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Epidemiological Study on Injury and Violence in Nepal

Nepal Health Research Council
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Epidemiological Study on Injury and Violence in Nepal

Conducted by

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Dr. Choplal Bhusal

Executive Chairman

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ABBREVIATION

BPKIHS	:	B.P. Koirala Institute of Health Sciences
CBS	:	Central Bureau of Statistic
DALYs	:	Disability Adjusted Life Years
HIV	:	Human Immuno-Deficiency Virus
LMICs	:	Low and Middle Income Countries
NHRC	:	Nepal Health Research Council
PPE	:	Personal Protective Equipment
RTA	:	Road Traffic Accident
SEAR	:	South-East Asia Region
SPSS	:	Statistical Package for Social Science
WHO	:	World Health Organization

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INTRODUCTION

Global Scenario

Injury is a major global disease burden for the twenty-first century. Injuries are overlooked as contributors to global inequities in health, yet the long-term disabilities they frequently produce represent a significant burden. Injuries occur as a result of environmental, social, biological, economic, and behavioral factors.(1)

Injuries have traditionally been regarded as random, unavoidable "accidents". Within the last few decades, however, a better understanding of the nature of injuries has changed these old attitudes, and today both unintentional and intentional injuries are viewed as largely preventable events. As a result of this shift in perception, injuries and their health implications have demanded the attention of decision-makers worldwide and injury policy has been firmly placed in the public health arena.(2)

An injury is defined as "a bodily lesion at the organic level, resulting from acute exposure to energy (mechanical, thermal, electrical, chemical or radiant) in amounts that exceed the threshold of physiological tolerance. In some cases (e.g. drowning, strangulation, freezing), the injury results from an insufficiency of a vital element".(3)

Each year injury accounts for more than five million deaths globally.(4) The overall burden of injury in terms of morbidity and mortality is underestimated while ignoring the number of survivors of injuries, many of whom suffer life-long health consequences. Traffic collisions, falls, drowning, burns and deliberate acts of violence against oneself or others are among the causes of these injuries. Most injury-related deaths and disabilities are preventable.(4)

The injury account for 9% of global mortality, and are a threat to health in every country accounting for nearly one of every 10 deaths globally. However, ''…deaths due to injury represent only the tip of the injury iceberg''.(2) For every death, it is estimated that there are dozens of hospitalizations, hundreds of emergency department visits and thousands of doctors'

appointments. A large proportion of people surviving their injuries incur temporary or permanent disabilities. Injuries account almost one in 8 male deaths and one in 14 female deaths.(5)

Among the external causes of injuries, it is broadly categorize into two sub groups as intentional and unintentional injuries.

Intentional injuries account for 57% of adult mortality due to injuries, while motor vehicle accidents account for 25% of adult mortality due to injuries. Intentional injuries were observed to be twice as high among men in 2004. Injuries are further projected to cause 28% of global deaths between 2004 and 2030 predominantly which is due to increasing number of road traffic accidents. Road traffic accident deaths are projected to increase from 1.3 million in 2004 to 2.4 million in 2030. Road traffic accidents are projected to rise from the ninth leading cause of death globally in2004 to the fifth in 2030.(5)

Worldwide, unintentional injuries accounted for more than 3.5 million deaths in 2001, or about 6 percent of all deaths and 66 percent of all injury deaths. Males accounted for almost two-thirds of the deaths attributed to unintentional injuries in Low and Middle income countries (LMICs) in 2001, with rates of both injury death and DALY losses higher among males than females. Compared with other age groups, young people age 15 to 29 accounted for the largest proportion of deaths from unintentional injuries. RTA accounted for the greatest burden of deaths from unintentional injuries in 2001, or about 34 percent of the total burden. Whereas young people age 15 to 29 years accounted for the highest proportion of all unintentional injuries, those ages 45 to 59 accounted for the highest proportion of injuries from poisonings, while those ages 70 to 79 accounted for the highest proportion of injuries from falls.(6)

Estimates of the burden of unintentional injuries as measured in terms of economic costs are almost nonexistent. The best estimates available are for RTA. Using road crash costs from 21 developed and developing countries, the Transport Research Laboratory Ltd. finds that the average annual cost of road crashes was equivalent to about 1.0 percent of gross national product in developing countries, 1.5 percent in transition countries, and 2.0 percent in highly motorized countries. The annual burden of road crash costs is about US$518 billion globally and about US$65 billion in LMICs, exceeding the total annual amount these countries receive in development assistance.(7)

Of the five million people killed due to injuries in 2000, approximately 1.2 million people died of road traffic incidents, 815 000 from suicide and 520 000 from homicides. In addition to the considerable number of deaths, millions more are wounded or suffer other non-fatal health consequences due to injuries. The magnitude of the problem varies considerably by age, sex, and region and income group.(Table 1)

Table 1 Magnitude of Problem due to Injury

Type of Injury	Deaths due to Injuries, 2000
Road traffic Incidents	1 260 000
Suicide	815 000
Interpersonal violence	520 000
Drowning	450 000
Poisoning	315 000
War and conflict	310 000
Falls	283 000
Burns	238 000

(Source: WHO)

Worldwide injury cause, as many deaths as from HIV, malaria and tuberculosis combined. Eight of the 15 leading causes of death for people ages 15 to 29 years are injury-related: road traffic injuries, suicides, homicides, drowning, burns, war injuries, poisonings and falls. Every day, 1000 child deaths could be prevented by proven injury prevention measures. For every child who dies from an injury, many more are left with lifelong disabilities.(8)

Globally injury mortality among men is twice than that of women. Young people (15-44) year's accounts for 50% of world's injury related mortality. More than 90% of world's death from injuries occurs in low and middle income-countries. South-East Asia and western pacific regions account for highest no of injury death worldwide.(2) Three times as many men die as a result of road traffic collisions than women. Figures also suggest that three times as many men are murdered than women. However, in the Western Pacific and Asia regions, rates of suicide and burns are higher amongst females.

The patterns of injury deaths differ by region. While death rates from road traffic, burns and drowning are particularly high in Africa and Asia, death rates due to falls are highest in Western Europe. Homicide rates are three times higher than suicide rates in Africa and the Americas. The converse is true for Europe and South East Asia where suicide rates are more than double the homicide rates.

WHO estimates that nearly 90% of deaths due to injuries take place in poorer countries. The Newly Independent States in Europe have the highest overall injury mortality rates while North America, Western Europe, and Australia/New Zealand have the lowest overall injury mortality rates. The highest burden of injuries and fatalities is borne disproportionately by poor people in developing countries, as pedestrians, passengers of buses and minibuses, and cyclists.

Injuries also have a major impact on economic growth and sustainable development. Productive populations of society are among the majority of being victim of injury-related deaths and the burden affects the most. Indeed, almost 50 per cent of all injury-related deaths are among 15–44 years age group.(9)

South-east Asia Regional Scenario

In 2004, an estimated 58.8 million deaths occurred globally, with South-East Asia region the highest proportion of death (26%). More than 90% of world's death from injuries occurs in low and middle income-countries. South-East Asia and western pacific regions account for highest no of injury death worldwide.(5) In the Asia Pacific Region it is estimated that injuries caused about 2.7 million deaths in 2002, or over 7000 deaths daily, which constituted 52% of worldwide injury deaths. The injury burden amounted to some 92.5 million DALYs lost in the Region in 2002, 51% of the global total. Low- and middle-income countries have higher injury-related mortality rates than high-income countries. The 15-44 age groups accounted for 55% of injury-related mortality. In 2002, the major causes of injury deaths in the Region were due to road traffic (an estimated 600000 deaths), self-inflicted injury or suicide (577000), falls (237000), drowning (230000), burns (204000), interpersonal violence (179000), and poisoning (170000). Unintentional injuries and those due to violence are significant public health problems in the Region. Mortality and DALY'S lost due to road-traffic injuries, self-inflicted injuries, drowning and burns in regions were almost equal to or more than 50% of respective world's total. Road traffic is major cause of injuries and deaths throughout Asia pacific region. (WHO)

In South-East Asia for every injury-related death, there are about 50 emergency admissions, accounting for an estimated 70 million emergency visits every year which has a tremendous impact on the poor health care systems of the Region. Injuries account for an estimated 1.4 million deaths and 54 million disability-adjusted life-years (DALYs) in South-East Asia. This region

alone accounts for 27 per cent of the global mortality and 31 per cent of the global burden of injuries. If the burden of all diseases and conditions are taken together, 10 per cent of all deaths and 13 per cent of all burden of diseases and condition in this Region result from injuries.(9)

Nepal

Disabilities due to violence and injuries are increasing in Nepal.(10) Due to increasing population, rapid urbanization, industrialization, migration and changing of the lifestyles of the people of Nepal, violence, injuries and disabilities are increasing. Injuries account for about 8% of death in Nepal. But injuries, disabilities and deaths are not systematically recorded or used for the purpose of prevention. There is no systematic surveillance system in place. The people in general are not aware and knowledgeable about how to prevent injuries and disabilities. Upgraded professional skills and knowledge are needed for effective management of injury and violence cases and prevention of resultant disabilities.

Injuries, violence and disabilities are a major public health problem in Nepal. Professional skills, relevant sectoral coordination and community involvement needed for effective management of violence and injuries to prevent disabilities. The information received from injuries surveillance helps understanding the extent of problem, the pattern of injuries, the high-risk population, and the daily, seasonal and yearly trend and compare the problem among and within geographical areas which help awareness and further planning.

Especially in Nepal, road traffic accidents are more common in urban region. Road traffic accidents are the major cause of injuries and disabilities including occupational injuries, burns, violence, falls and drowning. Self-inflicted injuries, wounds, burn, fall, drowning, poisoning are also increasing. Violence is another main cause of injury. Social violence, Self-directed violence, political violence, religious violence all is prevalent in Nepal which are also responsible for injury. Environmental factors like landslides and floods highly enhance the incident of injury in Nepal.

In Nepal as per estimates of morbidity and mortality for 1998-1999, injury contributed 9% to total mortality and was the third leading cause, with road accidents occupying the eighth position in the overall ranking. Fifty eight per cent of the injuries occurred in the 15-44 years age group with the male to female ratio of 3:1.(11)

Table 2 Causes of annual burden of injury in Nepal in 1990

Cause	Women	Men	India	Nepal
Injury	**119**	**147.6**	**266.6**	**5.332**
Unintentional	**104**	**126.3**	**230.3**	**4.606**
Falls	21.1	28.9	50	1
Motor vehicle	9.4	23.1	32.5	0.65
Drowning	8.3	9	17.3	0.346
Fires	8.5	7.1	15.6	0.312
Intentional	**14.6**	**21.4**	**36**	**0.72**
Self-inflicted	10.8	11.1	21.9	0.438
Poisoning	0.8	2.1	2.9	0.058
War	0.9	2	2.9	0.058

(Number in cells are 100,000 DALYs) *Source (12)*

Intentional injuries are five times more than unintentional injuries in Nepal. This Nepal DALY loss has been calculated as 2% of the Indian loss, assuming that Nepal's population is 2% of India's. (Table 2)

In country like Nepal non-communicable disease, especially injury, are not being seen as health priority, but due to rapid epidemiological and demographic transition burden of non-communicable disease in now not new to Nepal. Government of Nepal also prioritizes more on communicable disease only.

Draft national action plan for injury prevention has been developed, which needs review and implementation in a phased manner to address the major issues and risk factors.

