Indentification and Management of Traffic Accidents on Selected Stretch of NH73A

Sachin Dass, Saurabh Jaglan
Praveen Aggarwal[1] and
Dhirendra Singhal

Assistant Professor, CED, DCRUST, Murthal

[1]Professor, Department of Civil Engineering, NIT Kurukshetra

Abstract

This paper presents the study carried out of accident analysis, black spot study and to identify the causal factors of accidents on NH-73A. The road accident trends and black spot ranking were established. The paper aims at identifying the accident trends on seven stretches on NH-73A according to year, month, time of the day, type of hitting vehicle, primary causes of accidents and black-spots. The results show that, the existing number of major access points without traffic lights, road marking, road furniture and proper road signs, rise in speed, increasing number of Annual Average Daily Traffic (AADT), heterogeneous nature of traffic, lack of proper road lighting conditions, poor shoulder design and maintenance, bad road conditions and design are the potential contributors of incremental accident rates on the given roadway. The measures for improvement based on identified causes include construction of road features such as paved shoulders, pedestrian crossing, strict implementation of speed limits and traffic lights, proper road markings and signs, speed breakers and traffic lights to be provided.

Keywords: AADT, Shoulders, Road Marking.

INTRODUCTION

Indian road safety situation is ten times worse when compared to the developed countries of the world, which leaves much to be done in the field of road safety management. World health statistics 2008 cited in global status report on road safety states that RTI's (Road Safety Injuries) in 2004 were the 9th leading cause of death and at current rates by 2030 are expected to be the 5th leading cause of death. A number of studies on road safety have also been carried out in India, in different cities such as Delhi, Mumbai, Chennai and Ernakulum as well as some highways. In this research work, an attempt has been made to identify accident causes and improvement measures on a given stretch of NH-73A. The research aims at collecting and analyzing accident data for a selected stretch of NH- 73-A between Jagadhri and Paonta sahib (46.80 km) with a view to identify and improve accident prone locations on this selected stretch of the roads. The methodology followed and the results obtained in the research work pertain to this selected stretch of the road. However, the methodology used in the applicable to other stretches of the roads having similar roadway and traffic conditions.

LITERATURE REVIEW

Singh and Suman (2012) concluded that accident rate in terms of accidents per kilometer year increases with traffic volume. But accident rates in terms of number of accidents per million vehicle kilometer year decreases with increase in traffic volume.

Mustakin and Fujita (2011) published a paper investigating major factors contributing to highway accidents concentrating on the relationship between road condition, traffic flow, accident rates and their predicting using multiple non linear regression.

Turner et al. (2006) a study developed in New Zealand for rural roads that will consider all the key variables, including: traffic volume, access density, horizontal geometry, consistency,seal width, shoulder width and conditions.

Padmanaban,& Hassan (2009) study used to develop a road traffic accident database for Tamil Nadu, which can also be extended across India. It detailed the database design as well as the specific crash reconstruction methodologies to be used.

Singh and Mishra of IIT Kanpur carried out road accident analysis of Kanpur city. They concluded that the total number of accidents in the city as well as their fatality were on an increase. Persons killed per 100 accidents were alarmingly high, as high as 45 in the year 2000.Though fatality rate was lower but fatality risk was higher than rest of India. Pedestrian deaths as percentage of all road fatalities were very high.

P.Pramada VALLI (2004) of Central Road Research Institute(CRRI) New Delhi, India carried out a research on "Road accident models for large metropolitan cities of India". The data collected for selected metropolitan cities could not be fitted collectively to express the accident model properly.

The conclusion that accidents are dependent on following main parameters was considered in above studies shoulder width and its type, Curvature. Lightening condition, Traffic lights, Road Furniture, Road Marking, Cross section of road, AADT, speed, Length of section, mixed traffic, Number of accesses, Road Conditions.

Data Collection and Analysis

The accident data is collected from local authorities and police stations. The data collected is for two years i.e. from January

Sr. No.	Stretch	Location	Year	No. of Accidents	Chainage in Km.		Length in Kms.	Paved width in Mts.	Earthern Shoulder width in Mts.	Curves in Nos.	Minor Access Points in Nos.	Traffic Volume in No of vehicles on both direction in 1000
1	2	3		4	5	6	7	8	9	10	11	12
				A			x_1	x_2	X_3	X_4	X_5	X_6
1	S1	Jagadhari bus stand to AggarsenChowk	2011	15	0	1.6	1.6	8.75	1	0	8	35006
			2012	4				8.75				
2	S2	AggarsenChowk to TriveniChowk	2011	10	1.6	5	3.40	8.75	1	1	18	28639
			2012	1				8.75				
3	S3	TriveniChowk to M.L VermaChowk	2011	5	5	12.5	7.5	10.0	1	1	10	8275
			2012	8				10.0				
4	S4	M.L VermaChowk to Kishanpura	2011	10	12.5	25.5	13.0	10.0	1	0	5	9017
			2012	15				10.0				
5	S5	Khijrabad Town	2011	7	25.5	28	2.5	8.75	1	0	7	8404
			2012	7				8.75				
6	S6	Khijrabad to Hathinikund barrage	2011	3	28.0	34.0	6.0	10.0	1	0	1	7056
			2012	0				10.0				
7	S7	HathiniKund barrage – Lal Dang	2011	4	34.0	46.80	12.8	5.5	1	4	6	4112
			2012	3				5.5				

2011 to December 2012. The accident data contains the information like date, time and location of accidents. The accident data also includes minor and severe injuries, number of persons dead, vehicles involved in accident, probable cause of accident and jurisdiction of police station. It has been collected from various Police Stationi.e. City Jagadhari, SadarJagadhri, Chhachrauli and Khijrabad. The data regarding physical features of the site, wherever required is collected by conducting field visits to the sites of accidents and PWD office Yamunanagar. Accident data was collected and further analysis of data according to different characteristics of accidents is done. The characteristics are also studied on different stretches of road length. The Time of accident and month of accident are analyzed.

