, Wolaita Sodo University. A formal letter was submitted to Wolaita Sodo Teaching and Referral Hospital. To ensure the confidentiality, names of respondents were not written on the questionnaires.

RESULTS

Socio-demographic characteristics: A total of 320 patient records were included in the study. Forty-eight records were found to be incomplete. In the group who had minor injury, the majority (64.1%) were males and 49(33.8%) were aged

18-24. Sixty-five (44.8%) had secondary and above level of education and 78(53.8%) were single. Eighteen (55.2%) lived in urban and 77 (53.1%) were protestants. In the group that had moderate injury, the majority were males (70.3%) and 45(27.6%) were aged 25-34. Sixty-six (51.6%) were single and 81(63.3%) lived in rural areas. In the group who had severe injury, the majority were males (57.4%) and more than

one-third (38.3%). Eighteen (38.3%) were aged 25-34 years and more than half (70.2%) were married. Twenty-six (55.3%) lived in rural area and almost half (48.9%) were protestants. The median age of the patients was 27 (Table 1).

The severity of injury: The majority (45.3%), 128(40%) and 47(14.7%) had minor, moderate and severe injury, respectively (Figure 1).

Table 1: Socio-demographic characteristics of injured patients who visited the emergency department in Wolaita Sodo Teaching and Referral Hospital, Ethiopia, 2017

Variables	Category	Injury Severity			Total N (%)
		Minor N (%)	Moderate N (%)	Severe N (%)	
Sex	Male	93(64.1)	90(70.3)	27(57.4)	210(65.6)
	Female	52(35.9)	38(29.7)	20(42.6)	110(34.4)
Age	Less than 18	18(12.4)	15(11.7)	2(4.3)	35(10.9)
	18-24	49(33.8)	29(22.7)	15(31.9)	93(29.1)
	25-34	40(27.6)	45(35.2)	18(38.3)	103(32.2)
	35 and above	38(26.2)	39(30.5)	12(25.5)	89(27.8)
Educational Status	No formal Education	23(15.9)	14(10.9)	10(21.3)	47(14.7)
	Primary education	57(39.3)	26(20.3)	21(44.7)	104(32.5)
	Secondary and above	65(44.8)	88(68.8)	16(34.0)	169(52.8)
Marital Status	Single	78(53.8)	66(51.6)	14(29.8)	158(49.4)
	Married	67(46.2)	62(48.4)	33(70.2)	162(50.6)
Residence	Urban	80(55.2)	47(36.7)	21(44.7)	148(46.3)
	Rural	65(44.8)	81(63.3)	26(55.3)	172(53.7)
Religion	Orthodox	40(27.6)	41(32)	18(38.3)	99(30.9)
	Protestant	77(53.1)	74(57.8)	23(48.9)	174(54.4)
	Muslim	24(16.6)	12(9.4)	5(10.6)	41(12.8)
	Catholic	4(2.8)	1(0.8)	1(2.1)	6(1.9)



Figure 1: Severity of injury injured patients who visited the emergency department in Wolaita Sodo Teaching and Referral Hospital, Ethiopia, 2017

Injury characteristics: In the group who had minor injury, 74(51%) had a road traffic accident and 99(68.3%) were injured outside home. Sixty-

three (43.4%) were injured during nighttime and 97(66.9%) were stable on admission. Majority (41.4%) had extremity injury and 131(90.3%)

were supported on arrival. In the group who had moderate injury, 41(32%) were injured by assault. More than half (55.5%) were injured outside home. Eighty-four (65.6%) were injured in the afternoon and 101 (78.9%) were stable on admission. Fifty-two (40.6%) had extremity injury and 80(62.5%) were supported on arrival. Majority (64.1%) were doing other activity at the time of injury and 106(82.8%) send home after

treatment (82.8%). In the group who had severe injury, one-third (34%) had falling accident and more than half (55.3%) were outside home at the time of injury. More than three-quarters (78.7%) were stable on admission and majority (44.7%) had head, neck and spinal cord injury. Three-quarter (74.5%) were supported on arrival and majority (70.2%) were doing other activities at the time of injury (Table 2).

