

Identification of Factors in Road Accidents of Pabna-Sirajgonj Highway

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ABSTRACT

As roads and highways are the key medium of transportation for Bangladesh in this era, road accident has become an overarching issue. Rapid growths of vehicle and poor road environment condition have caused harsh safety hazards on the Pabna-Sirajgonj highway in recent years. In this study, current status of the road accidents and probable causes of the accidents in Pabna-Sirajgonj road section is identified. In Pabna-Sirajgonj highway, 57 accidents occurred on this highway section in a time period of 4 years from January 2014 to December 2017. As a result, 102 lives were lost and another 140 were injured. In this study, current status of the road accidents and probable causes of these accidents in Pabna-Sirajgonj road section is identified. Data collection, analysis and interpretation on road accidents were carried out for this road segment. The geometric parameters at accident-prone locations were compared with the standard parameters by using topographic survey. The results from the study unfold the probable reasons road accidents of selected accident-prone locations of Pabna-Sirajgonj road section, which may reduce the accident rates as well as save our lives and properties.

Keywords— Transportation, Accidents, Road Environment, Geometric Parameters, Topographic Survey

I. INTRODUCTION

Accident is a tragic problem in transportation system as it causes losses of properties, personal injury, death and several casualties (Sharma and Justo, 2011). The nuisance of road accident is a natural phenomenon and inevitable in daily life, as vehicle is controlled by human. The World Health Organization (WHO) has identified road accident as the 8th leading cause of death globally and according to their prediction it will climb up to 3rd position by 2020. Approximately 1.35 million people are dying each year and nearly 50 million are seriously injured (WHO, 2018). 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 (Hoque et al., 2001). It is predicted that a good number of persons killed on roads will rise by at least 80% over the next 20 years in

developing countries whereas it is expected to decrease by 30% in high-income countries (Mahmud et al., 2014).

As a developing country road traffic accident, injuries and fatalities are also major concerns for Bangladesh. Bangladesh is one of the most densely populated countries (Mahmud et al., 2011). Although once upon a time water way was the main transport mode in Bangladesh, now-a-days road is main mode of communications. As a result accidents are growing at alarming rate and the safety situation is very severe at present. Road crashes are the 4th leading cause of death of children aged between 5 and 14, and 67% victims are within the 15-49 age group in Bangladesh. The economic and human cost of the untimely deaths and injuries are immense (WB, 2019). Approximately 4500 road accidents occur in Bangladesh as reported by the police in each year. The rate of fatality of road accidents in Bangladesh has a very high rate with official statistics indicating more than 60 deaths per 10,000 motor vehicles. Everyday around eight persons die in road accidents (Maniruzzaman and Raktim, 2005). But according to World Bank, this annual fatality rate is even higher, 85.6 fatalities per 10,000 vehicles (Afsari and Rahman, 2018). Almost 2% of Gross Domestic Product (GDP) is lost in road traffic accidents in our country which itself demonstrates the severity both in terms of deaths and injuries as well as in monetary terms (Tahera et al., 2007), which is very fatal for the economy of a developing country like Bangladesh. Hence, the roads in Bangladesh have become deadly.

Road safety in the Pabna districts emerges as a serious issue as the total number of accident as well as other resulting casualties is increasing steadily over the years. This study focuses mainly the Pabna-Sirajgonj highway, which consists of portion of both N5 and N6 highway of Bangladesh. In the Pabna-Sirajgonj highway, 8 accidents were found in the year of 2014 which claimed 10 fatalities and 16 injuries, which has been increased to 22 accidents claiming 41 fatalities and 62 injuries in the year of 2017. This indicates that after only 4 years, the casualty rate increased almost 4 times. Among these pedestrian related accidents is the major concern, covering up to 53% of all. Surprisingly there is no significant research done on this road section. Considering the magnitude of the problem and its socio-economic impact, detail analysis and research are deemed necessary for this road section.

II. DATA COLLECTION

Pabna-Sirajganj road section of length 97.5 km is consists of national highway, N6 (Pabna-Kashinathpur) and N5 (Kashinathpur-Hatikumrul). Data on road accidents of Pabna-Sirajganj highway were collected from five Police Stations (Pabna Sadar Police Station,

Ataikula Police Station, Madhpur Highway Police Station, Sathiya Police Station, Hatikumrul Highway Police Station) for 2014-2017 in the form of First Information Record (FIR). At the second stage traffic volume data for this highway is collected. For the last stage road inventory survey was carried out at the accident prone locations.