Stretch 1 (Jagadhari Bus Stand to AggarsenChowk 0km–1.6km)

Classification of accidents according to months:-

The data collected has been arranged according to accidents per month. In the data shown in figure 1 we observe that more accidents have taken place during January, April, October the number of accidents has been more as compared to other months. The reasons for accidents during January, February and
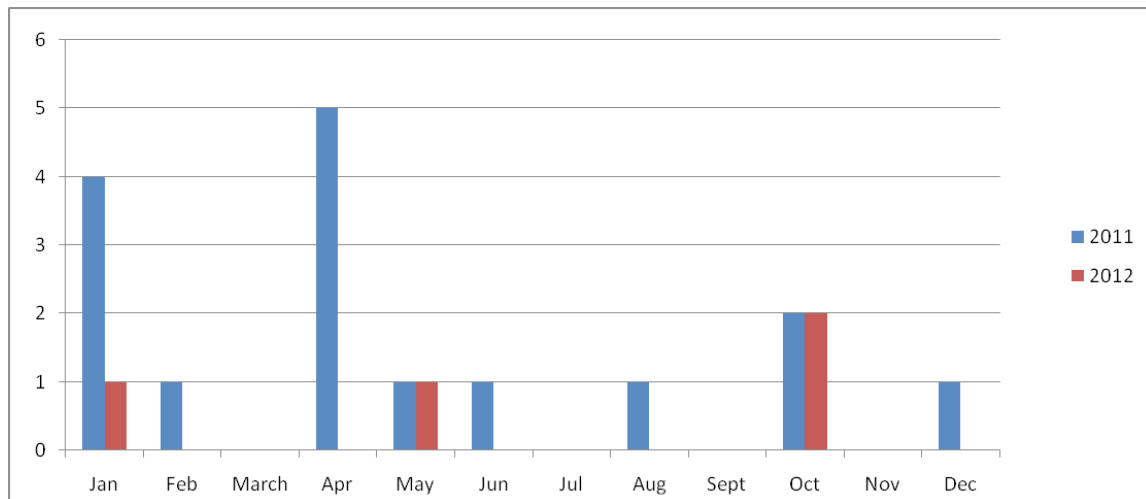
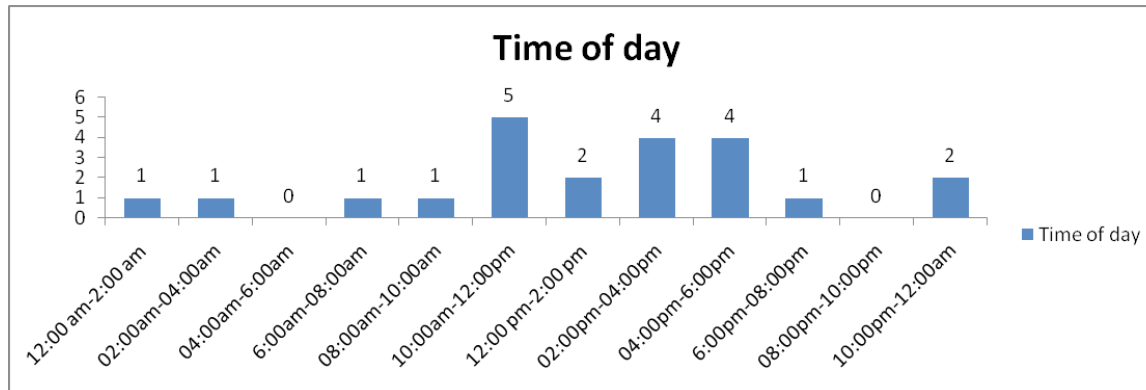**Figure 1:** Accidents according to month/year

Figure 2: Accidents according to time

December can be attributed to environmental factors like fog, smog etc. which reduce the visibility considerably especially during nights and early mornings.

Classification of accidents according to time of day:-

The time of day affects the occurrence of accidents as the number of vehicles and the driver alertness varies across different time. One can observe in figure 2 that a majority of accidents takes place in the mornings and afternoon. Late night accidents mainly occur because of reduced alertness of the driver.

In the figure 3 given below we observe that maximum number of accidents occur from 10:00am-12:00pm. High occurrence of accidents is also observed from 02:00pm-04:00pm and 04:00pm-06:00pm.

Identification of Black Spots

From the data given in figure 3 we can clearly observe that the maximum number of accidents take place at E-3 km(near Aggarsen Chowk). Hence this can be identified as the black spot for the given stretch.

Figure 3: Identification of Black spots

Observations about identified black spot:

1. Very high volume of mixed traffic especially heavy vehicles due to proximity to lakkar Bazar. Heavy volume of traffic is also due to the fact that it acts as a major connecting road between Yamunanagar, Jagadhri and NH-73 upto Kalanaur.
2. Road width is compromised because of the wooden logs lying illegally on road side.
3. Illegal divider crossings.
4. Though the crossing at the identified black spot has a traffic light but it was found that compliance to the same was very low.

Stretch 2 (Aggarsen Chowk to Triveni Chowk)

Classification of accidents according to months:-

In the data shown in figure 4 we observe that more accidents have taken place during January and June. Fog may be one of the reasons for more number of accidents during January. The number of accidents during March, May, July, November, December is equal. We also observe that the year 2012 sees very less number of accidents. No direct relation can be established between the months and number of accidents can be established from the collated data.