Rationale of the Study

Non-communicable disease contributes to severe disability and morbidity than communicable disease which directly affect on nation's development. Especially burden of injuries are rising throughout world with more than 90% of deaths in SEAR. Nepal being part of South-East Asia region therefore can't be isolated from injury burden.

Assessing magnitude of injury can therefore be used as useful tool to quantify burden of morbidity due to injury which further will be a scientific evidence for the review, amendments and implementation of already formulated draft national action plan for injury prevention.

So, research is must to assess the magnitude of injury in Nepal which could further help to formulate plan, policy and surveillance system regarding the non communicable diseases. There is lack of strict evidence regarding incidence of injury. This report gives an insight to the magnitude of different types of injuries in different regions of Nepal and hence will be helpful in policy formulation.

OBJECTIVES

General

The broad objective of the study is to estimate the problem magnitude of injury in Nepal

Specific

- To estimate prevalence of Injury in Nepal
- To describe distribution pattern of Injury in different regions of Nepal
- To describe the distribution of injuries according to age, sex in different regions of Nepal
- To assess the cause of injury

METHODOLOGY

This study was conducted using secondary data from emergency medical record section of tertiary care centers of five development regions of Nepal.

Study design

The study was retrospective descriptive in nature.

Study place

1. Eastern Region
    - BP Koirala Institution of Health Sciences, Dharan
    - Koshi Zonal Hospital, Biratnagar
2. Central Region
    - Patan Hospital
    - Bir Hospital
    - Institue of Medicine
3. Western Region
    - Western Regional Hospital, Pokhara
    - Manipal Teaching Hospital, Pokhara
4. Mid-western Region
    - Nepalgunj Medical College, Banke
    - Bheri Zonal Hospital, Banke
5. Far-western Region
    - Seti Zonal Hospital, Dhangadi
    - Mahakali Zonal Hospital, Mahendranagar

Study period

The time period of the study was from mid-July 2008 to mid-June 2009 (fiscal year 2065/66 BS)

Source of data

Data were collected from five regions of Nepal including at least two tertiary care centers from each region.

Data collection Technique and Tools

Initially five developmental regions were selected purposively to make sample representative from all the regions. Then, from each region one zonal hospital and a teaching hospital were selected assuming that most of the major injuries landed at these tertiary hospitals. Two zonal hospitals were selected from Far-western region due to non-existence of medical college in the region. Similarly, two central level hospitals and a teaching hospital were selected from central region because most of the major injuries from all over the country are referred to these three centers.

All the tertiary care centers were approached to the emergency medical record section through proper channel. A format was developed to enter the data according to name, address, age, sex, cause of injury and diagnosis. This format was developed for the region where the recording system was manual. Similar format was developed in MS Excel for the hospitals where the data were stored in electronic version. The collected data were, then, entered into MS Excel. The data were transferred to SPSS 13 after the completion of data editing and cleaning.

Analysis was done using SPSS version 13.0. Prevalence was calculated for National level. Rate and proportions were used to calculate demographic variables and statistical significance test was applied wherever applicable. A time trend analysis was done to see the contribution of days of the week and months of the year in the occurrence of injury and trauma.

The cause-specific injuries examined here include those that the World Health Organization (WHO) routinely analyzes and publishes data on and that individually account for the greatest injury burden in terms of mortality and disability-adjusted life years (DALYs). The main subheadings include intentional and unintentional injury. Unintentional injury includes road traffic accident, poisonings, falls, burns, and drowning whereas intentional injuries include self-inflicted injuries, violence and war related injuries. Case definition of cause of injury is given in the following table (Table 3):

Table 3 Case definition of cause category of Injury

Cause category	Case definition
A. Unintentional Injuries	
Road traffic accident	Includes crashes and pedestrain injuries due to motor vehicles.
Poisonings	Only one outcome is included for poisonings.
Falls	Includes falls resulting from osteoporotic fractures.
Fires	Most of the sequlae of fires are due to burns. Some individuals, however, jump from buildings or are otherwise injured due to fires.
Drownings	Other than drowning and near-drowning rates, the only other major disabling sequelae from near-drowning included is quadriplegia.
Others	This is not a residual category, but includes injuries due to environmental factors, machinery and electrical equipment, cutting and piercing implements, and various other external causes of unintentional injury.
B. Intentional Injuries	
Self-inflicted injuries	Suicide attempts, whether or not resulting in death.
Violence	Interpersonal violence, including assault and homicide.
War	Injuries and deaths direclty attributable to war in coumbatants and non-combatants. For example, the estimates of mortality include deaths to children and adults from landmines.

The two main injury categories, intentional and unintentional injuries are defined in terms of a series of external cause codes; unintentional injuries are subdevided in to road traffic injuries, poisoning, falls, fires, drowing and "other unintentional injuries". The latter category includes for examples, exposure to animate and inanimate mechanical forces (including firearms), exposure to

electric current, radiation and extreme ambient temperature and pressure, and to forces of nature, and contact with heat and hot substances, and venomous plants and animals. Intentional injuries are sub divided into self-inflicted injuries (i.e. suicide), interpersonal violence (e.g. homicide), war-related injuries, and other intentional injuries.(2)

RESULT

General

Total number of injury recorded in selected tertiary care centers of Nepal from mid-July 2008 to mid-June 2009 was 37973.

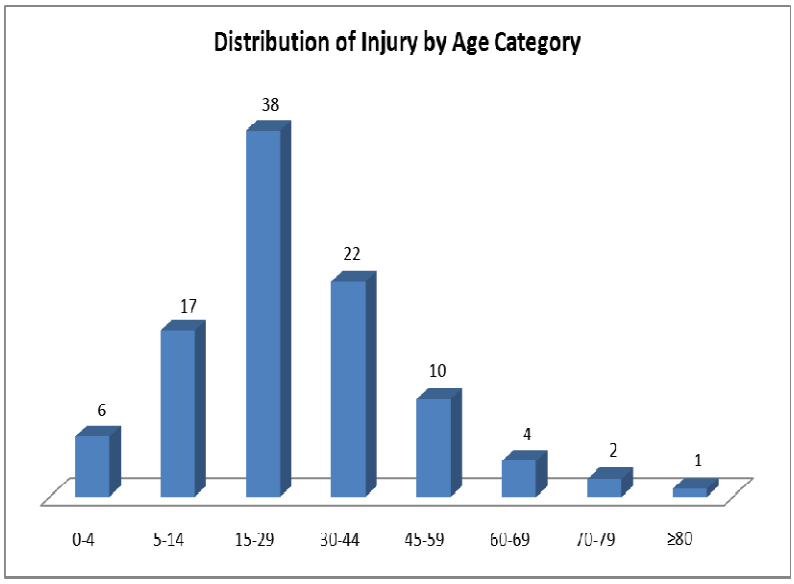

Figure 1 Distribution of Injury by age category

The bar chart (Figure 1) compares the distribution of injury by age category (1 to >80 age group). Almost 60% of the Nepal's injury-related events occur in the young people aged between 15–44 years which is the most economically productive population. However there was a gradual decline of injury cases as the age increased above 60 year.

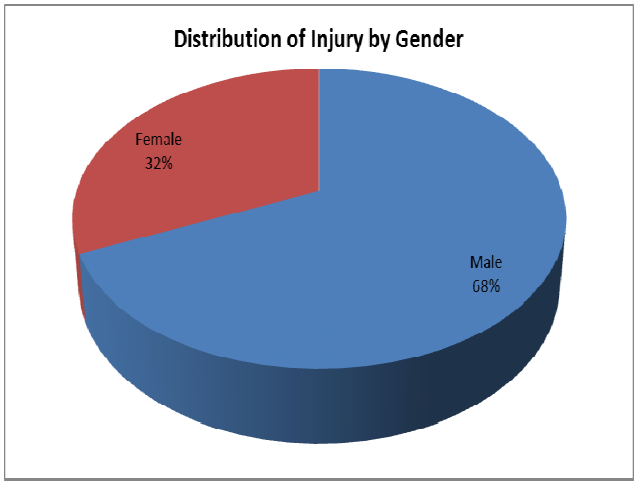

Figure 2 Distribution of Injury by Sex

The gender distribution of injury illustrates that the proportion of male population (68%) were much more high as compared to the female which accounts for only 32%. (Figure 2)

Intentional and unintentional injuries are the two categories uder the broad heading of injury. Table 3 illustrates the definition of injury on the basis of cause of injuries:

Table 4 Distribution of Injury by cause category

Cause category	Percent
A. Unintentional Injuries	**77.00**
1. Road traffic accident	28.75
2. Poisonings	8.64
3. Falls	26.54
4. Fires	2.29
5. Drownings	0.07
6. Others	11.15
B. Intentional Injuries	**23.00**
1. Self-inflicted injuries	0.34
2. Violence	21.83
3. War	0.39

The main causes of unintentional injury are road traffic accident, poisoning, drowning, falls, and burns. Intentional injuries are those caused by interpersonal and collective violence, and by self-harm.

Unintentional injuries is seem to be nearly 3 times higher than the intentional injury of which road traffic accident and fall related injuries contribute higher percentage. Other injuries and poisoning under unintentional injuries account for 11.15% and 8.64% respectively.(Table 4)

Intentional injuries reported 23% of all the injury, out of which violence was responsible for higher proportion of cases.

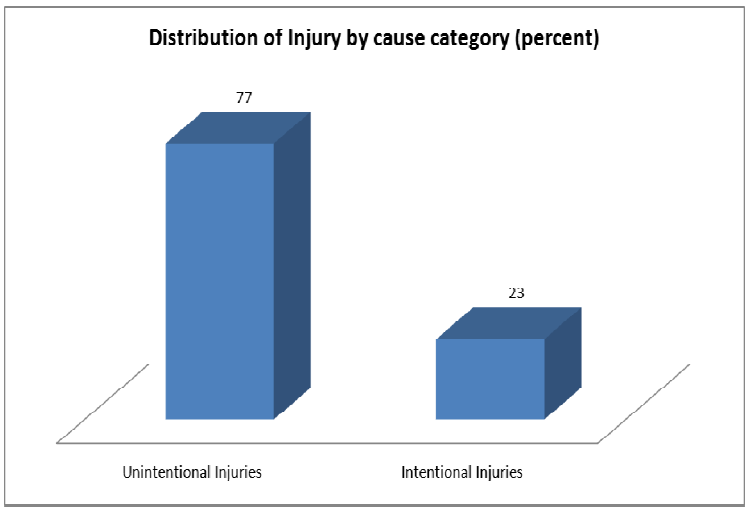

Figure 3 Distribution of injury by cause

The study shows that only about one quarter of the injury is intentional injuries and more than 75 percent is unintentional injuries. (Figure 3)