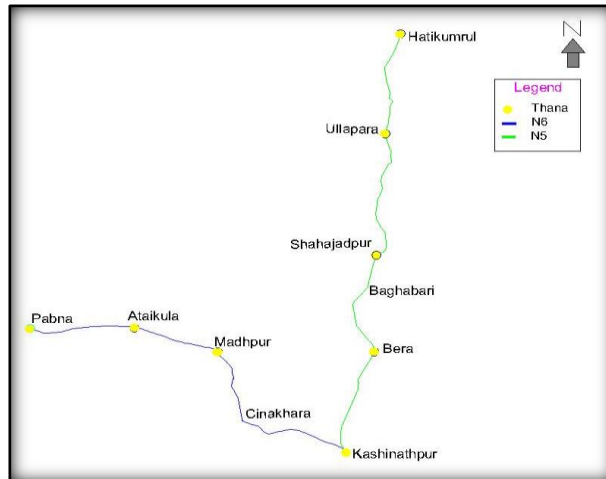


Figure 1: Layout of the Highway Section under Study

III. RESULTS AND DISCUSSIONS

The collected road traffic accident data of Pabna-Sirajganj road section is analyzed for the type of vehicles involved, collision type, number of accidents and

fatalities on different roads, time of accidents and the roads subjected to a higher frequency of casualties. The current situation for the road section under study can be surmised from the table 1 below;

Table 1: Road Accident Data of Pabna-Sirajganj Road Section

S N o	Thana	Fatality											
		2014			2015			2016			2017		
		Accident Count	D	I	Accident Count	D	I	Accident Count	D	I	Accident Count	D	I
1	Pabna sadar	-	-	-	1	1	-	-	-	-	-	-	-
2	Ataikula	5	7	4	4	4	9	6	6	-	5	7	15
3	Sujanagar	-	-	-	1	4	12	-	-	-	2	6	14
4	Santhia	-	-	-	-	-	-	-	-	-	1	5	15
5	Aminpur	-	-	-	1	2	2	1	6	-	1	3	1
6	Shahjadpur	2	2	3	2	2	3	4	4	8	5	9	7
7	Ullapara	-	-	-	7	13	9	3	3	1	6	6	4
Total		7	9	7	16	26	35	14	19	9	20	36	56

❖ D = Death and I = Injured

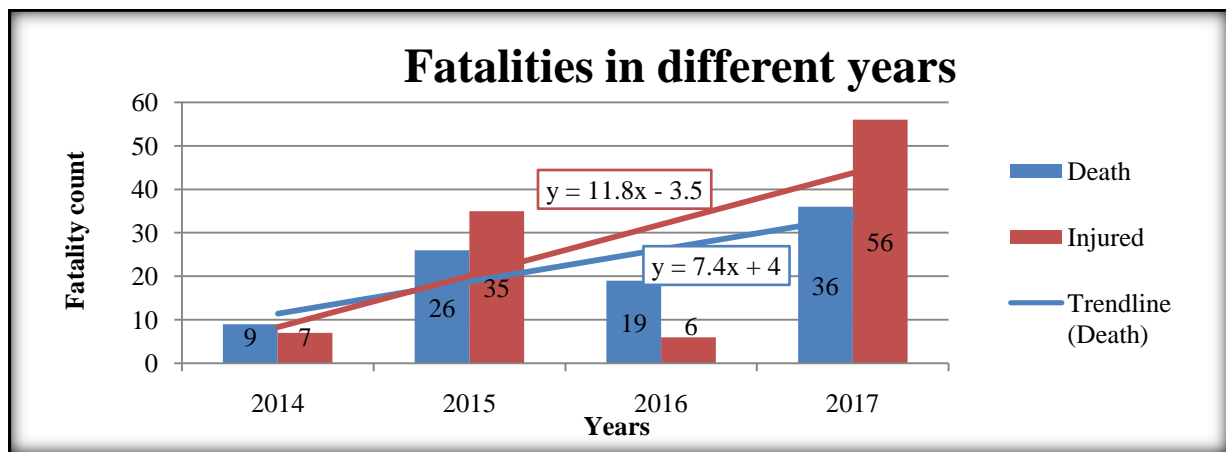


Figure 2: Histogram Showing Comparison of Fatality in Different Years

Figure 2 shows the fatality count in years 2014-2017. Casualties had increased several times in just few years from 2014 to 2017. 9 deaths had climbed 4 times to 36 deaths and 7 injuries increased more than 7 times to 56

injuries between these years. Trend lines for both death and injuries indicate that the number of accidents is rising for this road section.