Table 2: The injury Characteristics among injured patients who visited the emergency department in Wolaita Sodo Teaching and Referral Hospital, Ethiopia, 2017

Variables	Category	Injury Severity			Total N (%)
		Minor N (%)	Moderate N (%)	Severe N (%)	
Cause	Road traffic accident	74(51.0)	45(35.2)	17(36.2)	136(42.5)
	Fall down accident	40(27.6)	25(19.5)	16(34.0)	81(25.3)
	Assault	12(8.3)	41(32)	5(10.6)	58(18.1)
	Machinery	19(13.1)	17(13.3)	9(19.1)	45(14.1)
Place of injury	Inside home	46(31.7)	57(44.5)	21(44.7)	124(38.8)
	Outside home	99(68.3)	71(55.5)	26(55.3)	196(61.3)
Time	Night	63(43.4)	39(30.5)	18(38.3)	120(37.5)
	Afternoon	61(42.1)	84(65.6)	26(55.3)	171(53.4)
	Morning	21(14.5)	5(3.9)	3(6.4)	29(9.1)
Condition on admission	Stable	97(66.9)	101(78.9)	37(78.7)	235(73.4)
	Unstable and died	48(33.1)	27(21.1)	10(21.3)	85(26.6)
Anatomical location of injury	Head neck and spinal cord	28(19.3)	29(22.7)	21(44.7)	78(24.4)
	Chest	18(12.4)	22(17.2)	5(10.6)	45(14.1)
	Abdomen and pelvic area	39(26.9)	25(19.5)	8(17.0)	72(22.5)
	Extremity	60(41.4)	52(40.6)	13(27.7)	125(39.1)
Mode of transportation	Walking	14(9.7)	48(37.5)	12(25.5)	74(23.1)
	supported	131(90.3)	80(62.5)	35(74.5)	246(76.9)
Activity during the injury	Working	26(17.9)	46(35.9)	14(29.8)	86(26.9)
	Doing other activities	119(82.1)	82(64.1)	33(70.2)	234(73.1)
Outcome	Send home	95(65.5)	106(82.8)	28(59.6)	229(71.6)
	Admitted	46(31.7)	19(14.8)	12(25.5)	77(24.1)
	Referred or Died	4(2.8)	3(2.3)	7(17.9)	14(4.4)

Nature of injury: A significant proportion of the patients, 158(49.4%), had open wound injury (Figure 2).

Bivariate relationships between explanatory and outcome variable: On chi-square test, a significant difference was observed regarding the injury severity between urban and rural residents

($p=0.031$), among different causes of injury ($p=0.013$), between patients injured inside and outside home ($p=0.037$), among patients injured at night, afternoon and morning time ($p=0.002$), and between patients who were stable and unstable on admission ($p=0.034$) (Table 3).

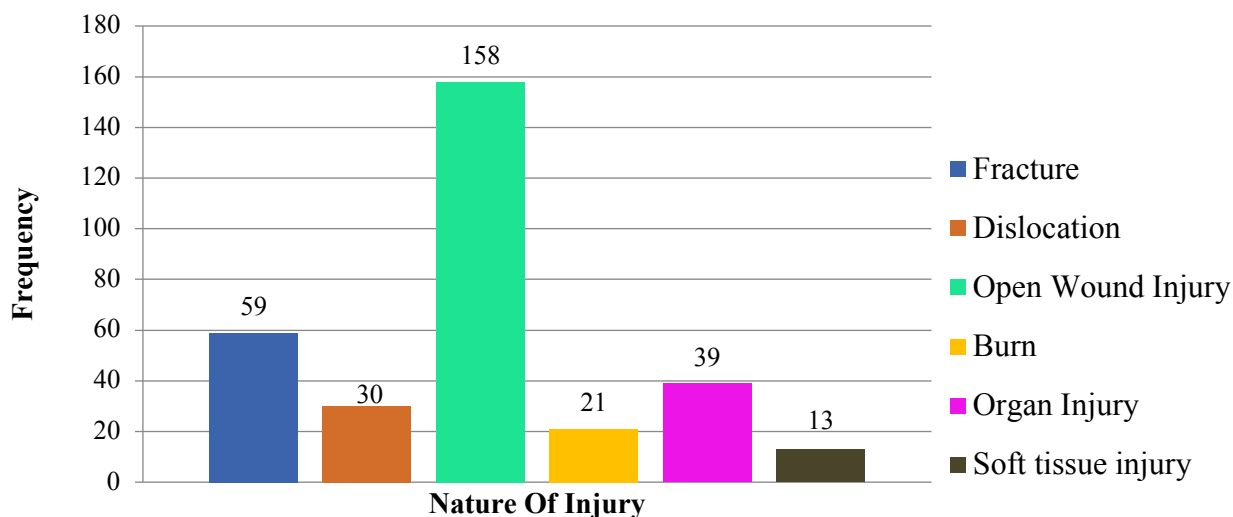


Figure 2: Nature of injury among injured patients who visited the emergency department in Wolaita Sodo Teaching and Referral Hospital, Ethiopia, 2017

