Suggestion and improvement to reduce highway accidents: A case study of Asish mangal vatika to Mirzapur intersection

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Abstract: Transport facilities and infrastructure is the important requirement of the society at present but with these transport facilities, there are some negative outcomes are also. Road traffic accidents is one of them.Nearly 1.3 million people die in road crashes each year i.e 1 person is killed every 25 second on average 3,287 deaths a day and between 20 to 50 million are injured or disabled. More than half of all road traffic deaths occur among young adults ages 20-35.The main objective of this study is to assess RTA related issues of study area of Vidisha city (Ashish mangal vatika to mirzapur intersection) with respect to time and space from 2017-2018. The RTA data necessary for this study was collected from city traffic police control room. The results were presented in the form of graph, tables and spatial maps.The results of this study show that, 34 RTA incidences occurred in the study area during 2017-2018. 4 accidents in night time and 5 dangerous accident in day time out of which 5 fatal accidents, 4 serious injury accidents and 25 minor injury accidents occurred during study period. It is observed that RTA mainly occurred in the May month has larger accident, 20-35 years age group, nearly 92% male's drivers, and mainly two-wheelers and four-wheelers and heavy vehicle(truck) involved in the RTA.Spatially Ashish mangal Vatika turning not properly made ,accident chanses large at night time and day time minor accident it is not proper turning and mirzapur intersection accident chanses day and night both time at afternoon time minor bike accident due to high speed of biker at highway RTA prone areas.Mirzapur intersection shown highest numbers of RTAs in the study area. Preventive measures regarding the improvement of traffic condition for lowest accidents rate are suggested.

I. INTRODUCTION

Transportation is the basic need for properly operating the societies as it is required in every field of the society or in every form like for individuals, for transporting the goods etc. Road Accidents (RA) are the occurrence in a sequence of events which usually creates unexpected injury, death or property damage.
The current road network in the city is worst. The roads are below the geometric sub standards. As the population increases rapidly the modes of public transport is degrading day by day, the use of personal vehicles increasing with a high rate, with just 23451 registered motor vehicles in 2015 to 29552 in 2017.
According to WHO in 2016-17 Road Traffic Accidents have turned out to be a huge global public health and development problem 1.3 million fatalities per year and between 20-50 million more people suffer non-fatal injuries. A global estimate was carried out in 2000 suggests that the economic cost of RTAs was rupees 20,386 billion. Road traffic accidents (RTA) are the main cause of death among young people, aged 20-35 years. 91% of the world's fatalities on the roads are occur in the developing countries. As the medical aids are not available on the spot of accidents.Lack of awareness in the people. By 2020 Road Traffic Accidents (RTAs) are predicted to result in the death of about 1.9 million people annually. Road accidents are a severe problem in most of the developing countries including India. As the individuals are not following the traffic rules genuinely. Problem of providing medical aids instantly or inadequacy of medical facilities will increase the quantity of death rates within the country. Though the above researches focused on the entire nature and disastrous effect of Road Traffic Accident (RTA) at a global scale, this study will focus on assessing the general characteristics of RTA, places of frequent road traffic accident occurrences, trend, causes and impacts of RTAs in Vidisha city (ashish mangal vatika to mirzapur intersection).Overall economic progress can be achieved, only if reasonably adequate transport facilities are made available between the villages and commercial centres, road devlopment also generates considerable employment potential.Revenue from the road transport in india has been much higher than the investment made on road development plans.
This study will focus on assessing the general characteristics of RTA, places of frequent road traffic accident occurrences, trend, causes and impacts of RTAs in Vidisha city (Ashish mangal vatika to mirzapur intersection).