Figure 4: Accidents according to month/year
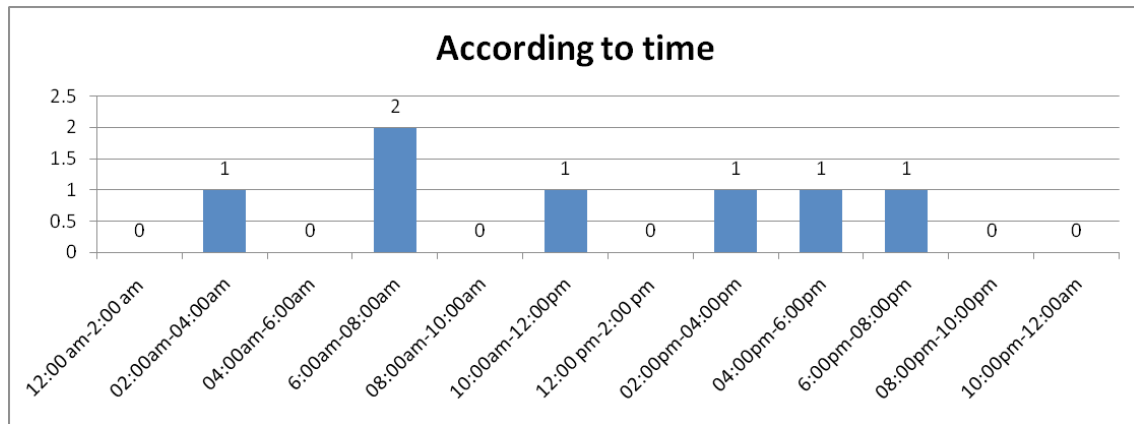
According to time

Figure 5: Accidents according to Time

Classification of accidents according to time of day:-

The time of day affects the occurrence of accidents as the number of vehicles and the driver alertness varies across different time. One can observe from figure4.9 that a majority of accidents takes place in the mornings and evenings. Since this stretch lays within the city limits, there is more rush on roads during morning due to proximity to Lakkar Bazar which might be one reason. This stretch also sees a lot of heavy traffic which might be overloaded. Late night accidents mainly occur because of reduced alertness of the driver. In figure 5 we observe that maximum number of accidents occur from 06:00am-8:00am followed by 02:00pm-04:00pm, 04:00pm-06:00pm, 06:00pm-08:00pm with 1 accident each.

Black spot Identification on stretch 2

The point NE 3km in figure 6 (near BuriaChowk) shows a relatively higher number of accidents and can be identified as the black spot on stretch S2.

Observations about identified black spot:

1. Very high volume of mixed traffic especially heavy vehicles due to proximity to lakkar Bazar. Heavy volume of traffic is also due to the fact that it acts as a major connecting road between Yamunanagarand NH-73A.
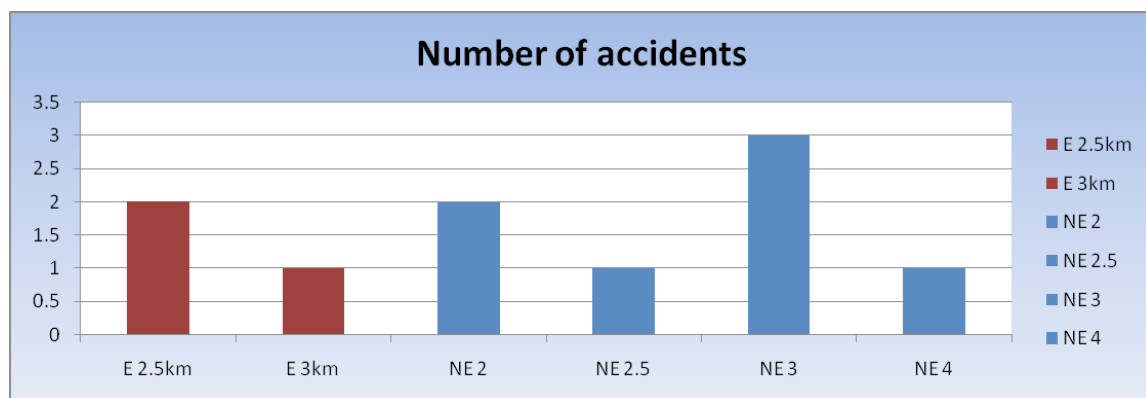
Number of accidents

Figure 6: Identification of Black Spot

2. Road width is compromised because of the wooden logs lying illegally on road side.
3. No traffic light on BudiaChowk crossing which has 3 access points.
4. Many heavy vehicles carrying timber move on the wrong side of the road because of timber market.

Stretch 3 (Triveni Chowk to M.L Verma Chowk 5km – 12.5km)

Classification of accidents according to months:-

The data collected has been arranged according to accidents per month.

In the data shown in figure 7 we observe that more accidents have taken place during April followed by February, June and July. We also observe that year 2012 saw more accidents on the given stretch as compared to 2011.

Classification of accidents according to time of day:

One can observe that a majority of accidents takes place in the afternoon followed by mornings. Since it is a major connecting road to the city there is more rush on roads during the day which might be one reason. In the given figure 8 we observe that maximum number of accidents occur from 12:00pm-02:00pm.

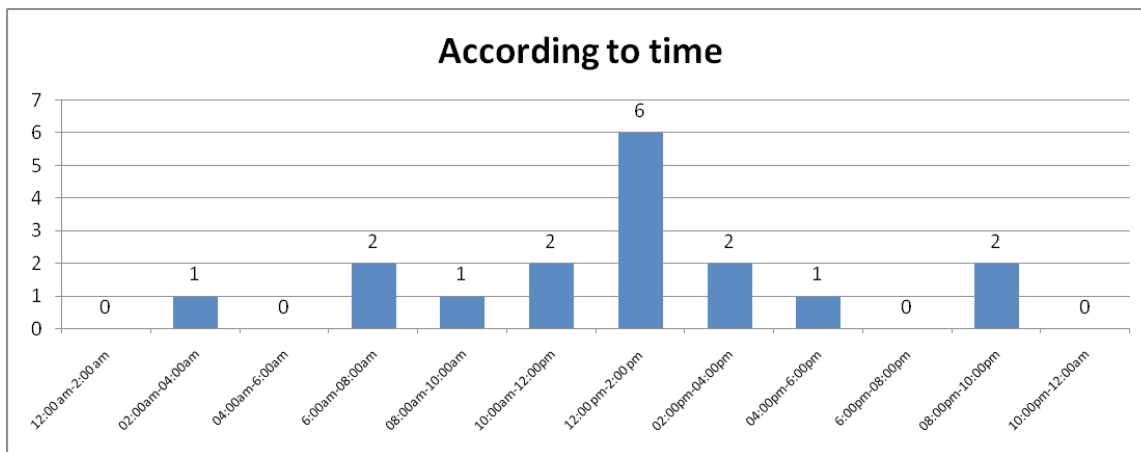**Figure 7:** Accidents according to month/year