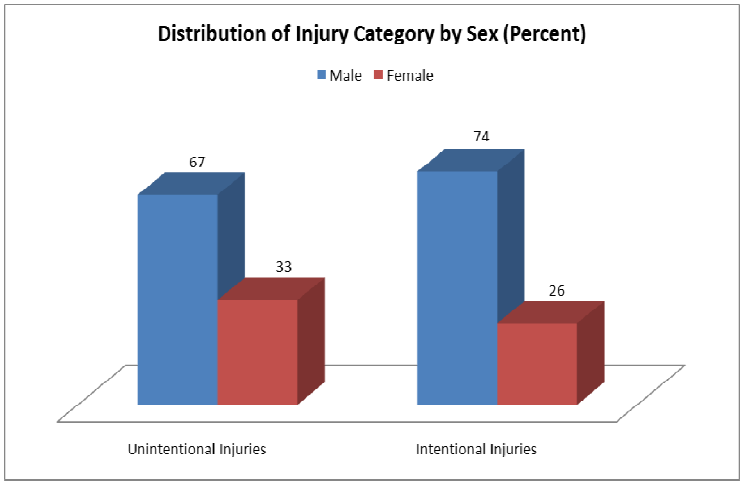

Figure 4 Distribution of injury by sex

The above distribution of injury by category shows that the proportion of male are three times higher in intentional injury whereas it is only two times more in unintentional injury. Majority of the male are affected by both Intentional injuries (74%) as well as unintentional injuries (67%). In contrast, only 33% and 26% of the female are injured due to unintentional and intentional injuries respectively. (Figure 4)

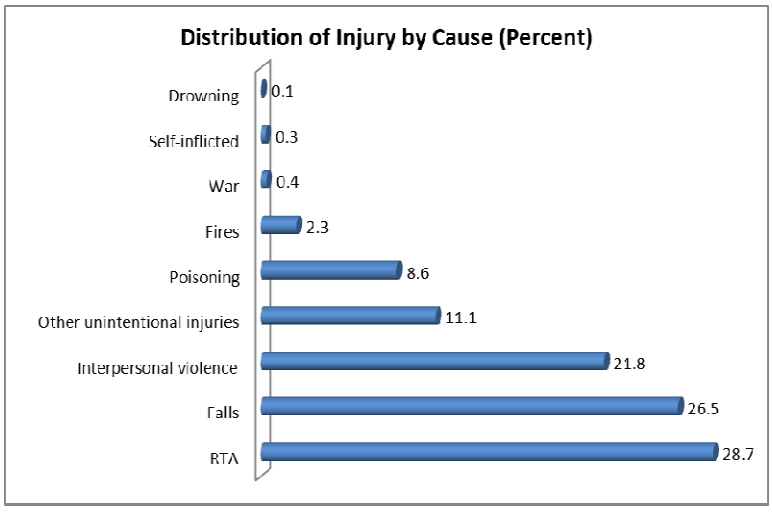

Figure 5 Distribution of injury by cause

In terms of cause of injury, road traffic accident (RTA) is the major cause of injury in Nepal with more than 28 % followed by falls (26.5 %) and interpersonal violence (21.8 %). Other major injuries are found to be other unintentional injuries, poisoning and fires. But the injuries due to war, self-inflicted injuries and drowning are subsequent causes of injuries which are reported less than 1 %. (Figure 5)

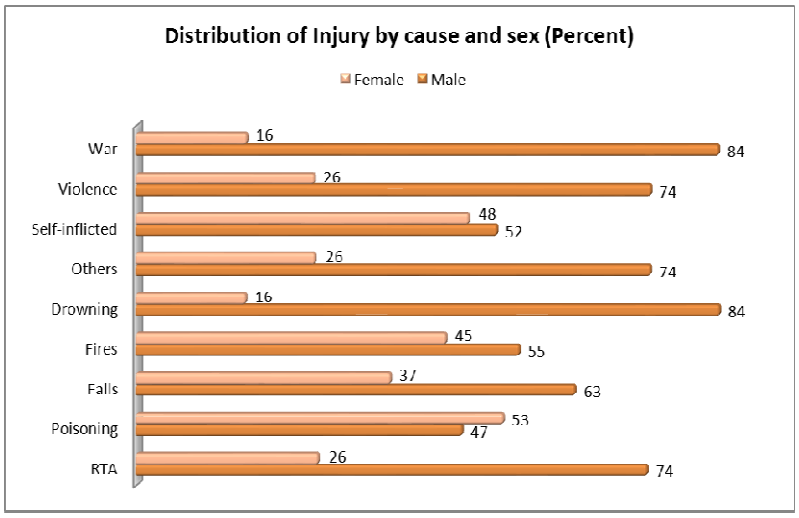

Figure 6 Distribution of injury by cause and sex

Male population are mostly affected in every injury related events in Nepal except in poisoning (47% Vs 53%). Among all the injuries, male are mainly injured in war and drowning in comparision to female with 84% and in road traffic accidents (74%). In contrast, female are less

injured in war and drowning. However, poisoning and self inflected injuries are most common in female. (Figure 6)

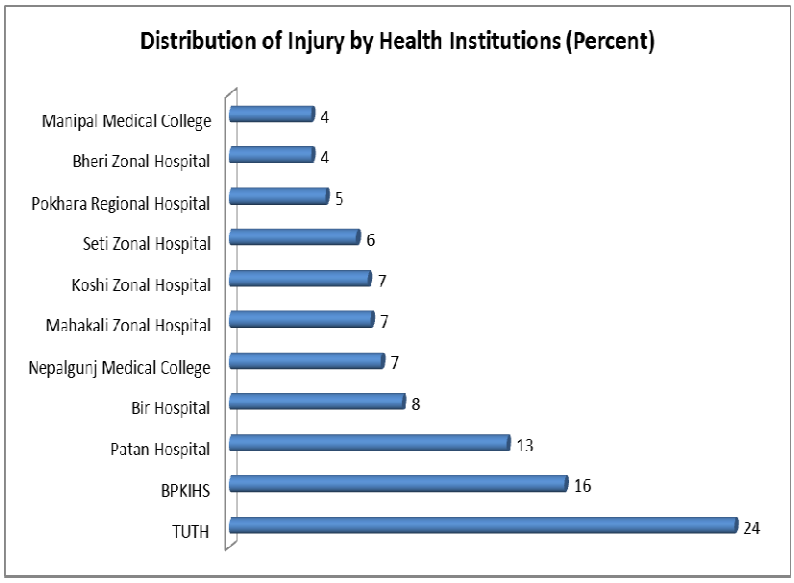

Figure 7 Distribution of injury by health institution

The data collected from the selected health institutions of Nepal revealed that there is high pressure of injury cases in Tribhuwan University Teaching Hospital, Kathmandu with almost one fourth of the cases, followed by BP Koirala Institute of Health Sciences, Dharan and Patan hospital, Lalitpur with 16 % and 13 % respectively. Subsquently, Bir hospital, Nepalgunj Medical College, Mahakali Zonal Hospital and other hospitals and medical college account less than 50% of injuries cases in Nepal. (Figure 7)

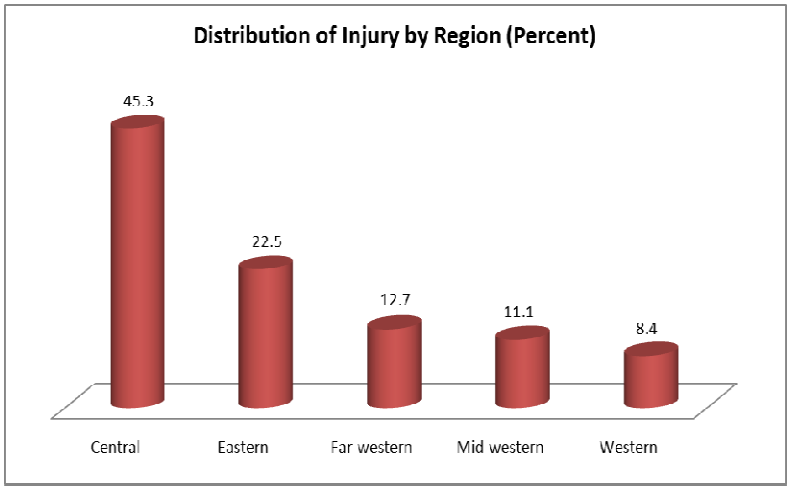

Figure 8 Distribution of injury by region

The most developed region where capital city Kathmandu lies, central development region has the highest proportion of injury.

Central region has the highest proportion of injury which is approximately 50% of total injury case in the country. Eastern development region represent to has the second highest number of cases with 22.5% of injury related cases which is followed by far-western, mid western and western development region respectively. (Figure 8)

Table 4 Distribution of Injury by Region, Age and Sex (Percent)

Age group	National			Eastern		Central		Western		Mid-western		Far-western	
(years)	Both sexes	M	F	M	F	M	F	M	F	M	F	M	F
0-4	6	4	2	3	2	4	3	4	2	2	1	5	2
5-14	17	12	5	12	5	11	5	15	6	8	3	16	7
15-29	38	27	11	25	11	28	10	22	12	32	12	25	11
30-44	22	15	7	16	8	16	7	11	6	18	7	13	6
45-59	10	6	4	8	4	6	3	7	4	7	3	6	3
60-69	4	2	2	2	2	2	2	3	3	3	1	2	2
70-79	2	1	1	1	1	1	1	2	1	1	0	1	0
≥80	1	1	0	0	0	0	0	1	1	0	0	0	0
Total	100	68	32	67	33	69	31	64	36	71	29	68	32

The table 4 represents the cross tabulation of entire data related to injury in terms of age category, sex and development region in Nepal. Uneven distribution of injury is seen in different regions, however the cases of injury are reported high in Central, Eastern and Mid-western region. It shows that there is high burden of injury among the age group 15-44 years, which is the economically active group. In terms of sex, proportion of male is highly injured in comparison to female. (Table 4)

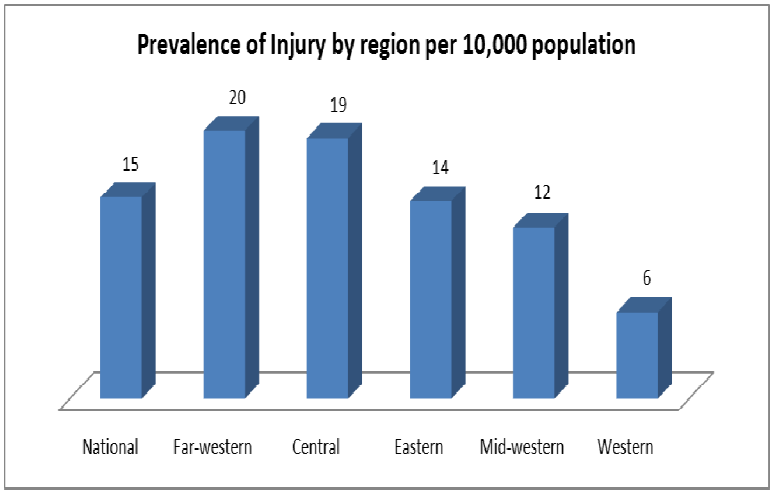

Figure 9 Prevalence of Injury by Region

The prevalence of injury is found to be 15 per 10,000 population at national level. Central and Far-western region has almost similar prevalence of injury whereas western region shows the least prevalence of injury. The prevalence is calculated assuming that most of the major injury cases ultimately seek health care from tertiary health care providers and this study included most of the tertiary care centers located in different regions of Nepal. So, the prevalence presented here underestimates the actual burden of disease as data from private and traditional health care providers are not included.