II. DESCRIPTION OF STUDY AREA

RTA Scenario in Vidisha City (Ashish Mangal Vatika To Mirzapur Intersection)

The state of Madhya Pradesh state houses an excellent roadways network which comprises national highways, state highways, district roads and other types of roads. It is home to 14 national highways spanning 4676 km and various state highways with an overall span of 8,728 km. The state is a trendsetter in the country in terms of execution of the Gramin Sadak Nirman Pariyojna, which is a plan supported by the Union Government to extend roadway networks to the villages. The table given below will give

you an idea about the different types of roadways in Madhya Pradesh:The mean density of roadways in MP is 22.14 km per 100 sq km in comparison to the country wide mean of 37 km. Road accidents are one of the biggest cause of deaths on Indian roads. Just before we observe road safety week, with the theme 'Sadak Suraksha – Jeevan Raksha'.Vidisha witnessed 8 deaths in 4 road accidents on 22nd April, highest in Recent-past.This is an alarming that the number of accidents are going up, one of the main reasons for the high number of fatalities is high speeding by drivers, because of good condition of roads especially on National Highway.At least 8 persons lost their lives due to road accidents in different parts of Vidisha and nearby area. The first incident took place on NH – 86, 54 km far from Vidisha. When two cars underwent Head-on collision.From one of the car all the passenger were taken out but in the another car which caught fire, all the four person died before they could be rescued.In second accident person was run over by a Scorpio car while moving on road a mirzapur intersection near area.In the third accident a man with his son died when a motorcycle collided with a Truck.According to Police information, family was going to Vidisha, and Truck was going to Mirzapur Bypass. This accident was also Head on collision.In the fourth accident in Vidisha a Safari car coming from Sagar to Vidisha(Ashish mangal Vatika to mirzapur intersection) collided with a tree .information police station area. family of Vidisha died in the accident. However,another young woman is seriously injured, and has been admitted to Sagar Hospital. Vidisha city is the main focus of this study. There is a tremendous increase in the number of accidents. Ashish mangal Vatika to mirzapur intersection total no.of major and minor accident 34, day time 5 accidents and 4 accident in night.Minor injuries 25 and major serious injuries 09. (**Source –civil line vidisha police station**).

III. Transportation Infrastructure

Vidisha is the best advantageously situated city in Madhya Pradesh. It is located near Bhopal, the state capital. It is linked to other cities in the state and country by Railway route as well as Road routes. The city is linked by broad gauge railway lines to almost all the main cities of the country. The main local Road network comprises of NH 86 AND NH146 connecting Bhopal and Sagar, vidisha bypass. The agencies involved in the construction and maintenance of the city road is PWD. The road network in the city area with very restricted scope of road widening, mostly suffers from very high volume of traffic, mixed traffic, and on-street parking. The average traffic volume Ashish mangal vatika area and mirzapur area NH146 ashish mangal vatika to mirzapur intersection in vidisha city in this highway not a proper turning town area and Some major places sign board and speed limit not provided mainly accidents are higher volume,near villages road connecting highway major and minor accidents day by day.Ashish mangal vatika to mirzapur section 8.6 km and approx 10min travel time. About Mirzapur according to census 2011 Information the location code or village code of mirzapur village 481986. Mirzapur village is located in vidisha tehsile of vidisha district in madhya pradesh, india. It is situated 4km away from vidisha, Which is both district and sub district Headquater of mirzapur village. The total geographical area of village is 301.2 Hectares. Mirzapur has a total population of 1140, Peoples. There are about 226 houses in mirzapur village. Vidisha is nearest town to which is 4km away. Population of mirzapur 1140 male population 620 and female population 520 .connectivity of mirzapur type Public bus service and private bus service and near railway staion And auto/rikshaw avilablity. And also ashish mangal vatika marriage garden bypass highway road to mirzpur intersection approx 10 km distance. Highway capacity is measured PCE/hour daily shown in table

Table no. - Highway capacity is measured PCE/hour daily (PCU Factor)

Sr.no.	Duration		4 wheeler	2 wheeler	Auto /rickshaw	Bus/truck	Other(large bullock cart)	Total PCU
	Start	End						
	PCU Factor		1	0.5	1	3	8	
1	9;00 am	10;00am	98	35	9	18	1	187
2	10;00am	11:00am	105	39	11	20	3	220
3	11;00am	12:00pm	94	27	7	16	2	179
4	12;00pm	1:00pm	82	29	6	11	0	136
5	1;00pm	2:00pm	67	31	9	8	2	132
6	2;00pm	3:00pm	45	19	11	9	4	125
7	3;00pm	4:00pm	57	21	11	13	0	118
8	4;00pm	5:00pm	61	25	13	8	0	111
9	5;00pm	6:00pm	98	37	15	7	5	193
10	6:00pm	7:00pm	87	31	9	9	1	147

