

ROAD ACCIDENT AND SAFETY STUDY IN SYLHET REGION OF BANGLADESH

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Abstract

Roads, highways and streets are fundamental infrastructure facilities to provide the transportation for passenger travel and goods movement from one place to another in Sylhet, north-eastern division of Bangladesh with rapid growth of road vehicle, being comparatively developed economic tourist prone area faces severe road traffic accident. Such severe road accidents cause harsh safety hazards on the roads of Sylhet area. This research work presents an overview of the road traffic accident and degraded road safety situation in Sylhet zone which in particular, discusses the key road accident problem characteristics identifying the hazardous roads and spots, most responsible vehicles and related components, conditions of drivers and pedestrians, most victims of accident, effects of accident on society, safety priorities and options available in Sylhet. In this regard, a comprehensive questionnaire survey was conducted on the concerned groups of transportation and detailed accident data was collected from a popular local newspaper. Analysis of the study reveals that Dhaka-Sylhet highway is the most hazardous in road basis and Sylhet Sador thana is the most vulnerable in thana basis in Sylhet region.

Keywords: Traffic, Casualty, Fatality, Severity, Collision, Vehicle, Pedestrian.

1. Introduction

Transport is an extremely important part of the daily life especially in the developing countries like Bangladesh where some 12% of GDP and 20% of the annual development budget is spent on transport, and 9.4% of the national employment is in the transport industry [1]. According to the *World Report on Road Traffic Injury Prevention* (2004) [2], worldwide an estimated 1.2 million people are killed in road accidents each year and as many as 50 million are

injured. Projections indicate that these figures will increase by about 65 percent over the next 20 years unless there is new commitment to prevention. Furthermore, road traffic deaths are predicted to increase by 83 percent in low income and middle income countries and to decrease by 27 percent in high income countries. Of the total 1.2 million deaths, by far the majority – over 80 percent of road accident fatalities occur in the so called developing and emerging countries, even though these countries account only about one-third of the total motor vehicle fleet. Accident rates in developing countries are often 10 to 70 times higher than in developed countries. Developing countries suffer staggering annual loss exceeding US\$ 100 billion for road accidents, which is nearly equivalent to the double of all developing assistance [3].

In fact, the road safety problem in developing countries may be much worse than the official statistics suggest because of widespread underreporting of road accident deaths and an over estimate of licensed vehicles resulting from scraped vehicles tending not to be removed from the vehicle register [4]. Nantulya (2002) have reported that poor people in developing countries have the highest burden of injuries and fatalities due to road traffic crashes. In 1998, more than 85 percent of deaths and 90 percent of disability adjusted life years lost worldwide because of road traffic accidents occurred in developing countries. In the same year fatality rates for children aged 0-4 and 5-14 years were five to seven times greater in developing countries than in higher income countries. Developing countries loss the most economically active and productive years from road accident victim, heavily tilted towards 5-44 years age groups [5]. Hoque gave a more detailed exposition of road safety in developing countries [6].

Traffic and transportation in urban centers of Bangladesh has not been got proper attentions to handle the increasing transport problems. Traffic, road expanded dynamically without any planning and control due to the rapid socio-economic changes and population growth rate also high compared to the other area of Bangladesh. As such, deteriorated transport problems of Sylhet region have not been commensurate with the increasing demands for its usage. Most of the divisional head office of corporate offices, the higher educational facilities, two public universities, one public medical college, one public engineering college, three private universities, four private medical colleges, private hospitals and clinics, government colleges and schools, so many business and shopping complexes, the holly shrines of Hazrat Shah Jalal (R.) and Hazrat Shah Paran (R.), and even one International Airport of the country, are located in or around the Sylhet city and also a traveling place in Bangladesh. So many people and vehicle come here from different place of Bangladesh and increase the possibility of accident occurrence.

To reduce accident occurrences, it is required to implement traffic engineering and transport planning measures including necessary records on the basis of scientific studies. From this point of view, an study on Road Accident in Sylhet District has been conducted by Civil and Environmental Engineering Department of Shahjalal University of Science and Technology to study the basic causes of road accident, to evaluate the types of accident, gender of causality, time, season of the accident in the study area, to identify the hazardous road in the study area, to assess the socio-economic impact of road accident in Sylhet zone.