1. Comparison of Number of Road Accidents

Table 2: Road Accident Statistics of Two Different Road Sections of Pabna-Sirajganj Highway

Road Section	Length of the road section (km)	Number of Accidents				Total Number of Accidents (2014-2017)	Accident rate (accident/km)
		2014	2015	2016	2017		
Pabna- Sirajganj road section	97.5	7	16	14	20	57	0.596
N6 (Pabna-Kashinathpur)	41.7	5	7	7	8	27	0.647
N5 (Kashinathpur-Hatikumrul)	55.8	2	9	7	12	30	0.537

From table 2 we can see that out of total 57 accidents, 30 accidents (53%) happened in N5 (Kashinathpur to Sirajganj) road section, but it is evident that N6 (Pabna-Kashinathpur) road section has higher

accident rate than N5, 0.647 accident/km while the N5 produced 0.537 accident/km. So N6 road section is more vulnerable in case of road accidents.

2. Accident Prone Locations

Table 3: Accident Prone Locations on the Pabna-Sirajganj Highway.

SL. No.	Thana	Accident prone locations	Accidents in 2014-2017
1	Ataikula	Putigara	3
		Madhpur	4
2	Sujanagar	Chinekhora	2
3	Shahjadpur	Binnadir	2
4	Ullapara	Boalia bazar	6

Table 3 shows the accident prone locations which were identified after analysis. Figure 4 indicates there locations on the Pabna-Sirajganj highway section. From the table 3 we can see that Ataikula has most of the

accident prone locations, but Boalia bazar of Ullapara thana has produced the highest number of accidents among the accident prone locations.

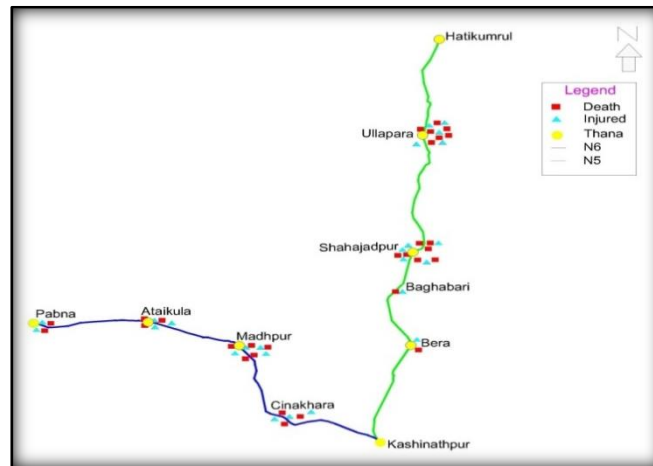


Figure 3 Pin Diagram Showing Accident Prone Locations

3. Hour-Wise Roads Accidents

The variations of the accident rates depend upon the activities which also vary frequently. At peak hours most of the roads are congested and occupied with more traffic intensity. During these periods the accident rate increases because workers, marketers, students and others

can go or come back from their destinations. From the figure 4 we can see that the result of the analysis also satisfy this theory. Most of the accidents were took places in 9am-11am, in which the roads are occupied by day labors, students, businessmen and people going or returning from markets.

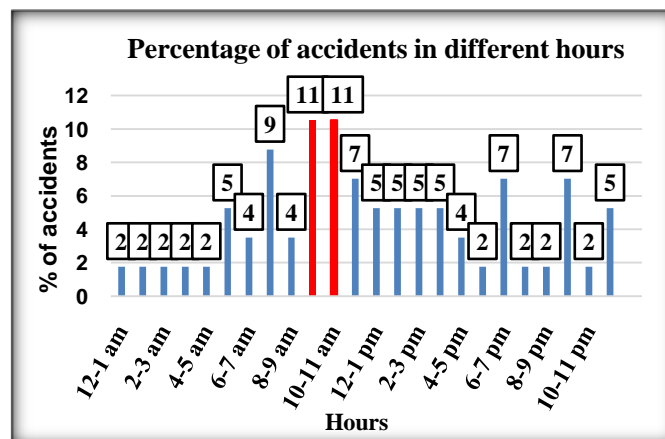


Figure 4: Histogram Showing Hour-Wise Accident Occurrences

4. Different Types of Collisions

Table 4: Collision Types in Different Years.