11	**7:00pm**	**8:00pm**	62	29	10	14	2	145
12	**8:00pm**	**9:00pm**	43	21	14	19	0	125

Figure :- Highway capacity is measured PCE/hour daily

IV. METHODOLOGY

Data Collection Methods and Procedure

The RTA data of study area from 2017 to 2018 were collected from the monthly RTA records file collected from police station area monthly by Traffic control room. Data collection format was prepared in excel document format which enables us to collect, filter and edit the required variables for the study. The main RTA input data sets collected from the monthly RTA records file of Traffic control room includes the following variables.

i. Accident date
ii. Accident month
iii. Accident year
iv. Driver's Age
v. Driver's Sex
vi. Vehicle type
vii. Accident location
viii. Accident Location type

Following the data filter, editing and data coding procedures, one years RTA database of the study area was made in an Excel format. The data base consists of the RTA records of 34 RTA incidences of study area from 2017 to 2018. The locations of known RTA spots of the vidisha city (ashish mangal Vatika to mirzapur intersection) and distance 8.6 km and travelled time 10 min, were collected from the Google Earth through Add Placemark tool using the special code given to the RTA.

Death rate in vidisha city(ashish mangal vatika to mirzapur intersection)(2017-2018)

- Death rate is calculated by two methods which is describing below:-

1. **Based on population**:- is calculated by using formula given below

R= (B*100000)/P

R = death rate per 100000 B = number of accident in a year p = population of area

on the basis of population death rate in year 2017 is increasing with a high rate in year 2018.

2. **Based on registered vehicles**:- it is calculated by using following formula