Road Traffic Accident (RTA)

Table 5 Distribution of RTA by age, sex and region

Age group	National			Eastern		Central		Western		Mid-western		Far-western	
(years)	Both sexes	M	F	M	F	M	F	M	F	M	F	M	F
0-4	3	2	1	1	1	1	1	3	2	1	0	3	1
5-14	10	7	3	7	4	6	3	8	3	6	3	9	6
15-29	44	34	10	31	10	36	11	30	13	34	10	35	10
30-44	26	20	6	22	6	21	6	13	7	21	6	17	6
45-59	11	8	3	10	3	7	3	8	4	8	3	6	3
60-69	4	2	2	2	1	2	2	3	3	2	2	1	2
70-79	1	1	0	1	0	1	0	2	1	1	1	1	0
≥80	1	0	1	0	1	0	0	0	0	1	1	0	0
Total	100	74	26	74	26	74	26	67	33	74	26	72	28

The distribution of Road traffic accident is shown in the cross tabulation that describes the scenario of the injuries caused by it throughout Nepal among different age group and sex. The age-group between 15 to 59 is found to be highest, where the poportion of male is high. There is almost similar proportion of RTA among male and female in different regions. (Table 5)

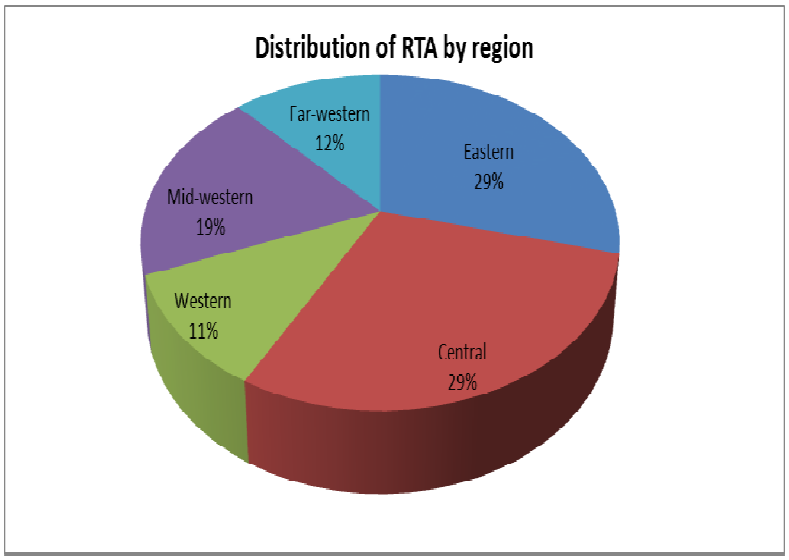

Figure 10 Distribution of RTA by region

Twenty nine percent of the road traffic accident (RTA) occur in each Central and Eastern development region. Mid western development region has the proportion of 19% of RTA and 11 % of RTA take place in western development region. (Figure 9)

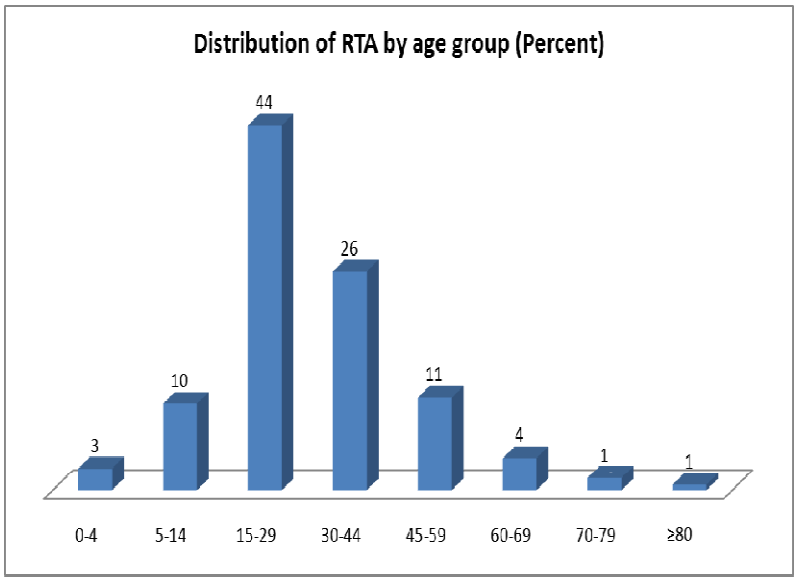

Figure 11 Distribution of RTA by age group

Road traffic accident is highly common in 15-29 year age group which accounts 44 % of the total injuries. Similarly, 30-44 age group is also among the high prevalent age group with 26% of RTA among total injury cases last year. It shows that the cases of RTA is less common in older as well as in younger age group. (Figure 10)

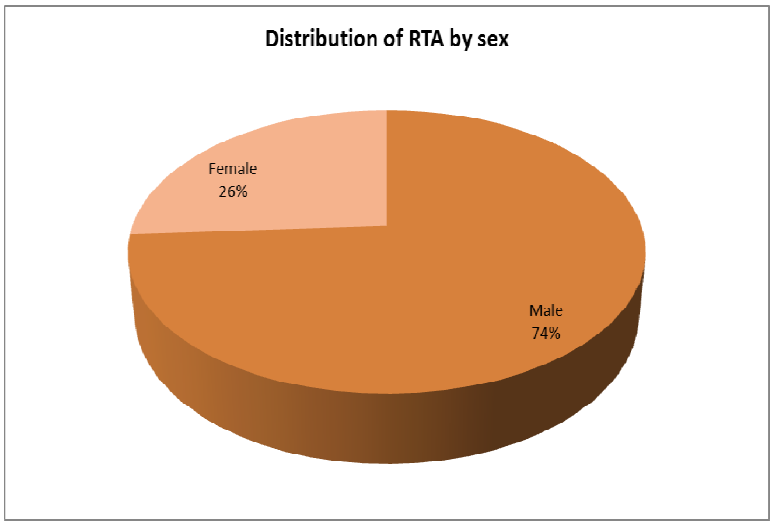

Figure 12 Distribution of RTA by Sex

Male population is highly exposed in the work outside home that might be the reason that nearly three fourth (74%) of the male population become the victim of road traffic accidents. In comparison to male, distribution of femle shows that only 26% of the female are injured due to RTA. (Figure 11)

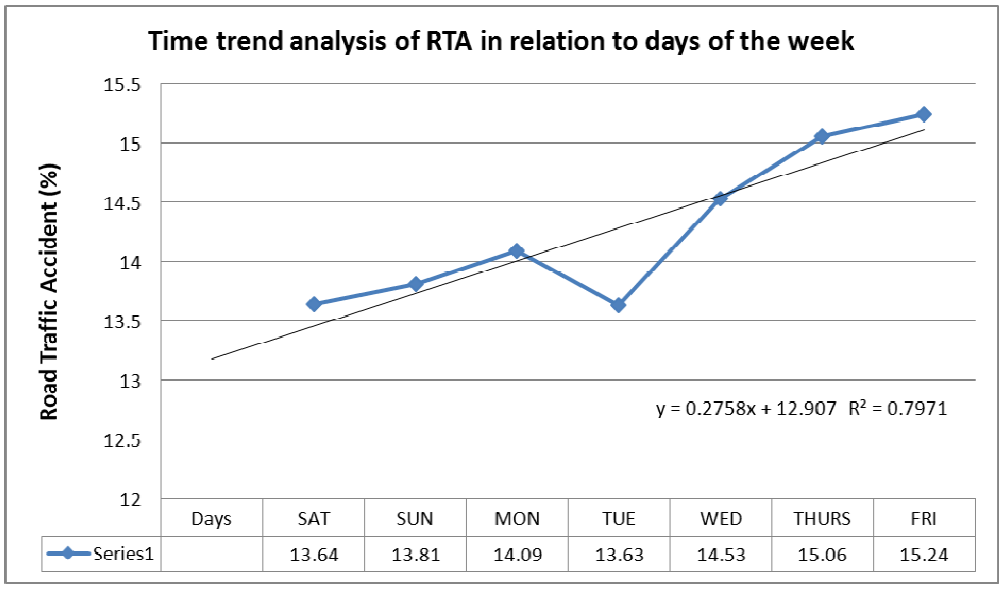

Figure 13 Time trend analysis of RTA in relation to days of the week

This figure explains that most of the RTA occur at the end of the weekdays on Friday. About 80 percent of the time, days of the week explains the occurrence of RTA in Nepal. (Figure 12)

Falls

Table 6 Distribution of Falls by age, sex and region

Age group	National			Eastern		Central		Western		Mid-western		Far-western	
(years)	Both sexes	M	F	M	F	M	F	M	F	M	F	M	F
0-4	10	6	4	6	3	8	4	6	3	2	2	7	4
5-14	32	23	9	27	9	18	8	24	12	20	7	25	12
15-29	22	14	8	12	5	17	8	9	11	14	11	15	9
30-44	15	9	5	8	4	11	7	8	5	10	6	8	5
45-59	11	6	5	6	7	5	5	5	5	9	4	5	4
60-69	6	3	3	3	4	2	3	3	4	6	3	2	2
70-79	3	2	1	2	2	1	1	2	2	2	2	1	0
≥80	1	0	1	1	1	1	1	0	1	1	1	0	1
Total	100	64	36	65	35	63	37	57	43	64	36	63	37

The table demonstrates that in all regions of Nepal, significantly higher number of fall-related injury is seen in the age group between 5 to 29 years, particularly among male than younger, older and female. (Table 6)

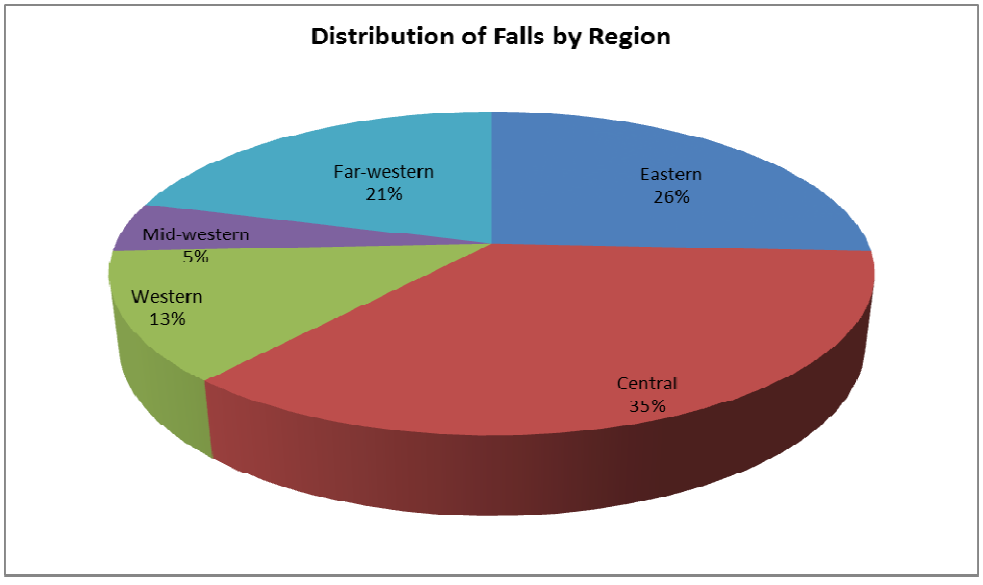

Figure 14 Distribution of falls by region

Central and eastern development region combined account for more than 60 % of the total fall related injury, while mid-western region has the least (5%) of fall injury. (Figure 13)