2. Methodology

2.1. Selection of study area

National, regional and district highways in Sylhet zone especially Sylhet district connected with Sylhet city (shown in Table 1 and Fig. 1) are studied.

Table 1. Road Network under Study.

Road Type	Road Name	Length (km)
National highway (N2)	Sylhet - Dhaka (up to Sherpur)	34
National highway (N2)	Sylhet - Tamabil - Jaflong	60
National highway (N2)	Sylhet - Fenchugonj (up to Fenchugonj)	25
Regional Highway	Sylhet - Golapganj – Bhadeshwar- Beani Bazar - Zakiganj	132
Regional highway	Sylhet - Sunamganj regional highway (upto Lama kazi)	22
Zila road	Sylhet - Companiganj - Bholaganj	53

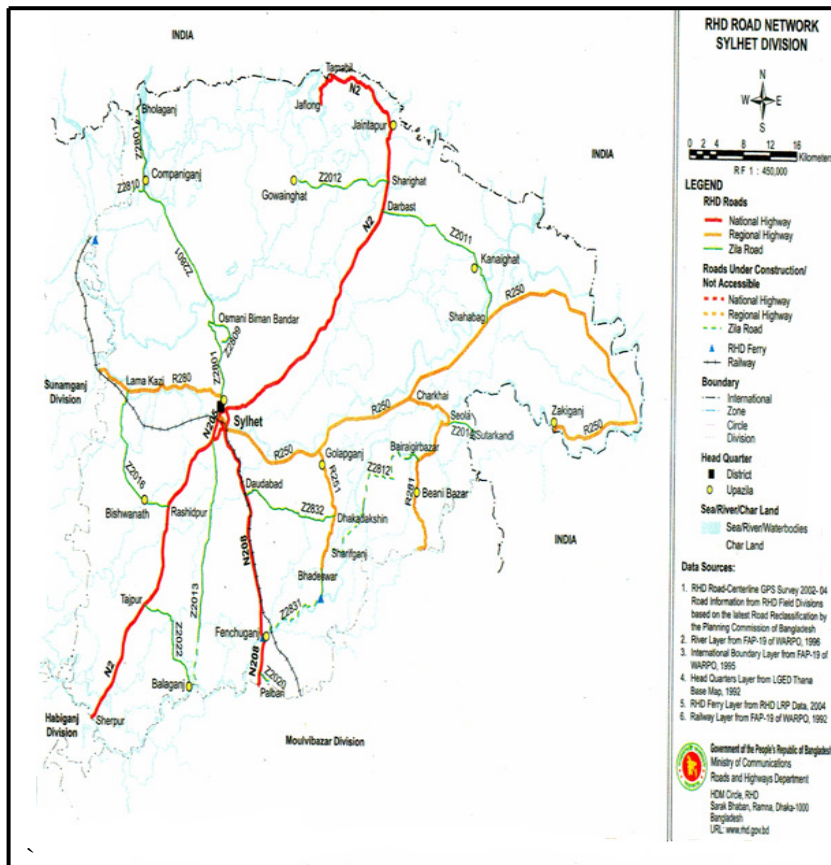


Fig. 1. Map of Study Area.
(Source: Roads & Highway Department, Sylhet, Bangladesh)

2.2. Questionnaire survey

Questionnaire survey was based on the cordial talking and taking interview of the drivers, pedestrians, traffic police. For questionnaire survey the participation is ensured from each and every level of pedestrian, drivers, traffic polices, typical accident victims and all types of vehicles. 100 drivers with different age groups were interviewed and pedestrians were also 100 but the traffic police were 20 due to the fact that they are relatively small in number in compare to driver or pedestrians.

2.3. Secondary data collection

The accident information was collected from the print media for the last three years from 2005-2007 as one of the core database for this study and analyzed subsequently. In this regard, accident data was collected from a popular and reliable divisional newspaper the daily “**Sylheter Dak**” for the following reasons:

- Newspaper is the mirror of society, locality and the whole geographic area.
- Spot death accident and simple and collision accident patient never go to the hospital.
- Inadequate data about road accident from police station.