Sl. No	Collision Type	No of collision in year				Total	Fatality	
		2014	2015	2016	2017		Death	Injured
1.	Hit pedestrian	3	6	8	6	23	23	1
2.	Head On	1	5	2	4	12	36	43
3.	Rear End	2	1	3	4	10	12	13
4.	Over Taking	-	-	-	1	1	1	1
5.	Marginal	-	2	1	1	4	5	18
6.	Lost Control	1	3	1	4	9	13	35

In most of the accidents pedestrians were involved, figure 6 indicates in 39% accidents pedestrians were involved. According to table 4 head on collision are more fatal for this road section, causing 36 lives loss and

43 injuries in just 12 accidents. Loss of control over the vehicle is also a matter of concern. 15% of all accidents took place due loss of control.

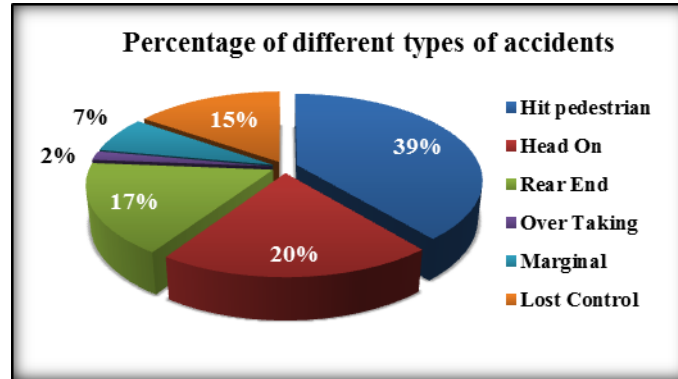


Figure 5: Pie chart showing percentage of accident types

5. Accidents Vs. Vehicular Type

Table 5: Accidents in different years with respect to vehicular type.

Sl. No	Vehicular Type	No of collision in year				Total
		2014	2015	2016	2017	
1	Bus	1	9	7	17	34
2	Mini truck	2	1	3	2	8
3	Truck	2	7	3	3	15
4	CNG	2	4	2	1	19
5	Car	-	1	-	-	1
6	Motor cycle	1	-	1	5	7
7	Leguna	-	-	-	1	1
8	3 Wheeler	2	3	-	-	5

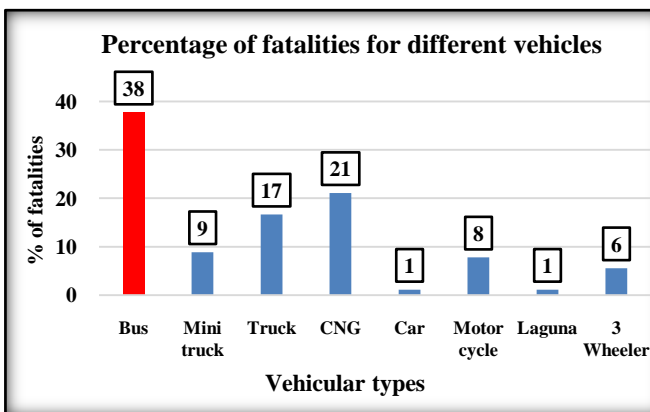


Figure 7: Accident Count for Different Types of Vehicles

Table 5 shows the distribution of accidents in different years for the different types of vehicles. The result after analysis reveals that bus is the cause for most of the accidents. In figure 7 we can see that out of all vehicles, 38% of all accidents were took place due to bus involvement. In the accident prone locations the same

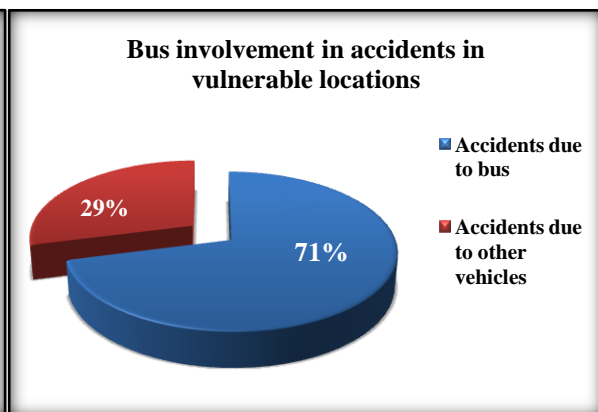


Figure 6: Percentages of Accidents Due To Bus and Other Vehicles in Accident Prone Locations

results were found. Pie chart in figure 8 indicates that on those accident prone locations 71% of accidents took place due to bus.