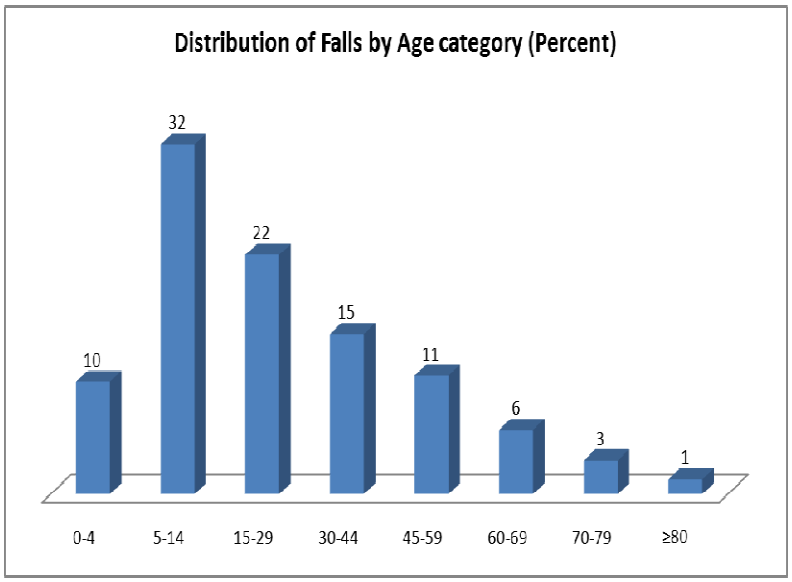

Figure 15 Distribution of fall by age category

Over 30 % of the falls occur in younger age 5-14 year age group. The trend of falls seem to be not as much in the successive age group above 15 years. (Figure 14)

Violence

Table 7 Distribution of Violence by age, sex and region

Age group	National			Eastern		Central		Western		Mid-western		Far-western	
(years)	Both sexes	M	F	M	F	M	F	M	F	M	F	M	F
0-4	1	1	0	0	0	1	0	1	0	0	0	2	0
5-14	5	3	2	3	2	3	1	4	2	4	1	6	2
15-29	48	38	10	33	14	42	8	47	8	41	9	38	9
30-44	31	21	10	20	13	24	8	16	6	22	7	18	9
45-59	11	8	3	8	4	8	2	10	2	9	3	8	2
60-69	3	2	1	1	1	1	1	1	2	3	1	3	2
70-79	1	1	0	1	0	1	0	1	0	0	0	1	0
≥80	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	100	74	26	66	34	80	20	80	20	79	21	76	24

Interpersonal violence is one of the major cause of morbidity in Nepal as shown in the table above. Especially in the age-group 15 to 44 years, the distribution of violence is observed significantly high, of which male population is highly injured. (Table 7)

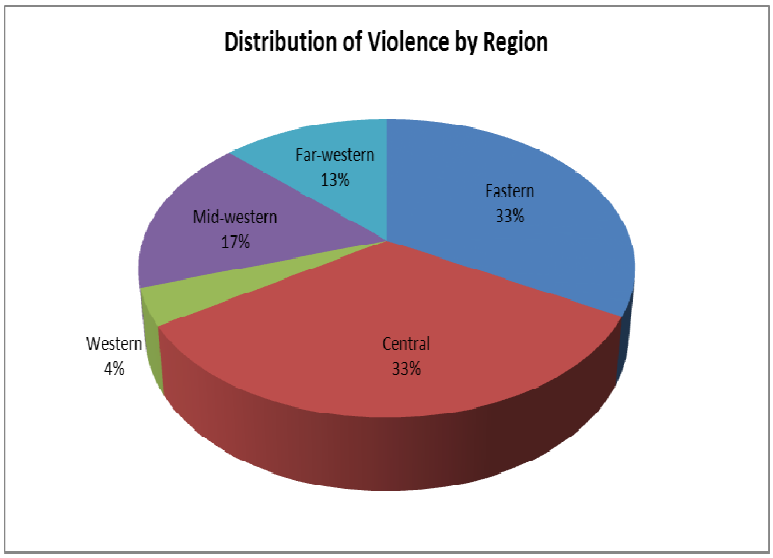

Figure 16 Distribution of Violence by Region

Central and eastern development region is reported to have the highest distributions of interpersonal violence which account for 33% in each region. The proportion is less in mid and far western development region with 17% and 13% respectively. However the distribution of violence is least (4%) in western development region. (Figure 15)

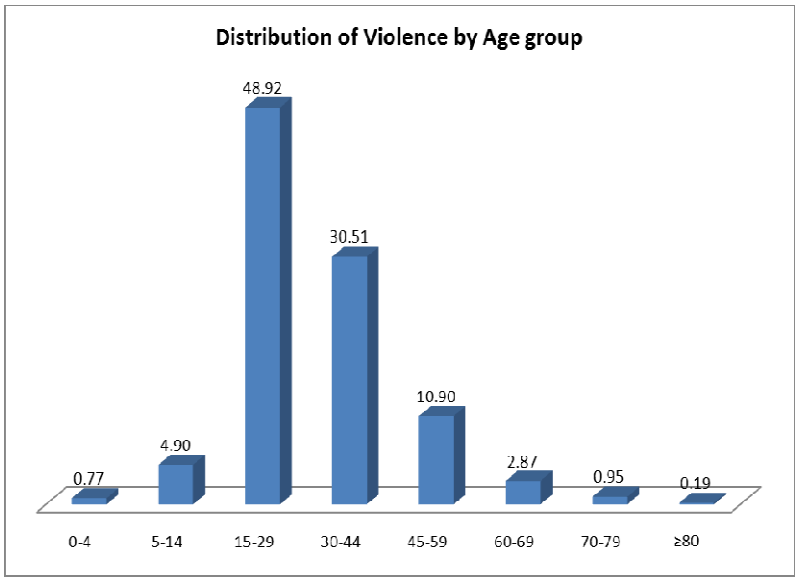

Figure 17 Distribution of violence by age group

Young people aged between 15-29 years has maximum interperosonal violence with almost 50% whereas the same proportion of violence occur amongs rest of the age-groups. In comparision to this, 30-44 age group which is adult age had the second highest (30.51%) proportion of violence. Older and younger age group are less exposed to interpersonal violence. (Figure 16)

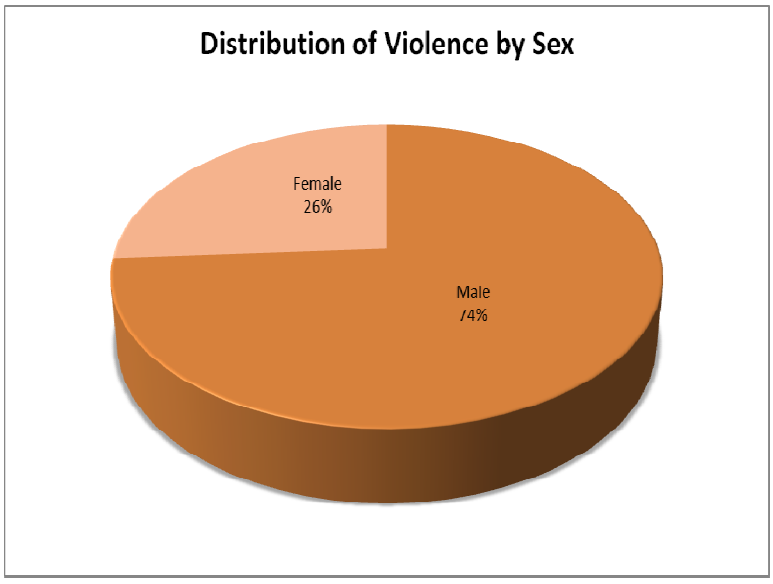

Figure 18 Distribution of violence by sex

Almost three fourth of interpersonal violence in Nepal is found to be in male. As compare to male, female share only 26 % distribution of violence. (Figure 17)

Table 8 Distribution of Violence by days of the week

Days	Percent
Saturday	14.56
Sunday	14.21
Monday	13.67
Tuesday	13.94
Wednesday	14.28
Thursday	14.29
Friday	15.04

This table shows that the highest percent of violence occurred at the weekend. But the time trend analysis does not show any explanation of the days of the week on the occurrence of violence. (Table 8)

Poisoning

Table 9 Distribution of Poisoning by age, sex and region

Age group	National			Eastern		Central		Western		Mid-western		Far-western	
(years)	Both sexes	M	F	M	F	M	F	M	F	M	F	M	F
0-4	5	3	2	7	4	0	0	5	3	2	1	4	2
5-14	8	4	3	6	6	2	2	2	4	4	2	8	4
15-29	53	22	31	16	32	23	35	21	35	29	29	19	26
30-44	22	10	12	8	12	11	12	6	7	10	13	14	9
45-59	8	5	4	3	3	6	4	6	4	4	3	6	4
60-69	3	2	1	2	1	3	1	1	2	2	1	2	1
70-79	1	1	0	0	0	1	0	1	0	0	0	1	0
≥80	0	0	0	0	0	0	0	2	1	0	0	0	0
Total	100	47	53	42	58	46	54	44	56	51	49	54	46

In general, the poisoning cases are seen high among the 15 to 44 year age group. The crosstabulation shows that the female population is more likely to be injured by the poisoning than the male. Unequal ditribution of poisoning is reported from different part of the country. (Table 9)

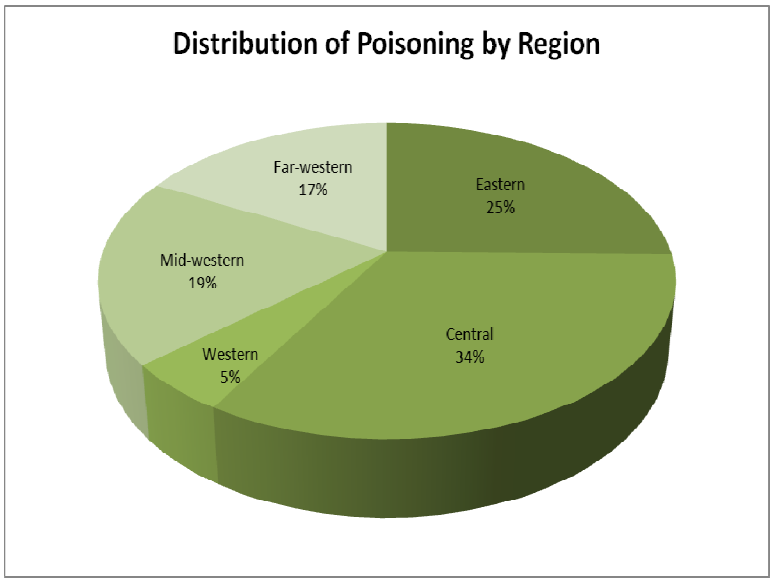

Figure 19 Distribution of Poisoning by Region

Central region has the highest case of poisoning amongst the total poisoning cases in Nepal. Subsequent to this, eastern, mid western and far western region has also the relatively high proportion of cases with 25%, 19% and 17% respectively. The least cases of poisoning is seen in western development region. (Figure 18)

