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Study of Accidents on Yamuna Expressway's section joining Noida and Greater Noida

Dinesh Vagadia¹

¹Civil Engineering Department, Government Polytechnic Rajkot, 360003, India,

Abstract: Road being key component of infrastructure play vital role in development of any area. It is general observation that road accidents also increase simultaneously with road development. A study is carried out to find the probable causes of high rate of accidents on Noida to Greater Noida segment of newly built Yamuna Expressway in Uttar Pradesh. Study objectives, methodology and outcome are briefly discussed in present paper.

Keywords Yamuna Expressway, accidents, traffic, speed

I. INTRODUCTION

The Yamuna Expressway Project is conceived with the idea to not only reduce the travel time between New Delhi and Agra but also to open up avenue for Industrial and urban development of the region and provide the base for convergence to tourism and other allied industries.

Road accidents are one of the most important problems being faced by modern societies. Road fatality rates in India are probably among the highest and out of 1.25 million deaths worldwide every year, 8-10 per cent of all road deaths are in India ([1],[2]). On Yamuna Expressway section joining Noida and Greater Noida, the rate of accidents is much higher than the national average. Degree of fatality is also very high. These things are going to create a huge economic loss and also will create a bad image for investors. To identify the reasons for higher accident rate and to find out probable measures to reduce the rate, this study is carried out.

The study stretch as shown in Figure-1 is 23.4 km long section of Yamuna Expressway which starts from AMITY University at Noida and ends at Pari Chowk in Greater Noida.

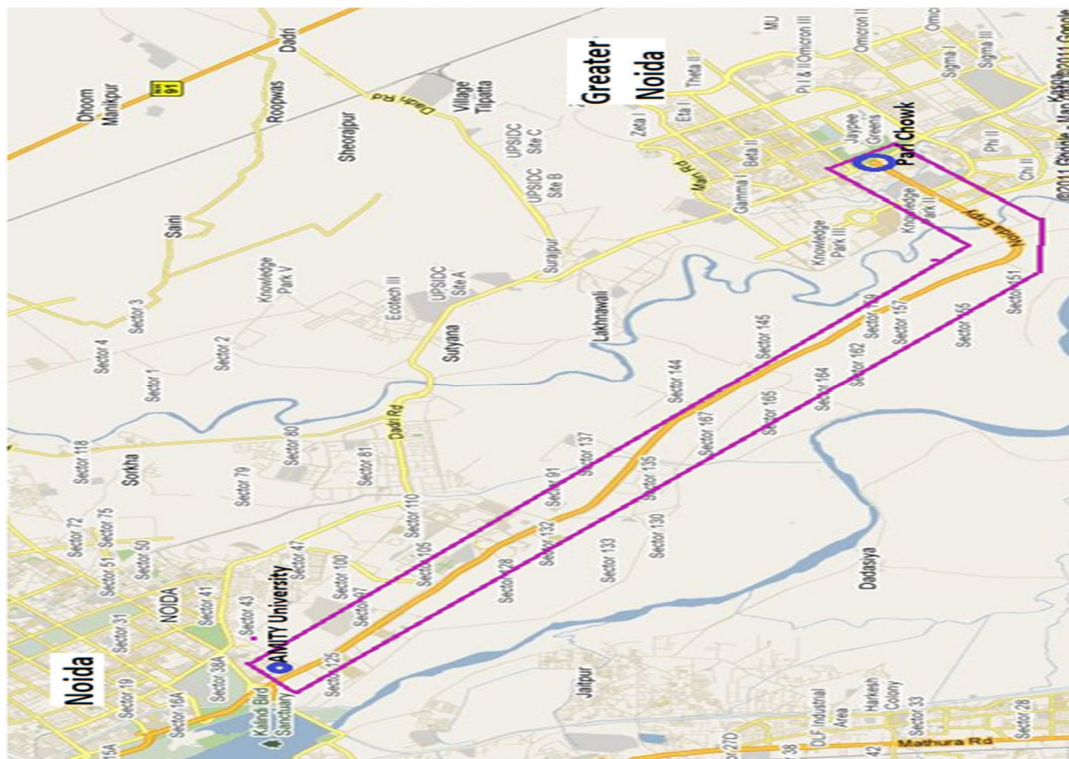


Fig. 1 Location sketch of study stretch

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II. METHODOLOGY

The objectives and methodology for the study are decided based on probable availability of secondary data and resources.