6. Age of Accident Affected People

Figure 8 shows number of accidents for victims of different age ranges. This is evident from the figure

that people of ages between 25-44 years are commonly considered, then the age group shifted to 45-65 years the main victim of road accidents. If pedestrians are only

considered, then the age group shifted to 45-65 years

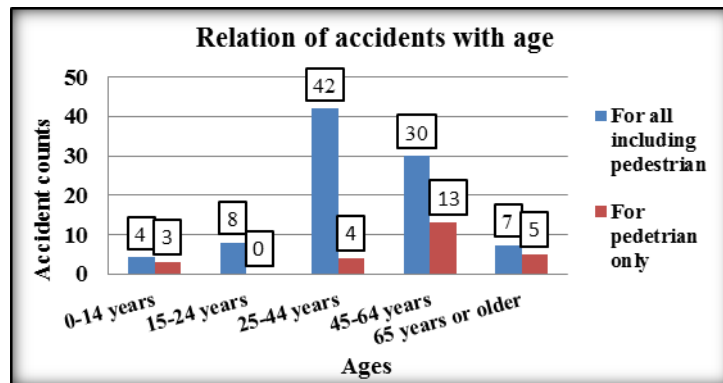


Figure 8: Relation of accidents with age of victims

7. Bus as the Main Responsible Motorized Vehicle and Their Daily Count

Table 6: Probable relation of accidents with bus

Thana	Accident prone locations	Cause		Perpetrator				Daily Bus count	Total Motorized Vehicle	% of Bus
		Over speed	Lost control	Bus	Truck	Pickup Van	Mini Truck			
Ataikula	Putigara	3		3				351	3693	9.50
	Madhpur	3	1	3		1		351	3693	9.50
Sujanagar	Chinekhora	1	1	1	1			378	3204	11.80
Shahjadpur	Binnadiar	1	1	1			1	217	8470	2.56
Ullapara	Boalia Bazar	5	1	3	2			733	6510	11.25

From previous discussion we have seen that the buses are found to be a major culprit for these road accidents. As a continuation of that analysis, table 6 presents the causes of accidents in accident prone locations, involvement of buses in them and percentage of bus in total motorized vehicle in those places. The table clearly indicates that in all of those accidents buses

were involved. As for the main causes, two particular causes can be mentioned; over speeding and loss of control. They are inter related, because over speeding often lead to loss of control over the vehicle.

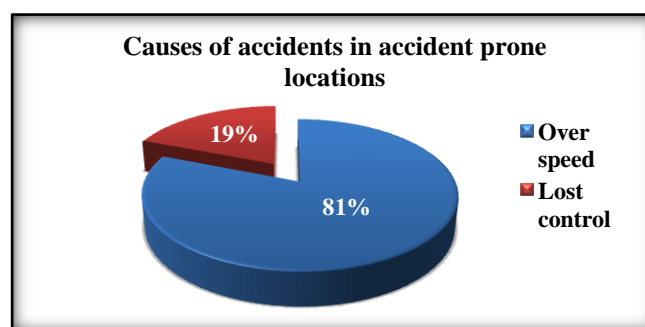


Figure 9: Percentages of Causes of Accidents in Vulnerable Locations

8. Pavement Condition

Table 7: Pavement conditions of accident prone locations.

Sl. No	Location name	Carriageway			Side Walk		Land use	Median width (m)
		Width (m)	Pavement Type	Condition	Pavement Type	Condition		
1	Dhormogram	7.6	AC	F	E	B	C	-

	Bazar							
2	Madhpur (Location 1)	6.5	AC	B	E	VB	R	-
3	Madhpur (Location 2)	7.5	AC	G	E	B	R	-
4	Putigara	7.4	AC	F	E	F	R	-
5	Chinekhora bazar	11.8	ST	F	CC	G	C	0.45
6	Chinekhora village	7.4	ST	G	E	F	R	-
7	Binnadair	6.85	AC	B	E	VB	A	-
8	Shyamolipara Bus-stand	7.16	AC	B	AC	VB	C	0.78
9	Purbo deluya	7.31	AC	F	AC	VB	C	-
10	Boalia bazar	7.31	AC	F	AC	F	C	-

❖ Pavement type -- AC (Asphalt Pavement), ST (Surface Treatment), CC (Cement Concrete), G (Gravel), E (Earth)

❖ Pavement condition -- VB (Very Bad), B (Bad), F (Fair), G (Good)

❖ Land use types -- R (Resident), C (Commercial), A (Agriculture)

During the topographical survey the road way condition of the accident prone locations are observed. Table 7 shows that in some places the carriage way pavement condition are below satisfactory level. Most of the places have unbounded side walk with very bad

condition. As a part of national highway these results are a matter of great concern for both the road users and authorities.