Some data were also collected from the civil surgeon office.

3. Results and Data Analysis

In depth scenario are depicted by the presentation of the questionnaire survey results that lead to the analysis of the overall study for driver, passenger, pedestrian, and major accident aspects, main causes of accidents, accident causalities in three consecutive years in 2005, 2006 & 2007, hazardous roads and Thana of Sylhet district, comparison of Sylhet district road accident with Sylhet division, socio-economic aspects.

3.1. Age range of driver

From Fig 2, it is evident that a large number of the drivers of about 53% as a whole are in the age of less than or equal to 30 years, that means majority of the drivers are young with up-rising stamina and inspiration and obviously they drive the traffics vigorously without thinking the up-coming accident risks vivid in mind. As a result, most of the time young courageous drivers fall in accident.

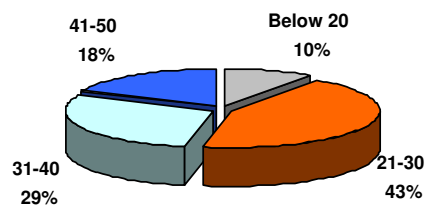


Fig. 2. Age Range of Drivers.

3.2. Training of the driver

According to Fig. 3, maximum 65% driver have practical knowledge, got their driving training from so called “ostaad”, i.e., guru or master which definitely

indicate that drivers have no institutional formal training for driving rather derive with acquiring the experience and skill only by following their ostaad (Driver). As a result, they are not well acquainted with formal traffic rules and regulations needed for driving in the roads.

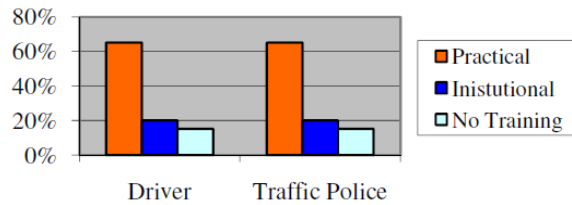


Fig. 3. Training of the Driver.

3.3. Duration of driving of a driver in a day

From Fig. 4, it is evident that about 52% drivers drive in a day less than 8 hours, about 12% drivers drive in a day more than 12 hours. Due to long time of driving they feel fatigue and frequently involve in accident from exhaust in driving. The drivers always try to drive maximum trip per day for profit maximization; as a result drivers run with high speed and face the road accidents.

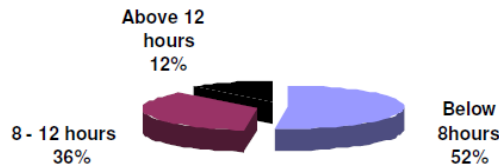


Fig. 4. Duration of Driving in a Day.

3.4. Accident causalities in three consecutive years

For different types of accident cases such as fatality, severity, simple and collision and the corresponding number of accidents are investigated in Sylhet district under the study as shown in Table 2. Fatality refers to the death of the victim whereas severity means that victim was seriously injured and was hospitalized. Again simple accident signifies the person experienced minor injury without any need of medical admission and the collision implies no human injury but some damage of vehicle. From the study, it is shown that simple accident is the prime cases of total accident. Fatality contribute 15.5% in 2005, 16.9% in 2006 and 14.49% in 2007, i.e., 15 person had died out of 100 accidental victims in 2005 and this rate is being increased by the following year. The rate of accident is increasing in proportional to the increase of population and vehicle.

Table 2. Type of Causalities in Sylhet District.

Year	Fatality	Severity	Simple	Collision	Total
2005	67	110	164	121	462
2006	72	115	125	114	426
2007	91	177	191	169	628

3.5. Major causes of accidents

Major causes of accidents are: head on of vehicle; press the pedestrian during cross the road or from behind; losses of the control of the vehicle due to break down of accelerator and tire strongly hit down by the first moving vehicle, suddenly stopped the vehicle; to overtake the another vehicle; to save the stray animal on the road; to give side the vehicle of opposite direction; overloaded the vehicle by taking goods or men in or on the vehicle; the vehicle of high speed press the low speed vehicle from behind; collision with passenger of standing vehicle during gets on or out by moving vehicle; during riding on the roof of vehicle face accident by hit by branch of tree or decorative gate, during turning of vehicle, suddenly stopped the vehicle; competitions; problem of mental or physical disable man when move along or across the road; backward movement of standing vehicle; rail line crossing.