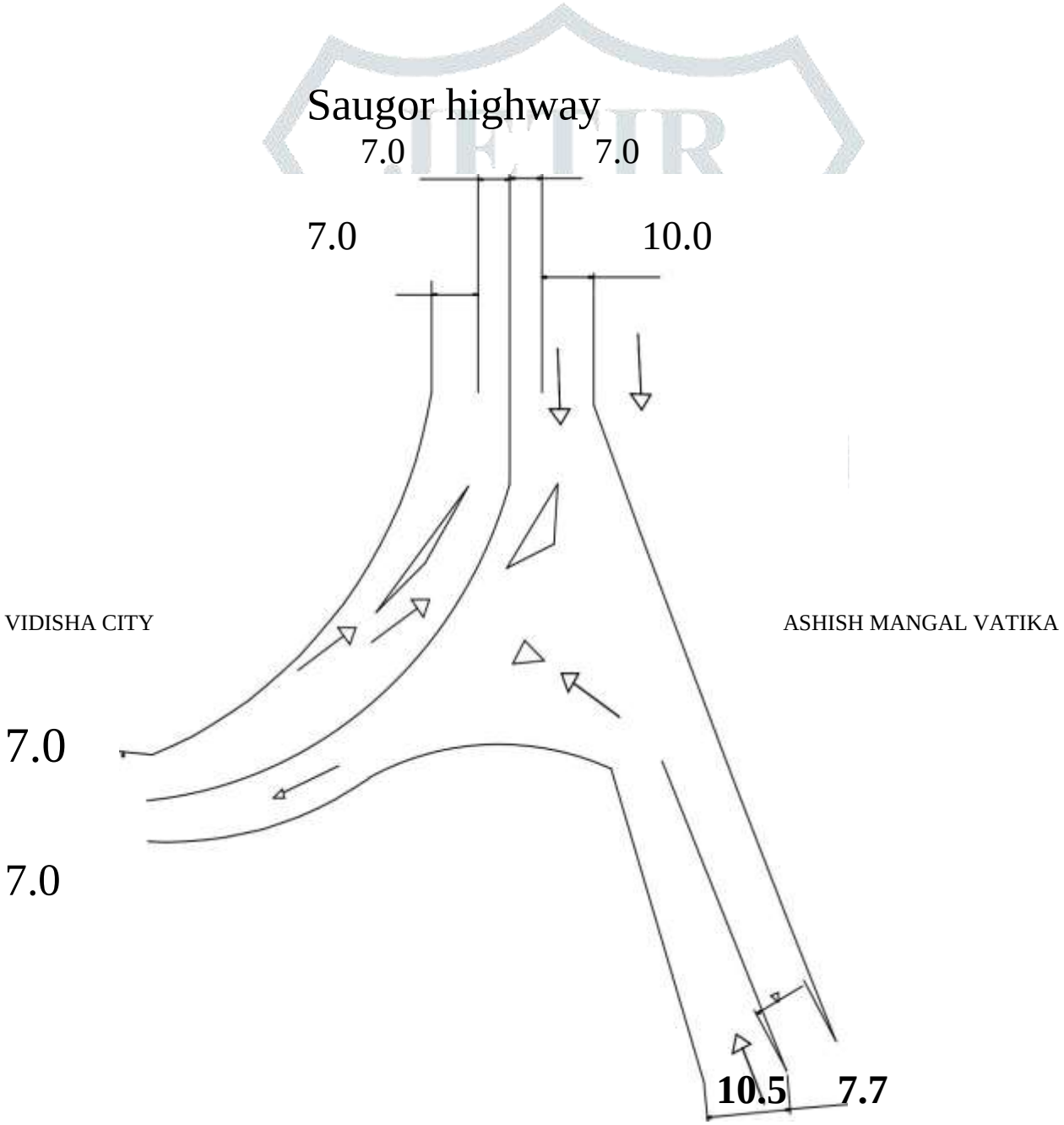
R= (B*10000)/M

R = death rate as per 10000

B= no of death in a year
M= number of motor vehicle registered in a year
This farmula was used to calculate the death rate based on registered vehicles

Data Processing, Presentation and Analysis

The RTA Data collected from Ashish mangal vatika to mirzapur intersection, Vidisha City Traffic control room was processed in Excel Word. Accordingly, the data was organized and presented in the form of tables, pie charts, column bar charts and line graphs. The difference and trend in the frequency of RTAs was presented on maps using graduated symbols and bar charts. Analysis of the data was basically made in five sections. The first part analyse the general characteristics of RTAs in study area using the collected 34 RTA incidences of the study area in a years. The second part converses about the spatial variation and distribution of RTAs across the study area in general and amongst the areas in particular. Spatial maps of RTA Spots and RTA Prone areas of study area were generated using the spatially referenced known places for RTA incidences out of the total 34. This is because the name of the places of the RTA ashish mangal vatika to mirzapur intersection study area of a last years.. Therefore, spatial maps of RTA Spots and RTA Prone areas are generated by using the available data. The third part discusses about the trend of occurrence of RTAs in the whole study area in general and in the RTA Prone areas in particular. The fourth part specifies socio-economic impacts of RTA in study area. road mapping of mirzapur intersection shown in figure.



Method used

Weighted severity index or method of ranking.

In this study this method is employed for ranking the most serve stretches, as it involves all type accident with proper weight age. For computation of accident severity index, the accident are classified into following groups namely, fatal, serious and minor injury accident.

$$WSI = (41*k+4*SI+1*MI)$$

- Where:-
- K= no. of person killed
- SI= no. of major injuries
- MI=no. of minor injuries

V. RESULTS AND DISCUSSIONS

Monthly Variation of RTAs

As the variation in the distribution of RTAs within 24 hours of a day, there is difference of RTA frequencies between the different months of the years. As presented in table 5.1, there is a very slight variation in the occurrence of RTAs among the months in study area. Comparatively, May months of highest RTA share in the study area in the time period 2017-2018. This could be mainly due to effect of weather conditions i.e. Vidisha have the peak peak summer in april-May months.Winter months many road traffic accidents occurred during the condition of fog, which can reduce visibility to a greater extents. May month have the maximum number of RTAs in vidisha city(Ashish mangal vatika to mirzapur intersection). Temporal Variation of RTAs shown in table 5.1

Table no. – 5.1 Temporal Variation of RTAs in a Year by Month (2017-2018)

MONTH	ACCIDENTS YEAR		TOTAL	PERCENTAGE
	2017	2018		
DECEMBER	1	-	1	2.94
JANUARY	-	3	3	8.82
FEBRUARY	-	4	4	11.76
MARCH	-	2	2	5.88
APRIL	-	7	7	20.59
MAY	-	9	9	26.47
JUNE	-	3	3	8.82
JULY	-	5	5	14.72

TOTAL	1	33	34	100

Drivers Sex and RTA

The occurrence of RTAs in study area shows a greater variation in term of driver's sex or rider's sex. Table 5.2 shows the yearly figure with respect to driver's sex or rider's sex. The number of male driver's involvement in RTAs outnumbers females in the study area. The surpass numbers of male drivers could result in more frequencies of engaging in RTAs scene. As shown in Table 5.2 in the year 2017 and 2018, male driver's caused 1 and 28 RTAs respectively. In general, from 2017 to 2018 male drivers caused 29 (85.29%) RTAs in the study area.