9. Traffic Control Measures

Table 8: Traffic control measures at accident prone locations

Sl No	Locations	Road Markings	Intersection		
			No of Legs	Traffic Signal	Traffic Control
1	DhormogramBazar	Not Exist	4	Not Exist	Not Exist
2	Madhpur(Location 1)	Not Exist	-	-	-
3	Madhpur(Location 2)	Exist	-	-	-
4	Putigara	Not Exist	3	Not Exist	Not Exist
5	Chinekhora bazar	Exist	-	-	-
6	Chinekhora village	Not Exist	-	-	-
7	Binnadair	Not Exist	3	Not Exist	Not Exist
8	Shyamolipara Bus-stand	Not Exist	3	Not Exist	Not Exist
9	Purbo deluya	Not Exist	3	Not Exist	Not Exist
10	Boalia bazar	Not Exist	3	Not Exist	Not Exist

Most of the accident prone locations are situated at or near intersections. As an intersection is a junction of two or more roads, it attracts more vehicles and proper traffic control measures are necessary. Table 9 points out the current situations of road intersections on Pabna-Sirajganj highway. Out of 10 vulnerable places only 2 have road markings, but none of them has any traffic signals or traffic control devices. Field survey showed only one place had caution marking indicating upcoming accident prone location.

IV. MAIN CAUSES BEHIND THE ACCIDENTS

After analysing the data set some disturbing factors came to light which may be addressed as the main

causes for these accidents. They are divided into three major categories, as;

1. Due to drivers:

- i) In this road sections drivers usually operate continuously which lead to tiredness. This situation reduces their ability to handle their vehicle properly and ultimately results in losing control over the vehicle.
- ii) Another main cause of road accidents that relates to the driver is over speeding. We have seen in figure 10 that in accident prone locations 81% accidents took place due to over speeding.
- iii) They also have a tendency of overtaking carelessly, to get more passengers from the bus stoppages.
- iv) In most cases they pay no heed to the traffic rules.

2. Due to pedestrians:
 - i) Crossing attempt without looking around.
 - ii) Walking or standing on road instead of foot path.
 - iii) Miscalculation of approaching vehicles speed.
 - iv) Lack of traffic knowledge.
3. Due to road geometry:
 - i) Defective road curvature.
 - ii) Insufficient Sight distance.
 - iii) Absence of road sign, marking and guardrail.
 - iv) Poor road surface condition.
 - v) Absence of road lighting, median etc.
- vii. Studies shows that in most cases the convicts have managed to escape the site of accidents and the punishment as well. Proper law enforcement may contribute in reduction of accident rates. Number of Highway police, traffic police and their facilities should be increased.
- viii. More and better highways should be constructed to accommodate the increasing numbers of drivers every year. The surface condition of the existing highway should be improved as soon as possible.

V. CONCLUSION AND RECOMMENDATIONS

Pabna-Sirajganj highway section has mostly run through rural areas. Over the years pedestrians have become the prime victim of the road accidents. They lack the awareness and proper way of use of the road. To add to this problem vehicle drivers are playing a big role in the road accidents. Analysis has also shown that particular days of a week have produced more accidents. These days are the weekly hat days for the rural people.

The after effect of the accidents is more severe. The vehicle owner loses his vehicle, public properties get damaged and above all lives are lost. Sometimes the accidents lead to permanent injuries to the victim. The cost of treatment becomes a burden to the corresponding family.

Following recommendations can be made:

- i. As collision with the pedestrians is one of the major causes of accidents here, introducing zebra crossing, footpath, pedestrian guard rails, overpass etc. can reduce the accidents related to pedestrians. Specific schemes should be under taken to educate the local people about the traffic rules and regulations to reduce the sufferings.
- ii. The accident prone locations should be properly identified and proper traffic signs should be installed to notify the road users especially the drivers for the upcoming accident prone locations.
- iii. The commuter traffic can be managed by introducing rapid bus transit or guided bus service.
- iv. All the drivers should be properly trained. As the buses usually operate continuously, alternate driver arrangement should be ensured.
- v. Head on collisions caused more life losses than any other accidents, so medians should be introduced, which will stop the head on collisions.
- vi. Bus lay by, speed hump, proper sign-signal-marking should reduce the accident rate.

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