Other causes are; practicing how to drive vehicle causes accident; to save the pedestrian driver fall in accident; press the repairman of vehicle who repair the impair or defective vehicle on the road by moving vehicle; fallen from the backseat of motorcycle; vehicle hit the pedestrians into narrow bridge; collision of vehicle with island or divider; up and down of vehicle along the vertical slope (Ferri ghat); elevation difference between carriageway and shoulder; inadequate shoulder; erosion of pavement or creating hole into the pavement; sleeping of driver for over working or illness or fatigue; taking turn with high speed; loosen of shoulder soil by heavy loaded vehicle (truck) and overturned; talking with the passengers; driving in the rough weather (rain or fog); after doing first accident, trying to escape and making second accident; rough surface in the fueling station; break down of bridge by extra loading heavy vehicle; and drying of straw on the road, etc.

Earlier studies of Hoque in 1997 of road accidents in Dhaka revealed that heavy vehicles such as trucks and buses including minibuses are major contributors to road accidents. This group of vehicles is particularly overinvolved in pedestrian accidents accounting for about 79 percent (trucks 37%, buses 20% and minibuses 22%) [7]. A graphical statistics of different type of vehicle press the pedestrians are presented in Fig. 5 which is also reflecting almost the same situation here in Sylhet as well.

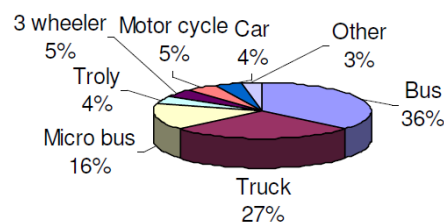


Fig. 5. Pedestrian Accident Caused by Different Vehicles.

3.6. Time of accident

As per Fig. 6, most of accident occurs at day time. Most of the accidents occur at peak hour while at day or night. During day time 10-2 pm most of the vehicle move from here to there and they are susceptible to accident. During night time

after peak hour 6-10 pm, pedestrians, animal, private vehicle and local vehicle are not found on road when the possibility of occurrence of accident is reduced that proves that there is a close relation between the number of vehicle in the road and accident occurrence.

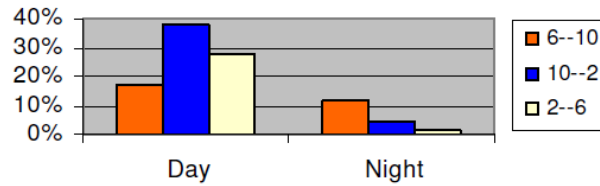


Fig. 6. Time of Accident.

3.7. Involvement of accident in gender approach

Accident involvement for male about 29% male are fallen in accident in the age range of 25-35, that is most male accident victims are young as shown in Fig. 7. For involvement of accident by gender approach about 37% female are fallen in accident in the age range of 35-45, 31% are fallen in accident in the age range of above 55 and maximum accident causes the press down by the vehicle in accordance with Fig. 8. From Fig. 9, it is obvious that about 62.50% children are below 10 year, 37.50% are 10-15 year whose are involved in accident they are primary level school student and do not know the traffic rules and regulation and became victim most of the time.

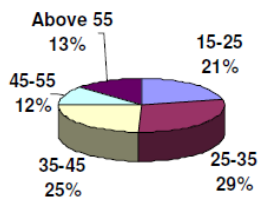


Fig. 7. Age Range for Male.

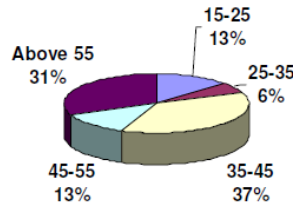


Fig. 8. Age Range for Female.