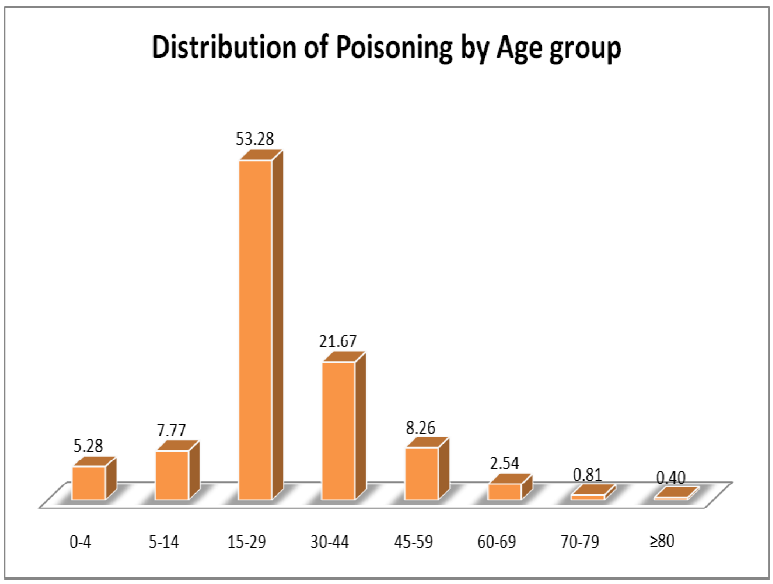

Figure 20 Distribution of poisoning by age group

Nearly 75% of the poisoning related injury occurs in young people aged between 15–44 years, which is the most economically productive members of the country population. While the cases appear to be less in the younger and above 60 age group. (Figure 19)

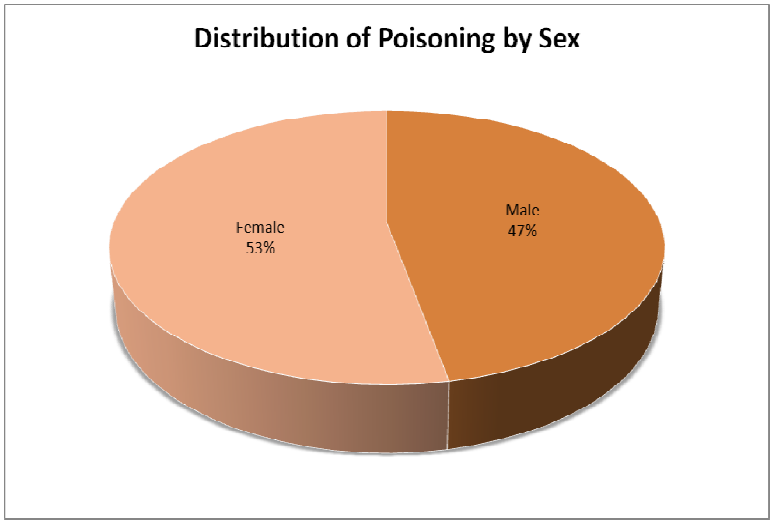

Figure 21 Distribution of poisoning by sex

The proportion of poisoning among female is found to be more than 50% while the male population shares 47% among the total poisoning cases. (Figure 20)

Table 10 Distribution of Poisoning by days of the week

Days	Percent
Saturday	14.33
Sunday	13.32
Monday	13.52
Tuesday	14.16
Wednesday	15.29
Thursday	13.24
Friday	16.14

This table shows that the highest percent of poisoning occurr at the weekend. But the time trend analysis does not show any explanation of the days of the week on the occurrence of Poisoning.(Table 10)

Fires

Table 11 Distribution of Fires by age, sex and region

Age group	**National**			**Eastern**		**Central**		**Western**		**Mid-western**		**Far-western**	
(years)	Both sexes	M	F	M	F	M	F	M	F	M	F	M	F
0-4	16	10	7	10	9	6	5	15	12	11	6	23	7
5-14	13	8	5	11	3	5	3	8	10	11	10	19	4
15-29	36	17	18	11	15	21	22	17	19	15	19	17	7
30-44	23	14	9	20	5	15	12	4	8	10	9	7	6
45-59	8	4	3	8	6	4	3	2	2	4	1	4	1
60-69	3	1	1	1	2	1	2	0	0	2	1	4	1
70-79	8	1	1	1	1	0	1	2	0	0	0	0	0
≥80	1	1	0	0	1	0	0	0	1	1	0	0	0
Total	100	56	44	62	42	52	48	48	52	54	46	74	26

The table illustrates that the fire related injury is significant in the younger age group than the older. There is irregular number of burn cases seen in various regions of the country. Male and female are nearly equally injured due to fire burn. (Table 11)

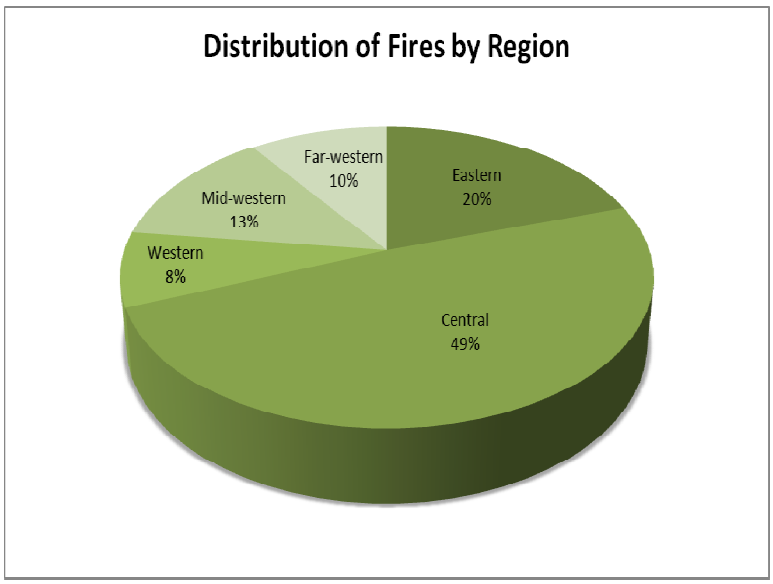

Figure 22 Distribution of Fires by Region

Central region alone represents nearly 50% of the total number of fire-related injuries in Nepal. Eastern, western, mid-western and far-western regions also account for more than 50% of the total fire related injuries. (Figure 21)

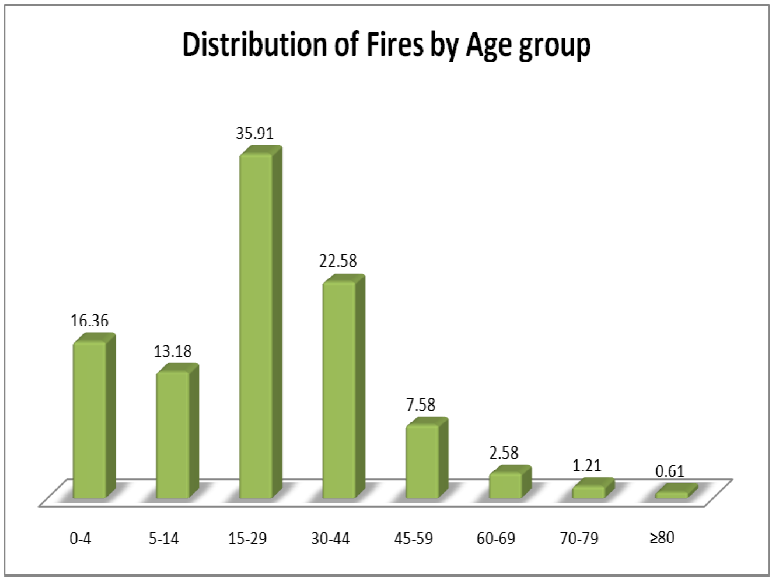

Figure 23 Distribution of fires by age group

Adult age group of 15-44 years reports for the highest proportion of injuries due to fires. Around 30% of the injuries are reported among the children aged 0-15 years. From the age above 45 years, the fire related injuries seem to decrease. (Figure 22)

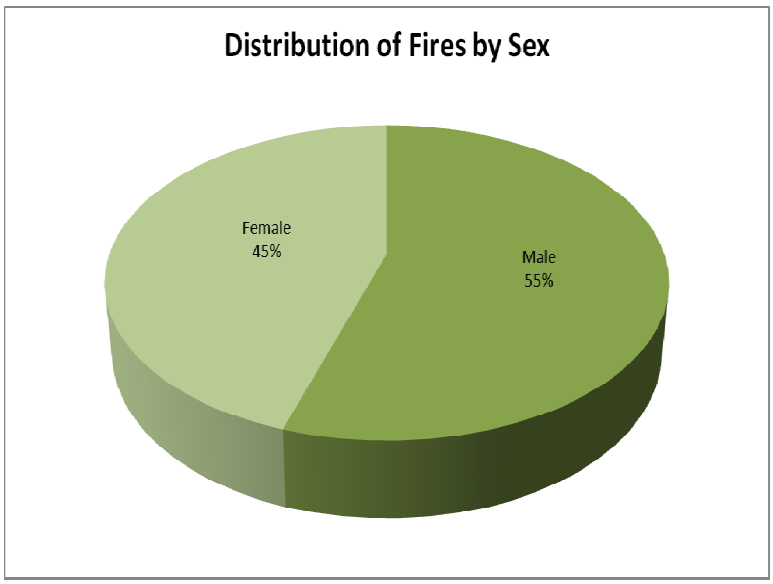

Figure 24 Distribution of fires by sex

Male has the highest fire related injuries with more than 50% of proportion. In comparision to the male, female is less injured by fires. (Figure 23)

Suicide

Table 12 Distribution of Suicide by age, sex and region

Age group	National			Eastern		Central		Western		Mid-western		Far-western	
(years)	Both sexes	M	F	M	F	M	F	M	F	M	F	M	F
0-4	0	0	0	0	0	0	0	0	0	0	0	0	0
5-14	6	4	4	0	4	5	5	33	0	34	0	3	2
15-29	48	18	31	18	30	36	31	0	33	0	33	10	31
30-44	21	14	6	27	0	9	9	34	0	33	0	10	8
45-59	14	9	5	0	9	0	5	0	0	0	0	18	4
60-69	3	3	0	4	0	0	0	0	0	0	0	4	0
70-79	3	2	1	0	4	0	0	0	0	0	0	4	0
≥80	4	2	2	4	0	0	0	0	0	0	0	2	4
Total	100	52	48	53	47	50	50	67	33	67	33	51	49

Age, sex and region distribution of suicide cases is shown in the above cross tabulation where the Eastern and Central region has the highest distribution and the highest number of distribution is seen among the age-group 15-29 years. (Table 12)

For most of the injury related morbidity, suicide is seen high among the female than the male.