Table no. – 5.2 Drivers sex and RTAs (2017-2018)

Driver"s/ riders genders	Accident year		Total	%
	2017	2018		
Male	1	28	29	85.29
Female		5	5	14.71
Total	1	33	34	100

while female contributed only 5 (14.71%) RTAs during the study period.Discussed that only 5% victims are females in India. These results show that male drivers are the main contributors to RTAs than female in the study area.

Vehicle Characteristics and Road Traffic Accidents

Vehicle Category and RTA

Numbers of vehicle categories have been involved in RTA scenes in the study area in the last a years. Table 5.3 shows the contribution of different type of vehicles in RTAs in the study area. Private vehicle including four-wheelers and two-wheelers are more frequently involved in the RTAs than other vehicle categories. Four-wheelers (Cars) caused 8(23.52%) RTAs in a year study period. This is followed by two-wheelers (Motor Bicycle &Scooty) causing 10 (29.42%) RTAs. Vehicles serving for public transport have limited (182, 7.35%) contribution in RTAs; this is mainly because of less use of public transport in the city and most of the people prefer

Vehicle	**Vehicle**	**Accident year**		**Total**	**%**
		2017	**2018**		
Public transport	**Bus**				
	Auto				
Freight transport	**Loading auto**		2	2	5.88
	Truck		14	14	41.18
Four wheeler	**Car**	1	7	8	23.52
Two wheeler	**Motor cycle**		10	10	29.42
Total		01	33	34	100

Table no. – 5.3 Vehicle Category and RTA (2017-2018)

Vehicle	Vehicle	Accident year		Total	%
		2017	2018		
Public transport	Bus				
	Auto				
Freight transport	Loading auto		2	2	5.88
	Truck		14	14	41.18
Four wheeler	Car	1	7	8	23.52
Two wheeler	Motor cycle		10	10	29.42
Total		01	33	34	100

Road Characteristics and Road Traffic Accidents

Type of Road Locations and RTA

The type of location of road contributes RTAs to a greater extents. Because the amount of traffic vary with different location type, RTAs also vary. Table 5.4 shows the variation between different types of locations.Based on the RTAs data collected in the study period of all road traffic accidents, followed by Straight location contributing 27(79.41%) RTAs. RTAs occurrence on the road is higher. The straight road length is much more than, the RTAs occurrence proportionality So it can concluded that RTAs are more frequent in the Straight locations. While opposite to these two categories turns have the lowest 7 (20.59%) contribution to total RTAs occurred in the study period.In 2017-18, Study area exhibits the occurrence of 34 spatially identified RTAs. The RTAs were unevenly distributed in different areas of Study area in this year. Here we take the different study areas, including the different and small localities and areas in it.

Table no. – 5.4 Type of Road Locations and RTAs (2017-2018)

RTA's Location Type	Accident year		Total	%
	2017	2018		
Straight	1	26	27	79.41
Turn		7	7	20.59
Total	1	33	34	100

The Spatial Distribution of RTA and Accident prone areas

Table 5.5 The Spatial Distribution of RTAs and RTAs Spots in Study Area in 2017-18

YEAR	STUDY AREA	DAY RTA		NIGHT RTA	
		MAJOR	MINOR	MAJOR	MINOR
2017	ASHISH MANGAL Vatika Or Near Area	2	8	1	4
2018	MIRZAPUR INTERSECTION Or Near Area	3	12	3	1

RTA by Severity Classes and by age of casualties

All age segments may not be equally exposed to RTAs. The economic role and responsibility of the age groups in the community could contribute to the fatality of age groups in road crashes. Table 5.6, shows RTA by accident severity classes in study area between the years 2017 to 2018. Out of every 100 RTA casualties in study area 14.71% have the probability of death, 11.76% the fate of serious injury and 73.53%. shows the variation of RTA with class of severity in study period (2017-2018). The highest frequencies of fatal, serious injuries and minor injuries in the study area have been exhibited in the year of 2018. This disaster shows that Victims of fatal road accidents might have died on the scene or in hospitals.