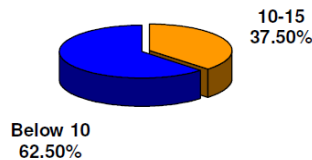


Fig. 9. Child Involvement in Accidents.

3.8. Accident by type

Analysis of accident type shown on Fig. 10, showed 'Pedestrian Related' as the dominant accident type both in urban and rural areas, about 26.29 percent accident are account for this type involvement in fatal accidents, followed by Run-off-Road accident (17.95%), Rear end (15.95%) and Head on (13.95%). That means pedestrian are the most victims of road accident, which happen at the time of unaware crossing of the road. A **Run-off-Road** collision is a type of single-vehicle **accident** that occurs when a vehicle leaves the roadway. Whereas Rear end means

collision of the front of fast moving vehicle with the rear end of the other relatively slow moving vehicle and the Head on means head to head collision.

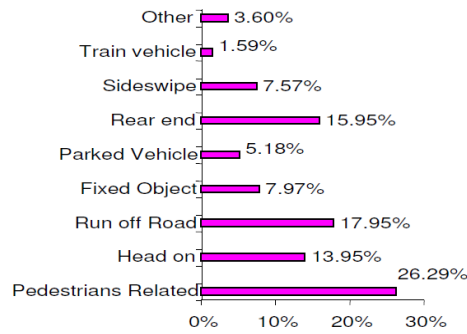


Fig. 10. Summary by Type of Accident.

3.9. Vehicle involvement in accident

Table 3 shows that most of accident occurred by bus which contribute 37.86% of total accident, truck contribute 27.72%, car contribute 16.52%, 3-wheeler contribute 13.49%, motor cycle contribute 4.56% of all accident. That is buses are most responsible for accident occurrence.

Table 3. Type of Vehicle Involved in Accident of any Type.

Vehicle Type	Year		% of contribution of total accidents		% of contribution of total accidents		Avg. % of contribution of total accidents
	2005	2006	2006	2007	2007	2007	
Bus/coaster	22	35.48%	24	36.92%	42	41.17%	37.86%
Truck	15	24.19%	21	32.30%	27	26.47%	27.72%
Car/ Microbus	10	16.12%	9	13.85%	20	19.6%	16.52%
3 wheeler	12	19.35%	8	12.3%	9	8.82%	13.94%
Motor cycle	3	4.83%	3	4.62%	4	3.92%	4.56%
Rickshaw	0						
Total	62		65		102		

3.10. Season of accident

From Fig. 11, it has been observed that most of accidents occur during rainy season followed by the winter season. In rainy season about 25% accident occur in 2005, 28% in 2006 and 40% in 2007. In the rainy season, majority of the roads become slippery and tending to muddy for non-paved roads; drivers lose the control of the traffic when the weather is stormy and the sky is overcast with clouds.

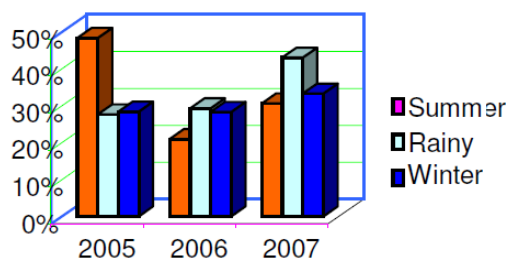


Fig. 11. Season of Accident.

3.11. Identification of Hazardous Road in Sylhet District

To identify the hazardous road “Fatality index” rule has used. The Fatality Index [8] is usually defined as the percentage of fatalities out of the total number of road accident casualties; it is expressed in the following equation:

$$\text{Fatality Index} = \frac{\text{Fatality}}{\text{Total Casualties}}$$

By using fatality index Dhaka-Sylhet (Sherpur) highway is the most vulnerable among the road in Sylhet district with an index of 34.33% (Table 4). The number of occurrence of accident is also high. It is increasing day by day after implementation of new road construction. Most accidents occur in public gathering places. From analysis Lala Bazar is most hazardous places in Dhaka-Sylhet highway in 2005, 2006 and Sherpur is most vulnerable in 2007 as shown in Table 4. Lala Bazar is a place on Sylhet-Sherpur highway 11 km away from Sylhet with a latitude 24°49'52" N and a longitude of 91°49'01" E. This is a very crowded place due to the Bazaar and people very often need to cross the road. No foot over bridge or underpass is there which ultimately results the accident.