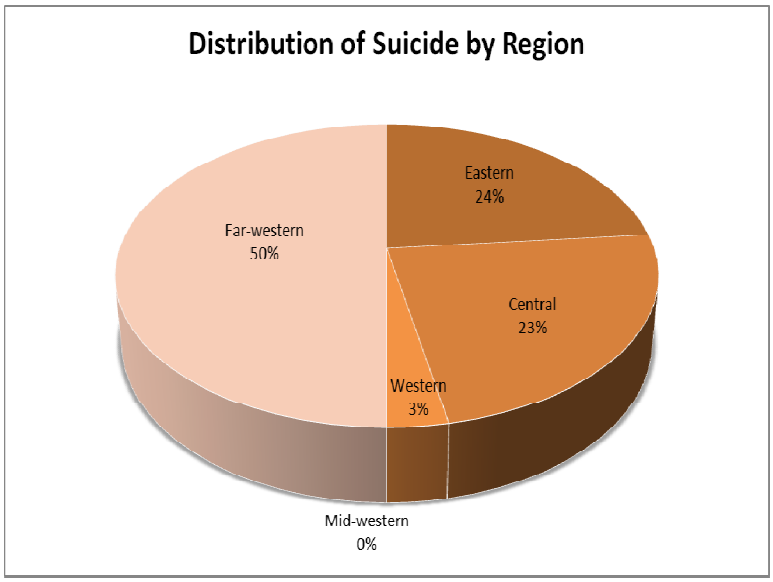

Figure 25 Distribution of suicide by region

The significant cases of suicide is seen in far western region which holds 50% of the cases. Eastern and central region has also the high prevalence of suicide case but there are not a single registered cases of suicide found in mid western region. (Figure 24)

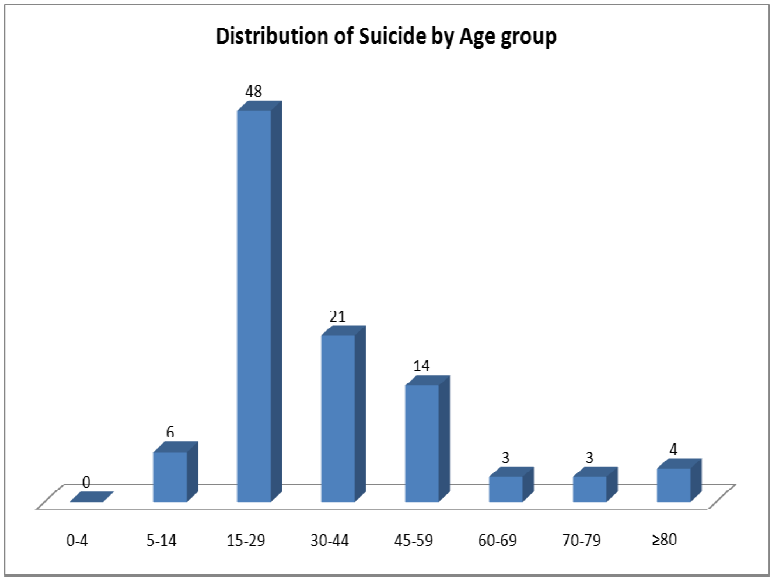

Figure 26 Distribution of suicide by age group

Almost 50% of the Suicide is occurred in the age group 15-29 years. However the case is also prominient from age 30 to 59 as well. The proportion is tremedously low in the younger and older age group. (Figure 25)

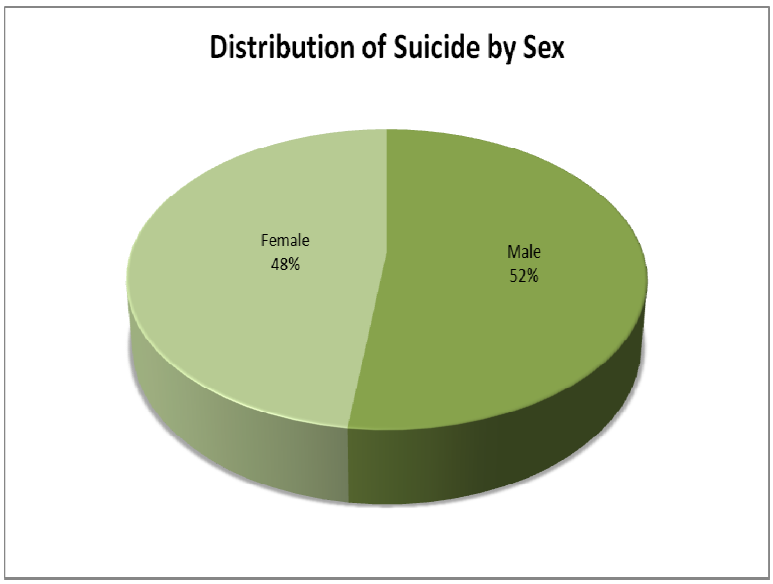

Figure 27 Distribution of suicide by sex

There is almost similar proportion of poisoning cases seen in both male and female population. (Figure 26)

Drowining

Table 13 Distribution of Drowning by age, sex and region

Age group	National			Eastern		Central		Western		Mid-western		Far-western	
(years)	Both sexes	M	F	M	F	M	F	M	F	M	F	M	F
0-4	11	0	11	0	0	0	25	0	0	0	0	0	14
5-14	21	16	5	67	0	50	0	0	33	0	0	14	0
15-29	26	26	0	0	0	25	0	67	0	50	0	0	0
30-44	21	21	0	0	0	0	0	0	0	50	0	29	0
45-59	16	16	0	33	0	0	0	0	0	0	0	29	0
60-69	5	5	0	0	0	0	0	0	0	0	0	14	0
70-79	0	0	0	0	0	0	0	0	0	0	0	0	0
≥80	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	100	84	16	100	0	75	25	67	33	100	0	86	14

Drowning cases are observed high among the males of Far western region among the age above 5 years to 59 years. Nevertheless the cases is seen higher in younger ages. (Table 13)

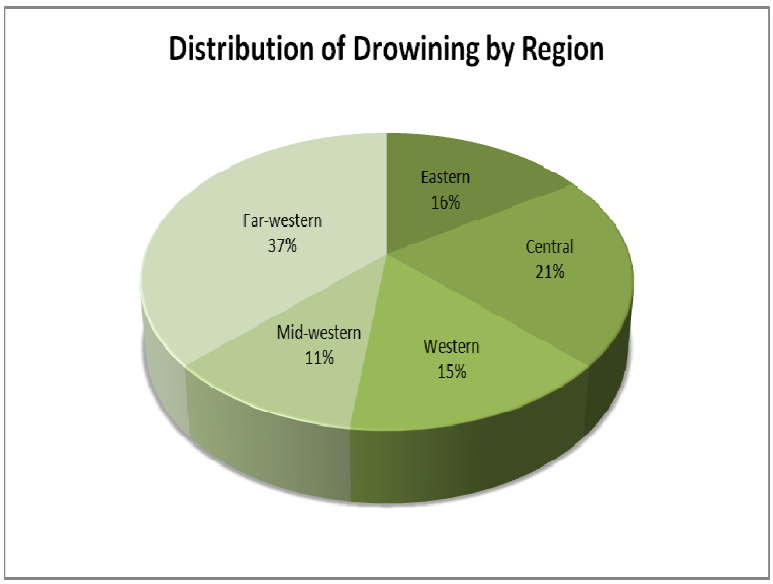

Figure 28 Distribution of drowning by region

The highest number of drowning is seen in Far Western Region. In comparision to this, central region represent the high cases of drowning. Eastern, Western and Mid Western region show the similar proportion of injury in terms of drowning. (Figure 27)

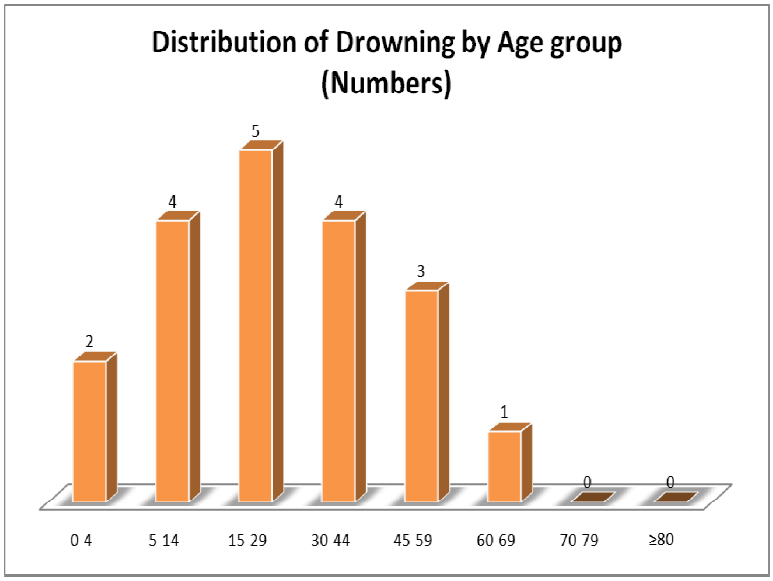

Figure 29 Distribution of drowning by age group

The drowning is appeared to be increasing as the increase in age above four years. The maximum number of 5 drowning is seen in 15 to 29 age group and the number is decreasing as the age increases. (Figure 28)

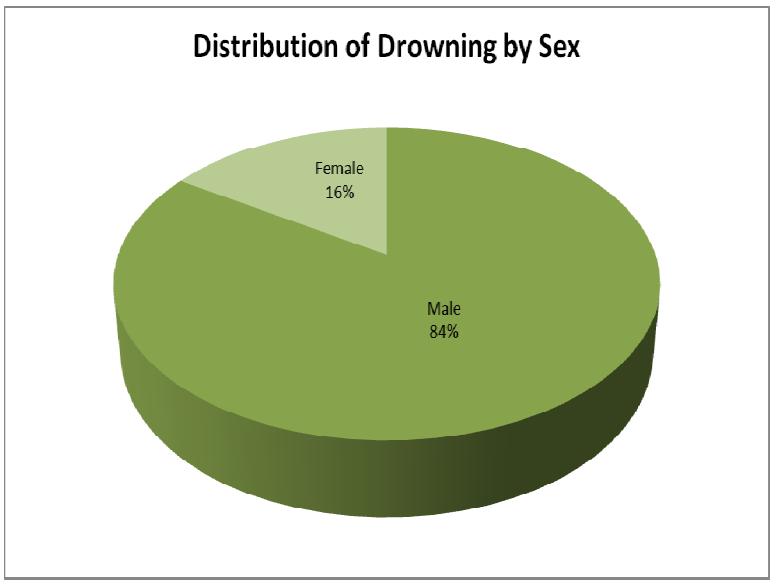

Figure 30 Distribution of drowning by sex

Male has the highest percentage of drowning cases with 84% and female had the proportion of only 16% of drowning. (Figure 29)

DISCUSSION

Injury is a damage or harm caused to the structure or function of the body caused by an outside agent or force, which may be physical or chemical.

This study considered only the tertiary care centers of Nepal where most of the major injury attend for medical and surgical care, which is one of the major limitations. The main purpose of this study is to find out the distribution pattern of Injury in Nepal.

The present study shows that the injury is most common in the age-group between 15-44 years and male are more injured than the female. According to a study conducted by Moshiro C et al in Tanzania, 15-44 years age group is found to be more injured in comparison to others. These provide the evidence that the age is an important group at risk for injuries but its influence varies among specific injury groups.(12)

The similar trend is observed in the study done by Oliver BA et al(13) in Valencia of Spain, Jha N (14) in eastern Nepal, Ahmed M et al (15) in Pakistan and Singh R (16) in Haryana India. These finding suggest that injuries are more common among men, due to involvement in the outside work. However the injury cases are also high in the younger ages from 5-14 age groups followed by 15-44 years age group.

The result shows that the unintentional injuries accounts for 77 percent of total injury related cases which are quite high. One of the study shows that the unintentional injuries account for 66 percent of all injury deaths in 2001. More than 90 percent of unintentional injury deaths occurr in low- and middle-income countries, accounting for around 7 percent of all deaths in those countries. Male account for almost two-thirds of the deaths attributed to unintentional injuries in these countries in 2001. (17)

Our study reveals that Road traffic accident is one of the major contributors of injury hospital admission in the country with 28.75 percent cases all over Nepal, among which 15-44 age group is highly injured and hospitalized. The proportion of male injuries due to RTA seem to be very high as compared to female and the male are three times more likely to be injured than female. A

hospital based retrospective study from Dharan also report similar trend of RTA during one year period. Out of 567 victims of RTA 77.8% are males and 22.2% females and 32.2% of age group 20-39 years is the victim of the incidents. (14)

Studies from all over the world show that there has been a persistent increase in the road traffic accidents over last two decades. A study done in Tanzania by Moshiro C et al (12) road traffic crashes is the most common cause followed by falls and cuts.