Figure 8: Accidents according to time

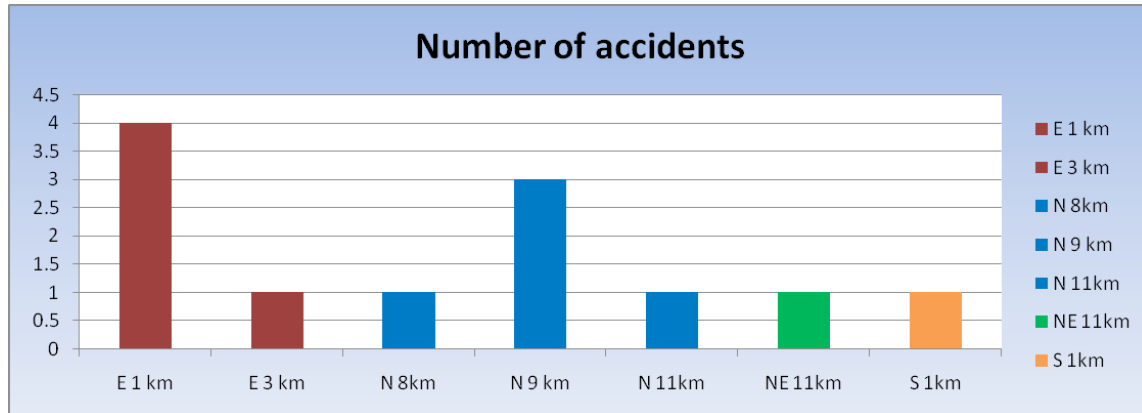**Identification of Black Spot on stretch S3**

Figure 9: Identification of Black spots

The figure 9 for stretch 3 indicates that point E 1km (near grain market Chhachrouli) is the black spot. However the accident location for two accidents was unavailable as per records. Observations about identified black spot:

1. Very high volume of mixed traffic especially heavy vehicles due to proximity to timber market at Manakpur HSIDC industrial area. Road width is compromised because of the wooden logs lying illegally on road side.
2. Many heavy vehicles carrying timber move on the wrong side of the road because of timber market.
3. Sharp curve at Triveni junction connecting Jagadhari road to NH-73A.

Stretch 4 (Chachhrauli To Kishanpura 12.5km – 25.5km)

Classification of accidents according to months:-

The data collected has been arranged according to accidents per month.

In the data shown in figure 10 we observe that more accidents have taken place during January and November. The reasons for the same can be attributed to environmental factors like fog, rain etc. July also saw a high number of accidents. On this stretch the occurrence of accidents is distributed across all the months. Year 2012 saw more number of accidents than year 2011.
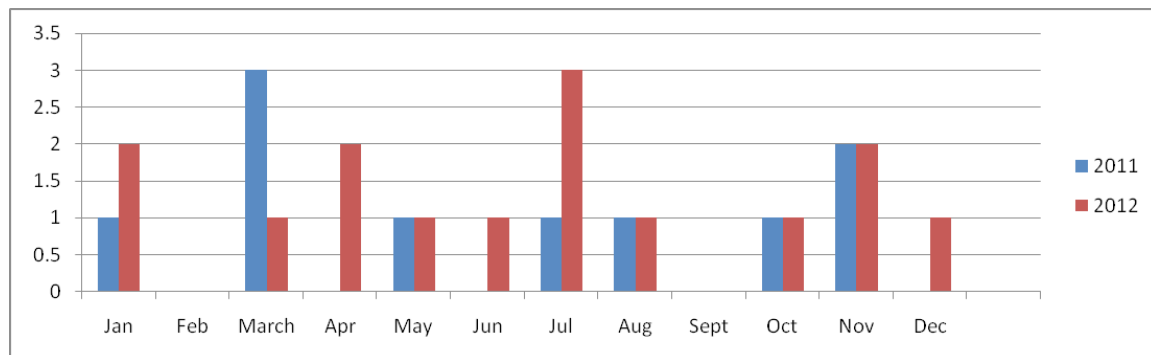

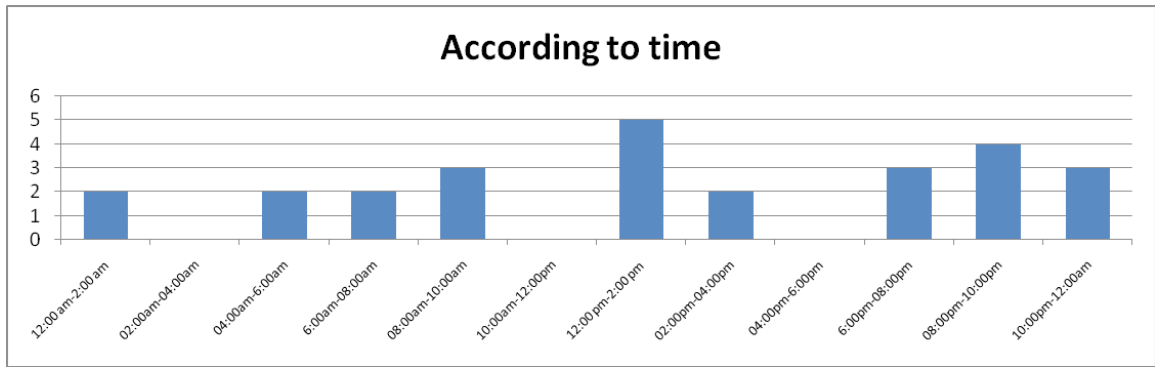**Figure 10:** Accidents according to month/year

Figure 11: Accidents according to time

Classification of accidents according to time of day:-

One can observe that a majority of accidents takes place in the afternoon and late evenings. Late night accidents mainly occur because of reduced alertness of the driver. In the figure 11 we observe that maximum number of accidents occur from 12:00pm-02:00pm. High occurrence of accidents is also observed from 06:00pm-08:00pm, 08:00pm-10:00pm.