A. Study Objectives

The objectives and scope of the study are as under.

- 1) Obtain secondary data from concerned police stations regarding road accidents.
- 2) Analyze the secondary data and identify black spots, black sights and dark sights with time, type and causes of accidents.
- 3) Obtain spot speed of the vehicles at identified locations.
- 4) Carry out physical survey on both the sides of the given stretch on Yamuna expressway.
- 5) Carry out road users' opinion survey
- 6) Suggest measures to reduce accidents and fatalities.

B. Study Planning

To meet the above objectives, the methodology adopted for the study consists of main activities like Secondary data collection, Field Surveys, Data Analysis, Interpretation and Report preparation.

C. Traffic Surveys

In order to access the traffic characteristics and road users' opinion, Spot Speed Survey, Classified Traffic Volume Count Survey, Pedestrian Volume Counts (Across Movement) and Road Users Opinion Survey were carried out.

D. Spot Speed Survey

Spot speed of various categories of vehicles were measured using laser gun with 15 minutes time interval for both direction of the road at four locations identified by analysis of secondary accidents data. The survey was carried at Safipur village (4Hrs.), Badauli village (12Hrs.), near Galgotia University (16Hrs.) and near AMITY University (16Hrs.).

E. Traffic Volume Count

Directional classified traffic volume count survey was carried out for 24 hours (08:00 am 21-06-2011 to 08:00 am 22-06-2011) on a normal working day. The traffic volume by different vehicle categories (such as B segment car, C segment car, Jeep/SUV, 2-wheelers, Bus, Truck, Auto and other slow moving vehicles) was counted every 15 minutes time interval by trained enumerators for the entire period of the survey. As substantial traffic change is possible due to bifurcation of road for sector 82 and 105, Noida to Greater Noida traffic was counted at two locations; one before the road bifurcation and other below the over bridge. Greater Noida to Noida traffic was counted near JayPee site office.

F. Pedestrian Volume Counts (Across Movement)

Pedestrian cross movements were counted near Galgotia University and near AMITY University simultaneously with spot speed survey.

G. Road Users' Opinion

Road users' opinion survey was carried out by using printed Performa. As major road users - car owners were not expected to stop cars for interview, opinions were taken from auto drivers and other concerned persons. Some opinions were taken from other nearby location like petrol pumps where car users were expected to answer.

III. DATA ANALYSIS

The secondary data from police station and data collected from primary surveys were collated and fed in the Excel format for the analysis purpose.

A. Accident Analysis

The secondary data collected was analyzed after necessary coding. Total 84 accidents are documented in concerned police station

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from 01-07-2007 to 30-06-2010.



Fig. 2 Year wise total no. of accidents

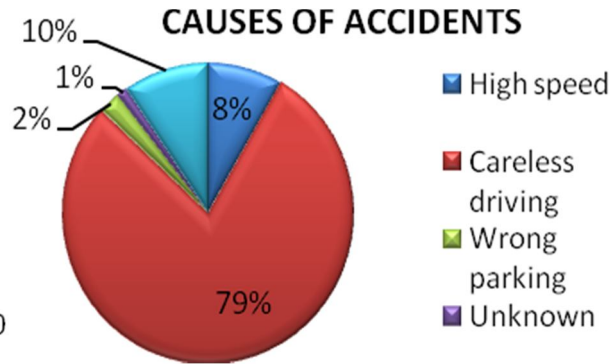


Fig. 3 Causes of accidents

Figure-2 shows the year wise accidents. It is highest in 2009. Year 2010 and 2007 have fewer accidents because data in each year is of six months. Figure 3 shows the causes of accidents. About 79% causes are careless driving followed by wrong side driving (10%), high speed (8%), wrong parking (2%) and unknown (1%).