A hospital based descriptive study of Road Traffic Accidents cases in South India show that 68% of injury hospital admissions are due to RTA where 603 (83%) are males and 123 (17%) females.(18) This proportion of RTA is higher than the present study from Nepal. The study in South India is conducted among the emergency admitted patient in urban area, which possibly explain the reason for high proportion of RTA.

The number of registered vehicles increased from 76378 in 1989 - 1990 to 528570 in 2005 - 2006. In the last fiscal year, registration of new vehicles increased sharply by 37.6 percent (Department of Transport Management, CBS, Nepal). The reason for the alarming situation of RTAs might be narrow and poor road conditions, excessive increase in the number of vehicles, lack of strict regulation and non compliance of traffic rules, no regular supervision and monitoring of old vehicle condition, lack of awareness to the public regarding traffic rule, driving while drinking etc. The policies seem to be ineffective to control the system and the acting body is dormant.

Fall injury is seen most common in the younger age group 5-14 years which is ranked second position under the heading of unintentional injuries in this study. Worldwide, an estimated 283 000 people die due to falls in 2000. A quarter of all fatal falls occurr in the high-income countries. (2)

But the evidences can be found that fall related injuries is most common in the older people generally as considered in terms of risk factors for falling. Analytical studies conducted in a variety of low and middle income countries have tend to show that risk factors for fall-related injuries, especially hip fractures, are consistent with the risk factors identified in high income countries. In relation to fall-related injuries among young children, lack of supervision of children is considered to be the factor associated to fall. (17)

Fall is the single largest contributor of injuries, next to transport. In a previous hospital based study carried out in the urban area of Ghana by Abatange FA et al(19), it is reported that 27% of the children are admitted to hospital due to fall related injuries which is after transport related admission.

Most fractures are caused by falls, and the most serious type is hip fracture. Falls are the most common cause of nonfatal injuries and of hospital admissions for trauma.

Unintentional injuries include many other injuries related to cut, electric shock, mechanical injuries etc which account for 11.15 percent in the study. These types of injuries are most common in the industries/factories/workplace (occupational injuries).

Poisoning cases are seen excessive in the age group 15-29 years of which more than 50 percent are female in this study. The poisoning related cases includes pesticide poisoning, organo-phosphorous, mushroom, paracetamol, kerosene poisoning, rat poisoning, food poisoning, opium poisoning etc. Paraffin (or kerosene) and other household chemicals, pesticide and various plants or animals, including snakes are the most common agents involved in childhood poisonings.

Globally, an estimated 315,000 people died due to unintentional poisoning in 2000. Around one-third of all poisoning deaths worldwide occur in the European Region (EUR). More than 94% of fatal poisoning occurs in low- and middle-income countries. (2)

Age group 45 to 59 accounts for the highest proportion of injuries from poisoning in low and middle income countries. (17)

A hospital based retrospective study of all acute poisoning cases admitted to the emergency Department of BPKIHS Dharan from January 1994 to December 1997 reports that, (n=184, 0.59%) patients admitted due to the acute poisoning and the incidence is seen much higher in married females (n=62, 74.69%) and in unmarried males (n=59, 60.82%). The commonly used poison is organophosphorus (n=86, 46.73%). Out of the 184 patients, 11 (5.98%) died. (20)

The reason for the increase in the number of poisoning cases include a number of socio-demographic risk factors, including young parents, residential mobility, and limited adult supervision of children. Other causes might be frustration, unsuccessful in study/job, family and social cause including health problems. However many of the poisoning are unintentional as well.

Fire related cause is most common in male than in female and most affected age group is 15- 29 years. However the cases are seen more in children and younger age group. The fire related injuries include superficial burn, scalds from hot water, electric burn, and flame burn.
Globally, fire-related burns are responsible for 238 000 deaths in 2000. More than 95% of fatal fire-related burns occur in low- and middle-income countries.
A hospital based prospective study from BPKIHS Dharan reports 95 cases of burns during one year period of which 40% were males and 60% females.
Flame burn is seen most common followed by scalds and electric burn. (21)

Drowning is observed excessive among male than female and the number of drowning is seen high among 15-29 age group.
In 2000, an estimated 450 000 people drowned worldwide. 97% of all drowning deaths occur in the low- and middle-income countries. Children under 5 years of age have the highest drowning mortality rates worldwide. Globally, more than one-half of children aged between 0–14 years die due to drowning. (2)

Injuries are commonly classified based on "intentionality". Intentional injuries include violence (interpersonal violence comprising physical assault, neglect, abandonment, homicide and other maltreatment), war and self-inflected injuries like suicide attempts.

Result suggests that among the total, 23 percent of the injuries are due to intentional injuries of which 21.83 percent are caused by violence most of which are physical and sexual assaults. Half of the male population of age group 15-29 year is the most exposed population.
An average of 565 young people aged 10 to 29 die every day through interpersonal violence, with males at greater risk, and for each death there are an estimated 20 to 40 youth that require hospital treatment for a violence-related injury across the world (22)

A growing body of research, within the Russian Federation and internationally, suggests that heavy alcohol consumption is closely related to violent behavior. (23)Qualitative research in the US found alcohol to be a central part of gang culture and to be strongly linked to violence. (24)
Sexual violence can profoundly affect the physical, emotional, mental and social well- being of victims. (25)

Self-inflicted injuries and war related injuries count low prevalence in the study with less than one percent. Under self-inflicted injuries, suicide is observed in almost 50 percent and male and female population both are nearly equally attempted suicide. In 2000, an estimated 815,000 people worldwide committed suicide. About 86% of which occur in the low- and middle income countries. More than 50% of the global mortality due to suicide occurs among young persons aged between 15–44 years. (2)

In a cohort study, it is found that about 1994 suicide deaths are among aged 18-64 with death rate of 59%. The age adjusted odds ratios of deaths by suicide among 25 to 64 years are unemployed compared with employed which are 2.46 (1.10-5.49) for women and 2.67 (1.87-3.70) for men. Strong age-only adjusted associations of suicide death with the socioeconomic factors of education and household income are observed. Sensitivity analysis suggests that confounding by mental illness might explain about half, but not all of the association between unemployment and suicide. (26)

CONCLUSION

Injury is one of the major public health problems in Nepal which till now is a neglected problem from policy as well as program perspective. The prevalence of injury is 15 percent at national level which is only the tip of iceberg because the major injuries that are beyond the scope of tertiary care centers were not included in this study.

The study is conducted with the view to assess the magnitude of injury which can further contribute to quantify the burden of morbidity caused by injury related events in Nepal.
As the study suggests that male are almost 3 times more likely to be injured than the female. Hence male population is three times more likely to be at risk of injuries than female. The age-group of 15-29 years observed to have higher proportion of injuries followed by age groups 30-44 and 5-14 years with 22 and 17 percent respectively.

The injury related events are first classified as the ICD code of WHO namely intentional and unintentional injuries. Male population shows the higher proportion of injuries in terms of both intentional and unintentional injuries. In the categories between unintentional and intentional injuries, unintentional injuries have higher proportion of injuries with 77 percent; out of which road traffic accidents and falls related injuries account for 28.7 percent and 26.5 percent respectively. Central region show the highest proportion of injuries among all the regions with 45.3 percent followed by eastern region with 22.5 percent. But the Western region has the lowest proportion of injuries.

Nearly three fourth of the male (74%) are injured due to the RTA related events where the 15-29 age group is highly victimized. It is found that most of the RTA occurred on Friday.
Central region represents the highest percentage (35%) of fall related injuries as compared to other regions where the fall injuries is seen most commonly in 5-14 age-group (32%).
Interpersonal violence is ranked in third position among all the injuries with 21.8 percent followed by other unintentional injuries, poisoning and fires with 11.1, 8.6, and 2.3 percent respectively. The distributions of these all injuries are seen higher in Central and Eastern region. Nearly 50 percent of population of age-group 15-29 years are generally engaged in interpersonal violence of

which male has higher proportion with 74% percent. More than 50 percent of the population who are unintentionally injured by poisoning is female and most prevalent age-group is 15-29 years with 53.28 percent.

Fire related events are seen high (35.91 %) among the age-group 15-29 years and male population are reported to have higher fire related injuries than female.
Fifty percent of the suicide cases are seen high in Far-Western region and 52 percent are male of age-group 15-29 years.

Drowning cases showed low proportion of injury among all the injuries in Nepal. The cases are seen high in the Far-Western region and the age-group 15-29 years are among highly affected group.

RECOMMENDATION

Recording and Reporting system

Most of the tertiary care centers keep the records in file format provided by government as a hard copy, whereas few of the centers keep records in software format. First of all, it was difficult to collect the recorded data due to poor recording system in the hospitals. The most important part was that the diagnosis was not clear in most of the cases. We recommend the government to make a uniform recording format and make guidelines for clearly recording diagnosis for consistency. However standard software is needed to record the data in electronic version and a well established database system should be maintained in all the tertiary level health institutions for effective recording and reporting system.

Ministry of Health

Policy was already drafted by Ministry of Health on Injury and Trauma in Nepal with evidence from two research findings, which further needs to be reviewed. This study recommends reviewing the draft policy and implementing it effectively. Ministry should initiate the formulation of Injury surveillance guidelines with the collaboration with an international group of experts which can help for designing and conducting the national level survey on Injuries and Violence to find the exact magnitude of injury in Nepal.

Traffic Police Department

The number of road traffic accidents was seen higher in Nepal especially during the weekend. So we also recommend the department of Traffic Police to be alert during the night time and weekend, when the number of accidents was seen high in these times. Traffic police are the key person to monitor, control and manage the traffic situation in the country. So focus should be given to the awareness programs regarding traffic rules, traffic signals and about the use of safety measures. Haphazard increase in the number vehicles should be controlled and the traffic management should be monitored regularly especially in the weekends where the RTAs were seen

higher. Policy and guidelines need to be formulated and implemented by the responsible sectors for the management and monitoring of roads conditions and motor vehicles in Nepal as the condition of road is directly responsible for the occurrence of accident.

There should be strict police security mostly in the night time and during especial occasions as the interpersonal violence is seen higher in these times.

Workplace and Home

People who work in the industries and factories should be provided with safety measures to reduce the magnitude of accidents. Occupational hazards can be reduced by the appropriate use of personal protective equipments (PPE).

In the home setting, most of the childhood injuries could be prevented by reducing the possible risk factors like storing weapon, medicines, poisons and inflammatory substances out of reach of children.

Most of the injuries in the children happen at the time of playing so they should be supervise at such moments. Hand rails should be used to prevent from fall injuries

Most of the injuries like suicide, poisoning, drowning, fall, fires etc occur due to the lack of care/support and unawareness of the problem so children and adults should be given appropriate care and support.

Smoke detector and fire extinguisher should be used in the household, hotels, schools, colleges, health centers and offices to reduce the extent of fire related injuries.

ANNEX

I. References

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II. Tool used for the Estimation of Burden of Injury

Epidemiological Study on Injury in Selected Hospital of Nepal

Nepal Health Research Council

Sn.	Date	Ethnicity	Age	Sex	Address	Diagnosis/ Cause of injury