Identification of Black Spots

From the data given in figure 12 location E 6 (near Urjani Village) can be identified as the black spot for stretch S4.

Observations about identified black spot:

1. Lack of proper road markings and Road signs.
2. No speed breakers on access roads.
3. Narrow bridge near Urjani village.

Stretch 5 (Khijrabad 25.5km – 28km)

Classification of Accidents According to Months

The data collected has been arranged according to accidents per month.In the data shown in figure 13we observe that more accidents have taken place during the summer season i.e April. During winter season there is higher probability of accidents due to low visibility. Considerable number of accidents was also observed duringJune, July, and October. Accidents are equally distributed between 2011 and 2012.
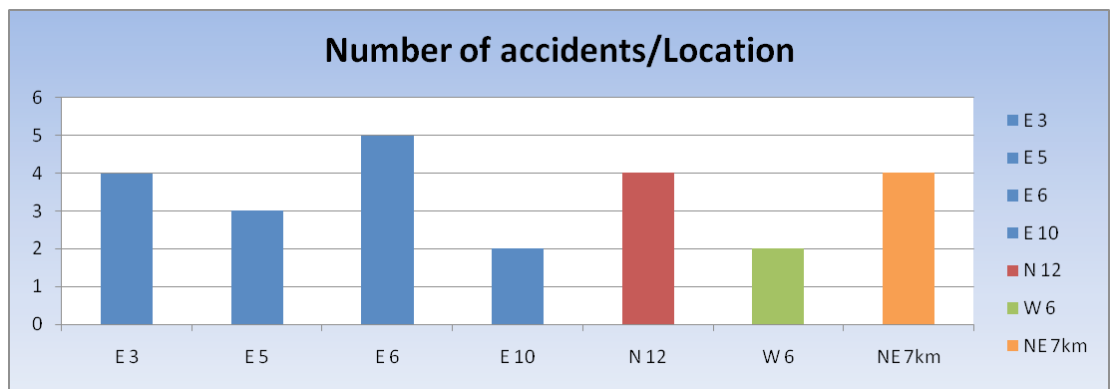

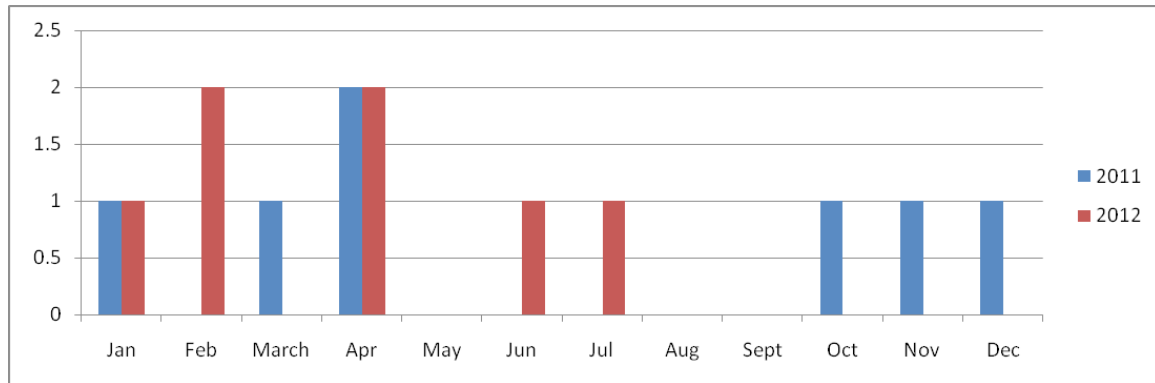**Figure 12:** Identification of Black Spots

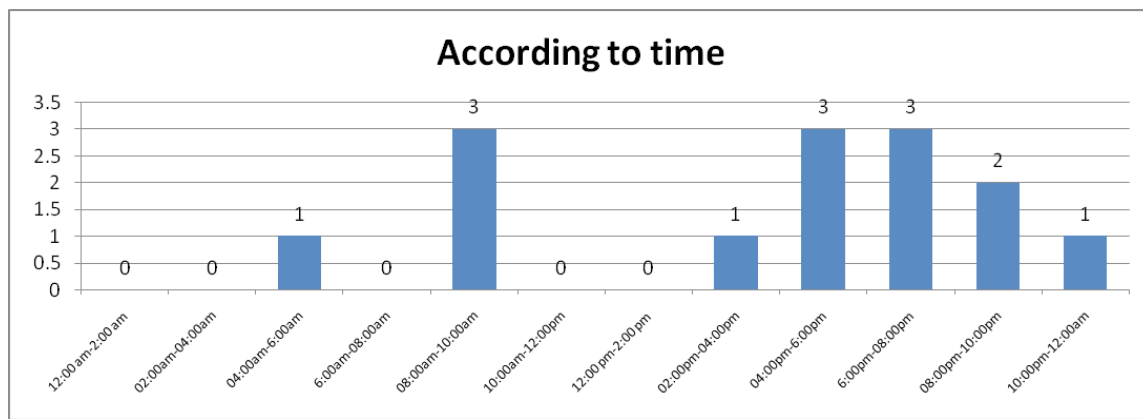**Figure 13:** Accidents according to month/year

Figure 14: Accidents according to time

Classification of accidents according to time of day:-

One can observe that a majority of accidents takes place in the mornings and evenings since there is more rush on roads which might be one reason. Late night accidents mainly occur because of reduced alertness of the driver. In the figure 14 given below we observe that maximum number of accidents occur from 08:00 pm-10:00 pm. High occurrence of accidents is also observed from 04:00 am-06:00 pm,06:00-08:00 pm.