Table 4. Fatality Cases by Year.

Vehicle Type	Year	2005		2006		2007	
		Fatality	Fatality Index	Fatality	Fatality Index	Fatality	Fatality Index
Sylhet – Dhaka (up to Sherpur)		23	34.33%	26	36.11%	41	45.05%
Sylhet - Tamabil – Jaflong		13	19.40%	9	12.50%	6	6.59%
Sylhet - Fenchugonj (up to Fenchugonj)		11	16.42%	11	15.28%	11	12.09%
Sylhet - Golapganj – Bhadeshwar-BeaniBazar		5	7.46%	8	11.11%	12	13.19%
Sylhet - Sunamganj regional highway (upto Lama kazi)		11	16.42%	12	16.67%	13	14.29%
Sylhet-Companiganj – Bholaganj		4	5.97%	6	8.33%	8	8.79%
Total		67		72		91	

3.12. Identification of hazardous location and elements (Accident rate method)

Accident rate method combines the accident frequency with vehicle exposure (i.e., traffic volume) and is expressed as “accident per million vehicles for intersection” (and other spot location) or “accident per million vehicle of travel” for highway section [9]. The locations are then ranked in decreasing order by accident rate.

$$R_{se} = \frac{A(1000000)}{365 TVL} = \frac{47(1000000)}{365 \times 1 \times 16088 \times 21.25} = 0.38$$

where: R_{se} is the accident rate at section (accident/million vehicle)
 T is the period of study
 V is the annual average daily traffic (AADT) during study period; for intersections is the sum of entering volumes of all legs
 L is the length of the section (in miles)

For Road Section :(Sylhet-Sherpur):

$A= 47$, $T=1$ year, $V= 16088$, $L= 34$ km = 21.25 mile, then

$$R_{se} = \frac{47 (1000000)}{365 \times 1 \times 16088 \times 21.25} = 0.38$$

This value indicates that if one million vehicles travel in the road section (Sylhet-Sherpur) the possibility of number of accident occurrence may 0.38.

3.13. Identification of Hazardous Thana in Sylhet District

Figure 12 shows that among the different Thana in Sylhet district Sylhet Sador is the most vulnerable. It contribute 40% of all accidental occurrences, i.e., 90 accident occurred out of total 229 accident in the Sylhet zone during study time as shown in Table 5. For fine climatic condition, most of the divisional head office, better quality of life, and better job opportunities and for other educational facilities migration is towards Sylhet City and increasing population. Also the city's urbanization rate is higher. From analysis Dakhin surma is most vulnerable places in Sylhet because various roads are passed through this place and roads are curved and narrow. Day by day number of roads, vehicles and pedestrians is higher which increases the risk of accident occurrence

Table 5. Occurrence of Number of Accidents in Thana Basis.

Thana \ Year	2005	2006	2007	2008
Sylhet Sador	23	31	36	90
Balagonj	12	6	32	50
Beanibazar	1	1	3	5
Fenchugonj	5	9	7	21
Companigonj	5	3	3	11
Golapgonj	1	4	1	6
Zakigonj	2	2	8	12
Jaintapur	6	2	2	10
Goainghat	2	1	3	6
Bishawnath	4	5	3	12
Kanaighat	1	1	4	6
Total number of accidents	62	65	102	229

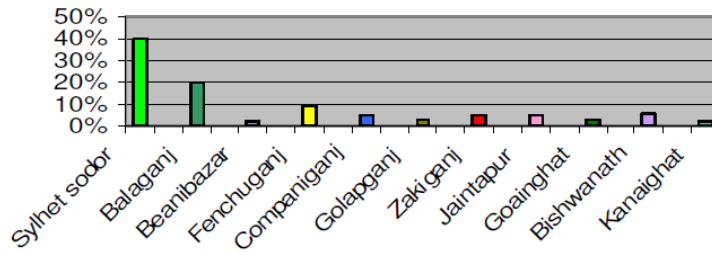


Fig. 12. Occurrence of Accidents by Thana (2005-07).