Table 1: Bivariate relationships between selected explanatory and outcome variable among injured patients who visited the emergency department in Wolaita Sodo Teaching and Referral Hospital, Ethiopia, 2017

Variable	Category	Injury Severity			X ² , P-value
		Minor	Moderate	Severe	
Sex	Male	93	90	27	0.078,0.780
	Female	52	38	20	
Age	Less than 18	18	15	2	0.081,0.150
	18-24	49	29	15	
	25-34	40	45	18	
	35 and above	38	39	12	
Residence	Urban	80	47	21	4.629,0.031
	Rural	65	81	26	
Cause	Road traffic accident	74	45	17	10.856,0.013
	Fall down accident	40	25	16	
	Assault	12	41	5	
	Machinery	19	17	9	
Place of injury	Inside home	46	57	21	4.365,0.037
	Outside home	99	71	26	
Time	Night	63	39	18	12.638,0.002
	Afternoon	61	84	26	
	Morning	21	5	3	
Condition on admission	Stable	97	101	37	4.519,0.034
	Unstable and died	48	27	10	
Anatomical location of injury	Head neck and spinal cord	28	29	21	5.794,0.125
	Chest	18	22	5	
	Abdomen and pelvic area	39	25	8	
	Extremity	60	52	13	

Factors associated with the degree of injury:

Time of injury and location of injury were predictors of both moderate and severe injury. Furthermore, residence and cause of injury were significant predictors of moderate injury.

Accordingly, with minor injury as a reference, those living in urban areas were 54.8% less likely to experience moderate injury as compared to those who were living in the rural areas (AOR: 0.462, 95% CI:0.268, 0.798). With minor injury as a reference, those injured due to assault were 4 times more likely to experience moderate injury as compared to those who were injured by machinery (AOR: 3.602, 95% CI:1.336,9.714). With minor injury as a reference, those injured during night time were 5 times more likely to experience moderate injury as compared to those who were injured during morning time (AOR: 4.895, 95% CI:1.472,16.277). With minor injury as a reference, those injured during afternoon were 9

times more likely to experience moderate injury as compared to those who were injured during morning time (AOR: 8.776, 95% CI:2.699,28.537). Anatomical location of injury was another predictor of moderate injury. With minor injury as a reference, those who had chest injury were 2.4 times more likely to experience moderate injury as compared to those who had extremity injury (AOR: 2.391, 95% CI:1.048,5.454). With minor injury as a reference, those injured during afternoon time were 5 times more likely to experience severe injury as compared to those who were injured during morning time (AOR: 4.683, 95% CI:1.137,19.296). Anatomical location of injury was another predictor of severe injury. With minor injury as a reference, those who had head, neck and spinal cord injury were 5 times more likely to experience severe injury as compared to those who had extremity injury (AOR: 4.933, 95% CI:1.945, 12.509) (Table 4).

Table 4: Factors associated with the degree of injury among injured patients who visited the emergency department in Wolaita Sodo Teaching and Referral Hospital, Ethiopia, 2017

Variables	Category	Moderate injury VS	Severe Injury VS
		Minor Injury	Minor injury
		AOR(95% CI)	AOR(95% CI)
Residence	Urban	0.462(0.268, 0.798)*	0.605(0.296,1.236)
	Rural	1	1
Cause	Road traffic accident	0.653(0.259, 1.648)	0.374(0.114,1.226)
	Fall down accident	0.821(0.336,2.006)	0.792(0.273,2.301)
	Assault	3.602(1.336,9.714)*	0.670(0.166,2.706)
	Machinery	1	1
Place of injury	Inside home	0.924(0.475,1.797)	1.077(0.463,2.504)
	Outside home	1	1
Time	Night	4.895(1.472,16.277)*	2.976(0.705,12.561)
	Afternoon	8.776(2.699,28.537)*	4.683(1.137,19.296)*
	Morning	1	1
Condition on admission	Stable	1.641(0.881,3.058)	1.866(0.803,4.334)
	Unstable and died	1	1
Anatomical location of injury	Head, neck and spinal cord	1.688(0.804,3.543)	4.933(1.945,12.509)*
	Chest	2.391(1.048,5.454)*	2.115(0.659,6.786)
	Abdomen and pelvic area	0.756(0.371,1.537)	1.360(0.511,3.617)
	Extremity	1	1