Identification of Black Spots

The data in figure 15 clearly shows that

location W 3km (near grain market Khijrabad) is the black spot. The number of accidents is uniformly distributed over other locations.

Observations about identified black spot:

1 Very high volume of mixed traffic due to proximity to the city.
2 Illegal divider crossings.
3 No traffic light on Khijrabad main Chowk.
4. Road width is compromised due to encroachment by unauthorized commercial activity and parking.
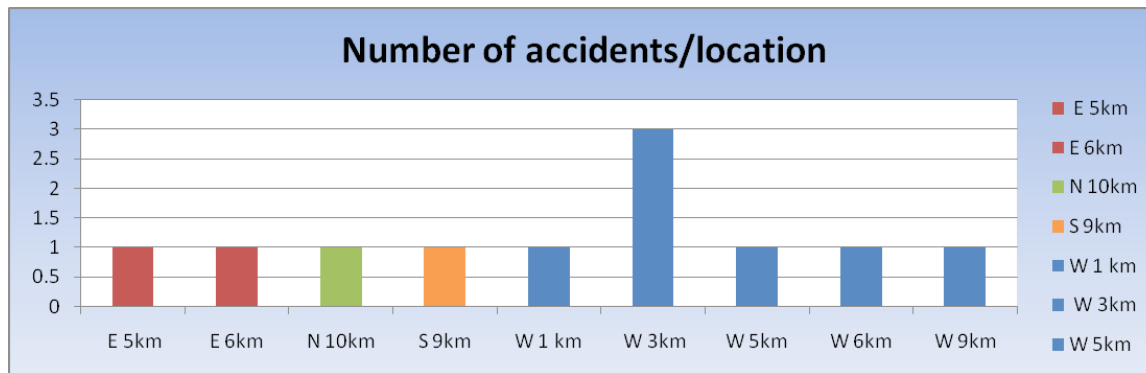5. Improper road lighting conditions even though this stretch lies within the town limits.

Figure 15: Identification of Black spot

Stretch 6 (KhijrabadtoHathiniKund Barrage 28km-34km)

Classification of accidents according to months:

The data collected has been arranged according to accidents per month.
In the data shown in figure 16 we observe that accidents have are distributed across three months i.e January, April and July. All the accidents occurred during 2011.

Classification of accidents according to time of day:

We can observe that a majority of accidents takes place in the evenings and during the day.
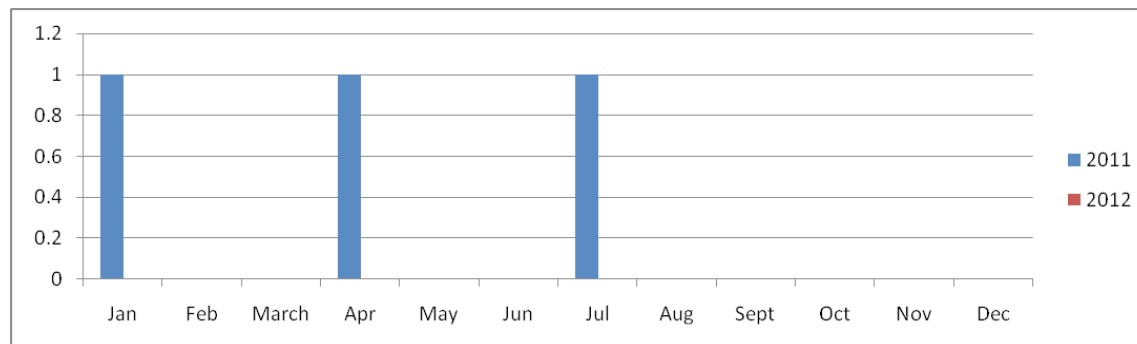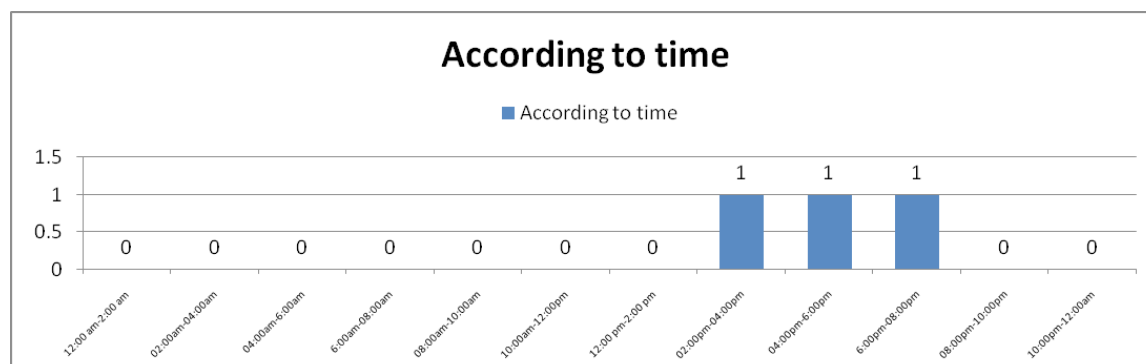