Table 5.6 RTA by accident severity class (2017-2018)

Accident severity classes	Accident year		Total	%
	2017	2018		
Fatal accident	-	5	5	14.71
Serious injury	-	4	4	11.76
Minor injury	1	24	25	73.53
Total	1	33	34	100.00

VI. Conclusion

This study was carried out to describe the characteristics of RTAs, places of frequent RTAs, examine the trend of RTA in terms of space and propose appropriate measures which could help to reduce RTAs in study area.RTAs are nearly equally distributed in a year by months but, May is the months of highest RTA share in the study area in the time period 2017-2018 where they contribute 9(26.47%) of the total RTAs in the study area. This study shows that the frequency and occurrence of RTAs in study area exhibits variations. Road Traffic Accidents are randomly distributed in the study in terms of time and space. Road Traffic Accidents are affecting the dwellers of the city in various aspects. The RTA casualties of the study area mainly belongs to the productive age group 20 to 35 years. It shared nearly 26.47% casualties followed by age group 35-45 with the 20.59% share in this Misery .The major portion of victim driver's is male, which is nearly 85.29% of total RTAs while female driver's victims are only 14.71%. It is observed that the two-wheelers category (Motor bicycle & scooty) accounts nearly 29.42% for RTAs cases followed by four-wheeler category (car) by 23.52% of RTAs cases. In addition to this as the point of view of vehicle involvement public transport have 7.35% contribution. With respect to RTAs location types, square midblock sections holds the major portion of RTA cases by 20.59 % followed by straight section by 79.41%. It is observed that in the study area by the year 2017 and 2018, there are 34 RTA Prone areas and on these accident prone areas 34 RTA cases have occurred Ashish mangal vatika to mirzapur

intersection. During the study period top two RTA Prone areas identified, have recorded. RTA incidences during the year 2017 to 2018.In some casualties people have lost their lives, others have got serious or slightly injuries due to RTAs. During the study period (2017-18) of RTA incidences in study area have resulted fatal or serious injury. The frequencies of RTAs have shown an unstable trend in the study period but top RTA Prone areas shown a slight decrease then an increasing trend.

VII. Recommendations

Based on the findings of this study, the following recommendations are made:-

- Width of a road is minimum then tha chances of accident is more but, when the width of road increases then Accident will be reduced.
- As per IRC recommendation the National highway plain or rolling terrain is 12 meter width but width is not properly maintained for IRC guide line.
- A moving vehicle which colloides with a object like an electric pole, tree or rigid structure.
- Super elevation are not provided properly for heavy vehicles which are not visible on the spot so, that collision can be created my suggestion is that in turning point the speed limit and sign board have to be provided.so that collision can be reduced.
- At night time when the turning point comes suddenly in centre island and then their width of a road is less this creates collision of heavy vehicles.
- As per IRC recommendation the trafic inter section and design speed limit 40 km/hr is for urban areas and design speed limit 30 km/hr of rural areas in this condition flat speed braker are provided for speed limit is minimum then collision chances will be reduced.
- As per IRC recommendation the camber is 2.5% and super elevation camber is 3%. Curve is not proper maintained.
- Traffic polices should be assigned in the major roads and RTA Prone areas of the study area to easy the volume of vehicles and pedestrians. Vehicle parking across main roads of the study area which results in traffic congestion needs attention
- Drivers aged 20 to 35 are more frequently involved in RTAs than the other. The bypass Road Transport Office which gives the driving license should seriously assess the capability of drivers and monitor the procedure for driving license.
- In the four-wheeler category (cars) and in two-wheeler category (motor bicycles) which are used to convey majority of the study area dwellers are found more likely to be involved in frequent RTAs than other vehicle types. Therefore, it is recommended that the use of seat-belt and helmet is strictly implemented by the traffic police.

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