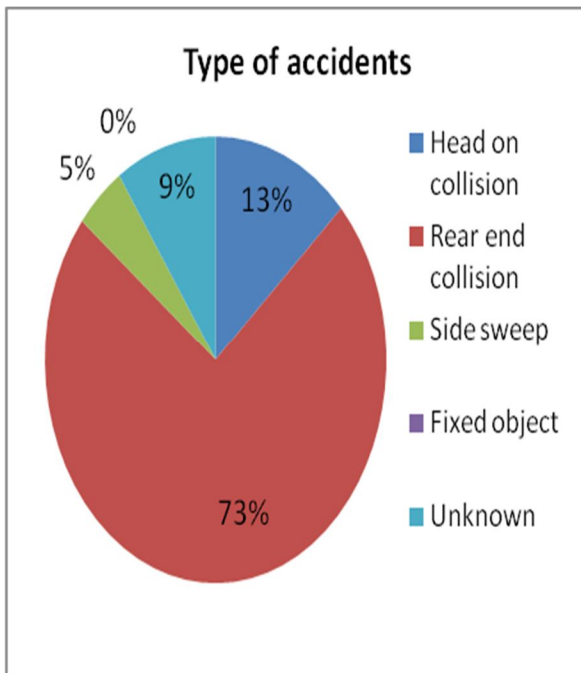


Fig. 3 Type of accidents

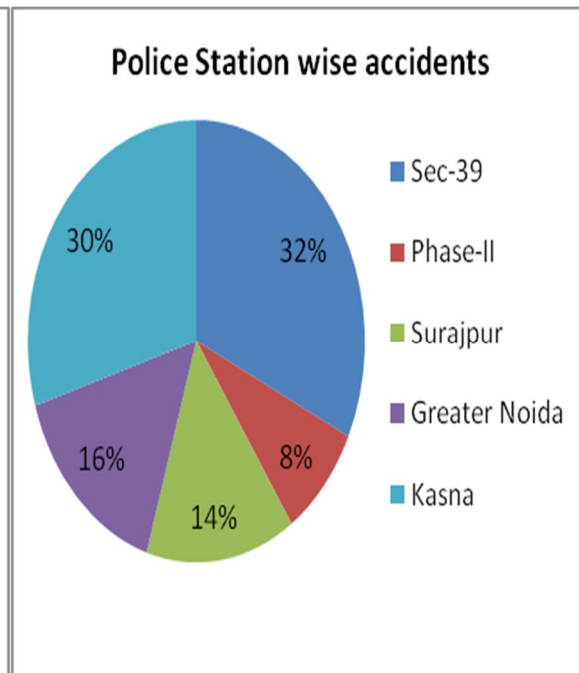


Fig 4 Police station wise accidents

Figure-4 shows type of accidents. Rear end collision are highest (73%) followed by head on collision (13%), unknown (9%), side sweep (5%) and others. Rear end collision accidents are more because most of the accidents are by fast vehicles (Car and truck) with medium and slow vehicle (Two wheeler, pedestrian, cycle). Figure-4 shows percentage of accidents registered in concerned police stations. As accident locations are not exactly shown in FIR of concerned police station, accident spots are identified as a road stretch with concerned police station and based on description in the FIR. AMITY University, Badauli, Safipur and Galgotia Uni. near Pari chowk are identified as main spot for the study. Figure-5 shows the accident related details like number of fatalities, grievous injuries, minor injuries, fatal accidents and total accidents in the last three years. Figure-6 indicates that more accidents are taking place during night time compare to day time.