Figure 16: Accidents according to month/year

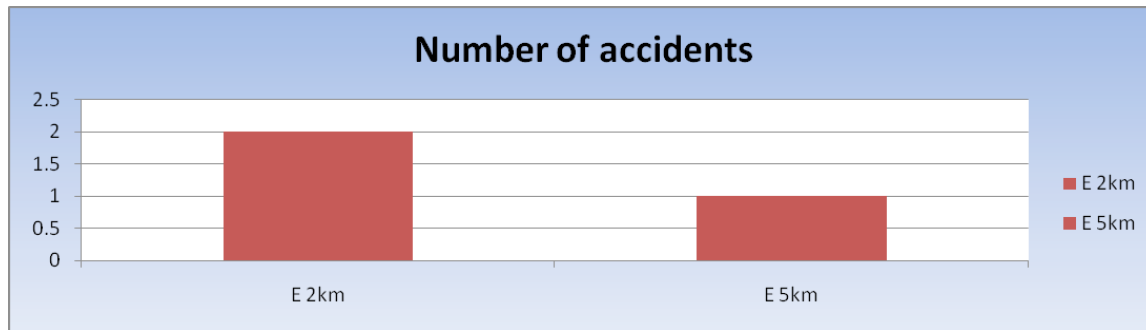

Figure 17: Accidents according to time

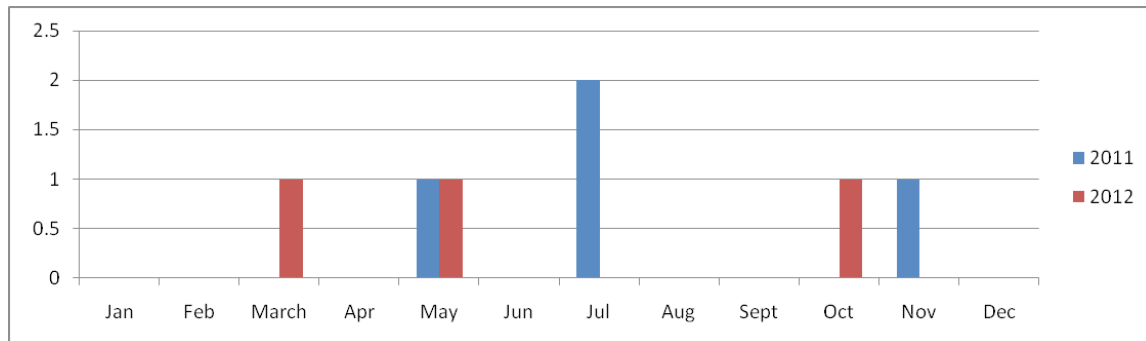**Figure 18:** Identification of Black Spots

Figure 19: Accidents according to month/year

Identification of Black spots

E 2 km (near Tajewala Village) is the black spot on this stretch.

Observations about identified black spot:

1. Many heavy vehicles coming from U.P through HathiniKund Barrage and Tajewala head merge with Nh-73A at the identified black spot.

Stretch 7(HathiniKund Barrage – Lal Dang 34km – 46.80km)

Classification of accidents according to months:-

The data collected has been arranged according to accidents per month. In the data shown in figure 19 we observe that more accidents have taken place during July, May and October. During rainy seasons there is higher probability of accidents due to slippery roads and low visibility during heavy rains. Considerable number of accidents was also observed during peak summer season.

Classification of accidents according to time of day:-

It can be observed that a majority of accidents takes place in the evenings and early mornings. Late night accidents mainly occur because of reduced alertness of the driver. In the figure 4.39 we observe that maximum number of accidents occur from 04:00 pm-06:00 pm. Occurrence of accidents is uniform across most of the other time slots.

Identification of Black spots

NE 10 km(Near LalDhang) location can be identified as the black spot for the given stretch.

Observations about identified black spot:
1. Steep gradient.
2. Damaged shoulder.
3. Sharp curves on the road.

Overall Analysis of Data

Month/Year-wise data analysis:

On observing overall trends in collected data in figure 22 we observe that maximum number of accidents take place during the month of April, followed by January, July and October. Month-wise no general trends can be observed.

Analysis according to Time of the day:

Maximum number of accidents takes place between 12pm to 2pm i.e. 13. It is followed by 2pm -4pm and 4pm- 6 pm i.e 12 accidents each.
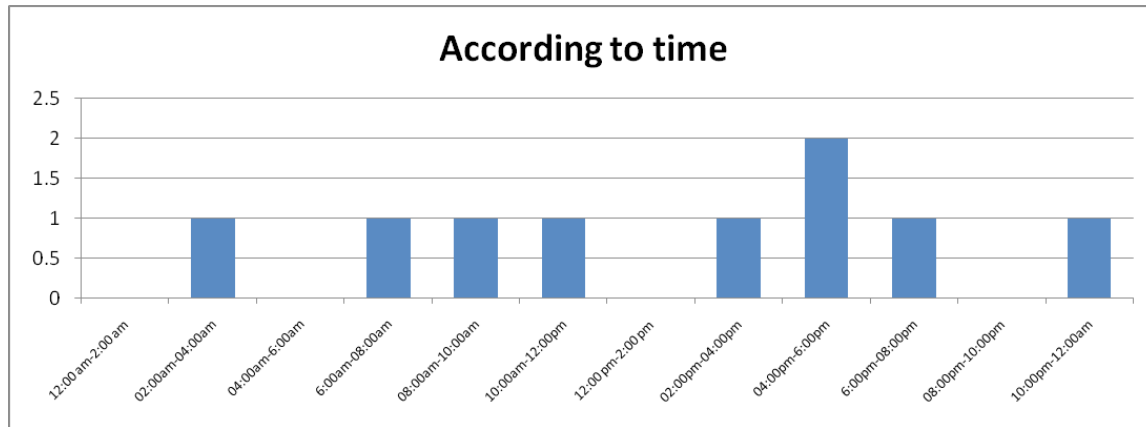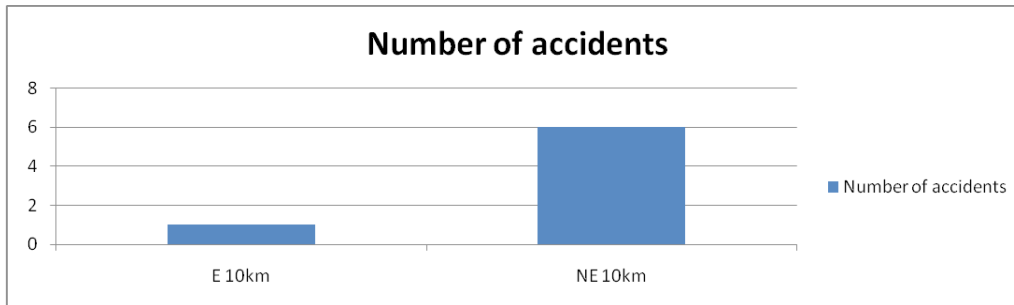