4. Socio – Economic Impact

The most devastating impact of road accident is the socio-economic. The vehicle owner loses the vehicle, public property is damaged. The cost of treatment and medicine, and the paralyzed man become burden to his family permanently; some family loses their earning members who were driver or helper. In a word, there is no positive impact of road accident, it badly affects on the community, society, country as well as on the world.

Effect on society: (Hospitalized data of Sylhet Civil Surgeon Office)

Both the hospitalized death and accidental death are not normal death. They mean social disorder. Hospitalized death contributes diseases death, seriously injured death, and suicide case, etc. Accidental deaths contribute only the road accidental death (on spot). It contributes to 30.65% in 2005, 19.74% in 2006, and 21.51% in 2007 of total death as shown in Table 6. This imply that road accident devastatingly effect the society. Here the severity of other accident is not considered. The injured face acute problems in their normal lives as they lost their priceless organ. They cannot contribute to the family; rather become burden to the community. Here only the spot death accident is considered because some grievous patient get admitted to the hospital and lost their lives there.

Table 6. Abnormal Death.

Year	Hospitalized death	Accidental death excluding hospitalized	Total death	Percent of accidental death
2005	129	57	186	30.65
2006	187	46	233	19.74
2007	197	54	251	21.51

5. Conclusions and Recommendations

Pedestrians are the most victims of road accident because of the lacking of awareness; when they move on road they are not at all conscious about accident and the cause of accident and the right of vehicle driver to use the road. Vehicle driver mostly exceed the capability of driving and vehicle. Three wheelers (with four stroke engine), lighter vehicle, compete with the heavy vehicles which are overloaded and have high momentum. When critical situation arise accident occur

between these vehicles. Traffic police and highway police have limitation in number. Only eight highway police perform their duty from Sherpur (Dhaka – Sylhet highway) to Sylhet to Jaflong (Sylhet - Tamabil - Jaflong highway) national highway by one car. Moreover highway is passed through the cultivable land and is made by cutting the land beside the road. Consequently, domestic animals several times come on the road and create problem for driving. Even when unfortunately accident occurs, vehicle fall into the canal beside road which is created for cutting soil and thus increase severity.

Road accident and its severity can be prevented and minimized if concerned professionals understand the causes of accident and being conscious about that. Traditionally this understanding can be achieved through systematic investigation and scientific research on road traffic accident that result from failure in the interaction of human, the vehicle and the environment - the three elements that produce the road traffic system. In this regard the following recommendation would be meaningful to reduce the accident intensity on the road and to ensure the road safety.

- Community clinic can be installed beside road to reduce the severity of accident.
- Number of Highway police, traffic police and their facilities should be increased.
- Mobile court can be installed at each and every road to check the rules and regulations. It should be repeated with interval.
- Head light of vehicle can be marked by black color.
- A road accident chapter can be introduced in primarily level to give initial knowledge about accident to the children.
- Driver should be checked before starting the journey.
- Driver should not drive the vehicle during rough weather.
- Raising public awareness about accidents and road safety through motivational program as well as mass media specially print and electronic media
- Organizing rally, special days and weeks on accident and road safety in city.
- Training the drivers, supervisors and helpers about accident information, road safety, traffic rules, marking, traffic signs, etc.
- More and better roads thus, safer roads with better traction, visibility, maintenance.
- Sufficient footpaths and footway should be constructed to facilitate free movements of pedestrians on major roads.
- Floating shops, mobile hawkers, artisans and temporary traders should be removed from roads and roadsides.
- The capacity of the existing road system would be enhanced from both vehicular and pedestrian points of view by taking immediate steps.
- Adequate numbers of speed breakers, Zebra crossings, traffic signals, light posts with street lights are to be constructed. Also provision of traffic markings and traffic signals should be introduced.
- Enforcement of law strictly as well as punishment to corrupted traffic police because they give illegal license by paying money
- The construction of more and better highways to accommodate the increasing numbers of drivers every year.

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