*: Significant at p-value < 0.05; AOR: Adjusted Odds Ratio

DISCUSSION

In this study, 14.7% had major injury. This is lower than a study finding of Amhara Regional State Referral Hospitals in which 76.9% of the patients had major injuries (25). This might be due to the fact that the current study was conducted in a single hospital, while the latter study was done in five regional referral hospitals. On the other hand, the finding of this study is slightly higher than a report from Gondar in which 13% of the injuries were major injuries (26), and in Southern Ethiopia, in which 9.3% had severe injuries (16). A possible explanation for this difference may be the fact that the current study incorporated data from two years while the study conducted in Gondar incorporated data from a one-month emergency department visit. With this high level of severe injury, it is hard to achieve the goal of reducing injury. Hence, holistic prevention and scientific approach is mandatory.

In the study, the majority of the injured patients were males. This is supported by a research conducted in Ethiopia, Kenya and Wales (26,27,28). This might be due to the increased exposure of males related to engagement in outdoor activities. This is related to the link between the level of masculinity and gender-based role. Furthermore, this might also be related to the gender based behavioral differences. Males are more likely to engage in situations that increase the risk of injury as compared to females (29).

Road traffic accidents are one of the major causes of injury, disability and death. In this study, the major cause of injury was road traffic accident. Accordingly, 42.5% had a road traffic accident. This is supported by researches conducted in Ethiopia, Kenya and Yasuj (14,16,23,26,30). In developing countries, the policies and regulations on acquiring the driving license and prevention of the accidents are not tight. Furthermore, it might be related to the absence of the traffic light. This implies a need to deliver community education regarding the responsibilities of both the driver and pedestrian. The world health organization has a target of

halving the global mortality and injury incidence from road traffic accident by 2020 (31).

In this study, with minor injury as a reference, those who had head, neck and spinal cord injury were 5 times more likely to experience severe injury as compared to those who had extremity injury. This finding is contrary to a finding from a study conducted in Gondar (26). The finding is in line with that of studies conducted in Ethiopia (33) and Australia (34). Patients with head injury might have associated meningeal hemorrhage, cerebral and subdural hematoma, which made the injury severe (29).

In this study, occupational injury accounted for 26.9%, which is smaller than a finding from studies conducted in Ethiopia (13,33). The difference might be due to the difference in the study time and setting. This study includes cases that come to health institution for care at emergency department, while the latter studies were community-based cross-sectional studies. Therefore, the study might miss cases with occupational injury that were taken to other health institutions and those treated at home. It is also lower than a finding from a research conducted in Tikur Anbesa Specialized Referral Hospital (24). The difference might be related to the fact that latter study area is a center of treatment for referral cases from all over the country.

The study area is the second populous area in the Southern Ethiopia. The urban part is a center for trade and industrial manufacturing. In the rural part, agriculture is commonly practiced. It is an exit and entry to major routes of the country and has no traffic lights yet. The area, where motorcycles and three wheeled vehicles used as a taxi, has high traffic flow. The road to Arba Minch has no separate road for pedestrian. Motorcycles, vehicles and three wheeled cars used the same road. This might increase the incidence of injury. While the use of helmet is mandatory, it is not commonly used.

It has to be noted that the finding of this study mainly reflect the situation in Wolaita Sodo Teaching and Referral Hospital. Therefore, the findings should be interpreted with caution. The factors expected to influence injury severity

may not be exhaustive. We recommend that future researchers conduct similar studies, which involve multiple health institutions and standard scales measuring the injury severity directly.

In conclusion, this study indicated that one quarter of the patients had major injury. Road traffic accident was found to be a major cause of injury and most of the individuals were injured outside home. Time of injury and location of injury were predictors of both moderate and severe injury. Living in Rural area, assault, nighttime, afternoon and chest injuries are more likely to cause moderate injuries. Afternoon time injury, head, neck and spinal cord injuries were more likely to cause severe injuries.

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