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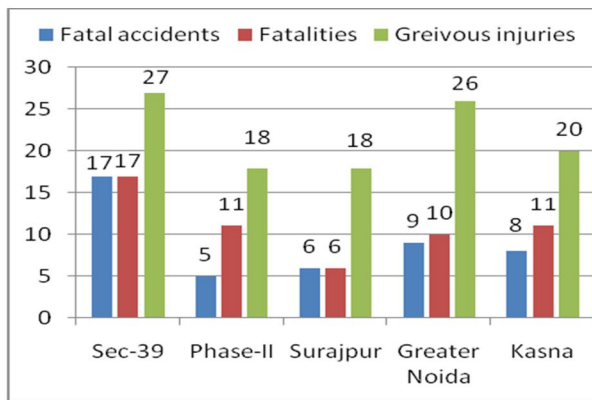


Fig. 5 Accident fatalities and injuries

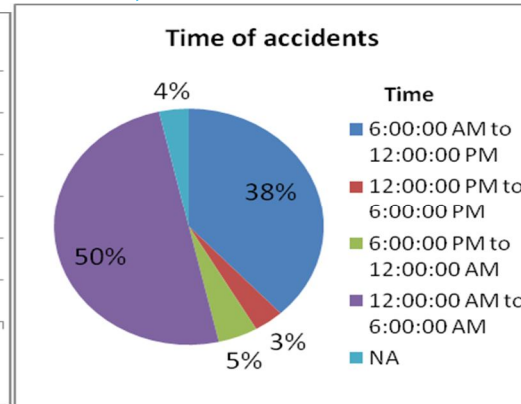


Fig. 6 Time of accidents

B. Traffic Volume

Figure-7 presents the observed hourly traffic volume on the road. Traffic volume in Noida to Greater Noida direction is about 43000 vehicles and in Greater Noida direction is about 42000 vehicles which is almost balancing. Traffic volume in Noida to Greater Noida direction near over bridge is about 28000 vehicles which is due to road bifurcation towards sector 82 and 105.

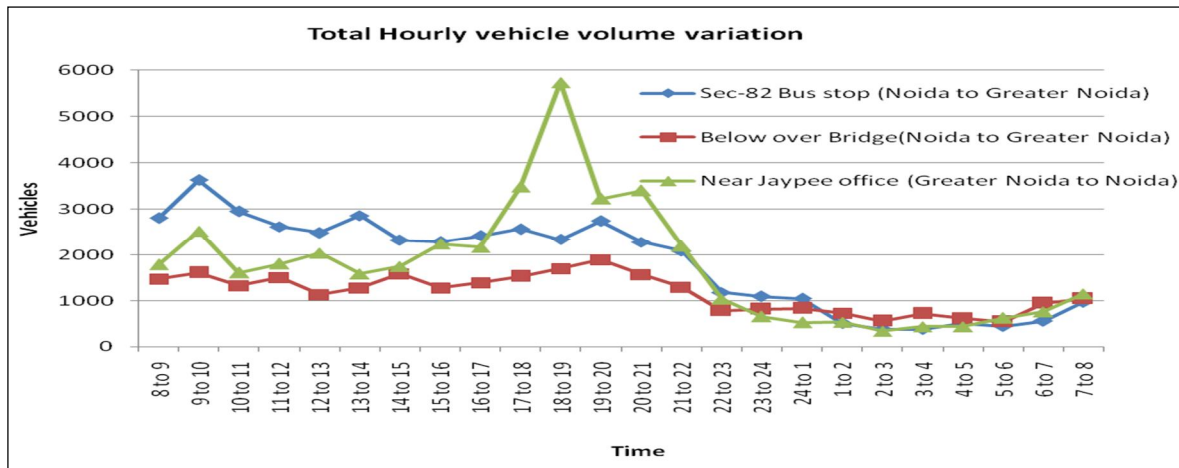


Fig.7 Total Hourly traffic volume variation on the road

C. Traffic composition

The traffic composition observed on the road at three locations. It is observed that cars are predominant (60 to 66%) followed by two-wheelers (20 to 25%). Traffic composition at sect-82 below over bridge (Noida to Greater Noida) and at Jaypee office (Greater Noida) is almost same while composition at Sect-82 bus stop (Noida to Greater Noida) is slightly different. This indicates that about 4% of 2-wheeler traffic is diverted towards sect-82-105 road. Total about 85% of the traffic are cars and two wheelers.