Figure 20: Accidents according to time

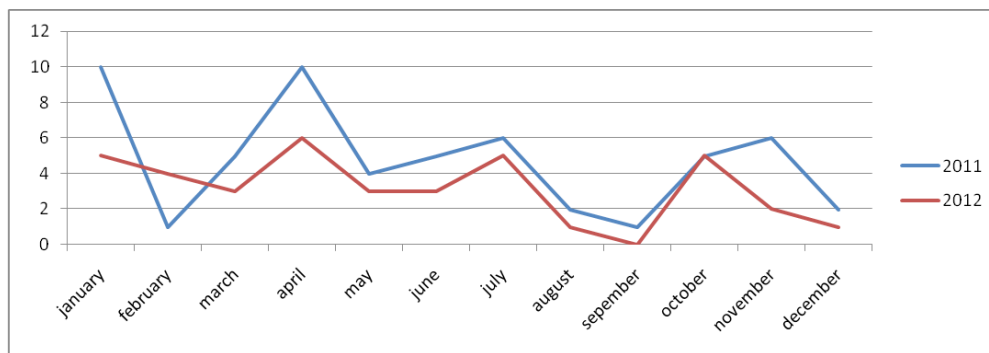**Figure 21:** Identification of Black spots

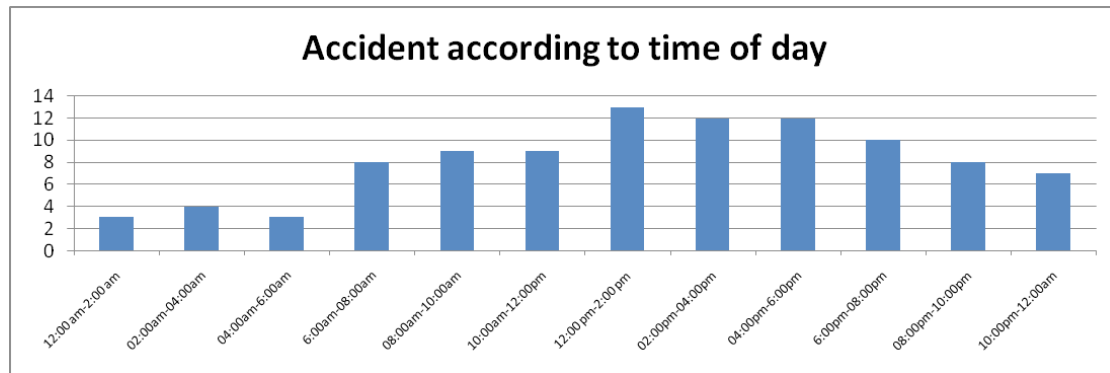**Figure 22:** Total accidents according to month/year

Figure 23: Total accidents according to time

CONCLUSIONS

On the analysis of above data certain trends were observed and the following conclusions can be drawn from the same:

1. The maximum number of accidents is observed during the winter month of January. The reason for the same can be attributed to fog and smog conditions.
2. As per the time of the day, maximum accidents take place between 12pm to 4 pm.
3. During physical examination of the given road it was observed that on maximum length of the studied stretch, the shoulder is either not properly made or repaired fully damaged and very low from the edge of road. This too is a cause of accidents.
4. The S7 and S3 stretches of the road have sharp curves which cause accidents.
5. Stretch S4 consists of a number of narrow bridges where the accidents occur.
6. Lack of proper lane for two wheelers was observed at many stretches.
7. Steep gradient on certain patches of stretch S7 also cause accidents.
8. Improper road design and lack of proper road signs at t-junctions and sharp curves also causes accidents.

Black Spot Identification:

The following points were observed about various Black spots:

1. Very high volume of mixed traffic especially heavy vehicles due to proximity to lakkar Bazar.
2. Many heavy vehicles carrying timber move on the wrong side of the road because of timber market.
3. Lack of proper road markings and Road signs.
4. No speed breakers on access roads.
5. Narrow bridge near Urjani village.
6. No traffic light on Khijrabad main Chowk.
7. Road width is compromised due to encroachment by unauthorized commercial activity and parking.
8. Improper road lighting conditions even though this stretch lies within the town limits.
9. Other factors including Steep gradient, damaged shoulder, Sharp curves on the road.

REFERENCES

[1] Sanjay Kumar Singh and Ashish Misra (2004), "Road Accident Analysis: A Case Study Of Patna City",Urban Transport Journal 2(2): 60-75

[2] Sensarma Kuntal, Balani Nimmi, Rawat S S (2011), "Road Accidents in India,2009", Government of India, Ministry of Road Transport and Highways Transport, New Delhi.

[3] Bishai, D., Quresh, A., James, P., Ghaffar, A., 2006. National road casualties and economic development. Health Economics 15, 65-81.

[4] Al-Ghamdi A (2003), "Analysis of traffic accidents at urban intersections in Riyadh" Accident analysis and prevention,35:717-724.

[5] Aworemi, Joshua Resmi Abdul-Azeez, IbraheemAdegoke, Olabode, SegunOluwaseun (2010), "Analytical study of casual factors of road traffic crashes in southwestern Nigeria" educational Research Volume 1(4) pp .118-224.

[6] Downing, A j, C J Baguley and B L Hills (1991), "Road safety in developing countries: an overview", Transport and Road Research Laboratory, Crowthorne, Berkshire.

[7] IRC-SP-55-2001 "Guidelines on Safety in Road Construction Zones".

[8] Peden Margie, Scurfield Richard, Sleet David, Mohan Dinesh, Hyder A Adnan, Jarawaneva and Mathers Colin(2004), "World Report on Traffic Injury Prevention, Geneva",World Health Organisation, Geneva, 2004.

[9] RavishankarRajaraman (2009), "Analysis of Road Traffic Accidents on NH-45, Kanchipuram District (Tamil Nadu)",IRTAD Conference,16-17 September, 2009, South Korea

[10] "Road User Behaviour: A Chennai Traffic Study", JP Research Private Limited, Volume3,No.2,April 2008.