D. Spot Speeds

Spot speed survey was carried out on 4 locations. AMITY University and Galgotia University are locations with high pedetrian volume and at ends of the stretch. Badauli and Safipur are mid-block locations. Average spot speeds and speed distribution of each category of the vehicles are determined for all the locations.

E. Average spot speed

Figure-8 shows spot speeds variation of various vehicles in Greater Noida to Noida direction at Badauli village. It is observed that average car speed ranges between 85 to 95 kmph while that for other categories like two wheeler, truck and auto ranges between 55 to 75 kmph. Thus there is substantial speed difference exists between different vehicle categories on the road.

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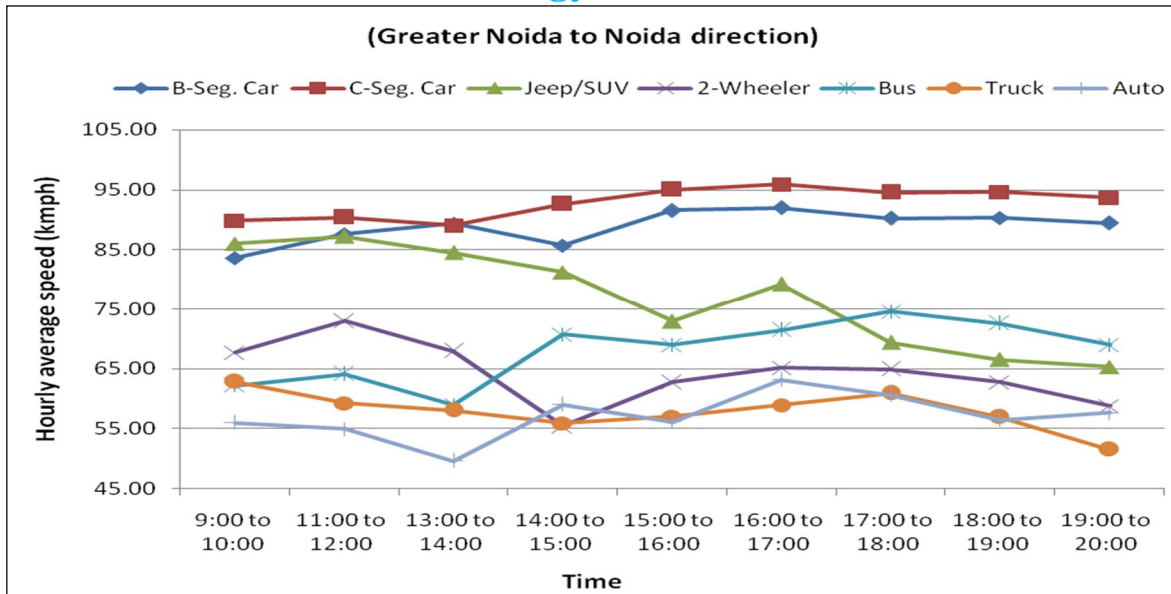


Fig. 8 Hourly average spot speeds of various vehicles at Badauli (Gr. Noida to Noida)

F. Spot Speed Distribution

Figure-9 shows spot speed distribution of various vehicle categories near Badauli village. It is observed that about 35% of the total cars travel at 90-100 kmph. 45% of the total buses have speed in the range 70-80 kmph. Around 25% of the total two wheelers have speed in the range 50-60 kmph. Also about 40% of the total trucks are having speed in the range 50-60 kmph. Figure-10 shows speed distribution in cumulative percentage of total vehicles. It is seen that speed is highest at Badauli followed by Safipur, Galgotia University and AMITY University respectively. About 15 % of all the vehicles have spot speed more than 90 kmph. As samples are from all categories and cars are having high portion of about 65 %, the percentage of vehicles having speed more than 90 kmph may further increase.

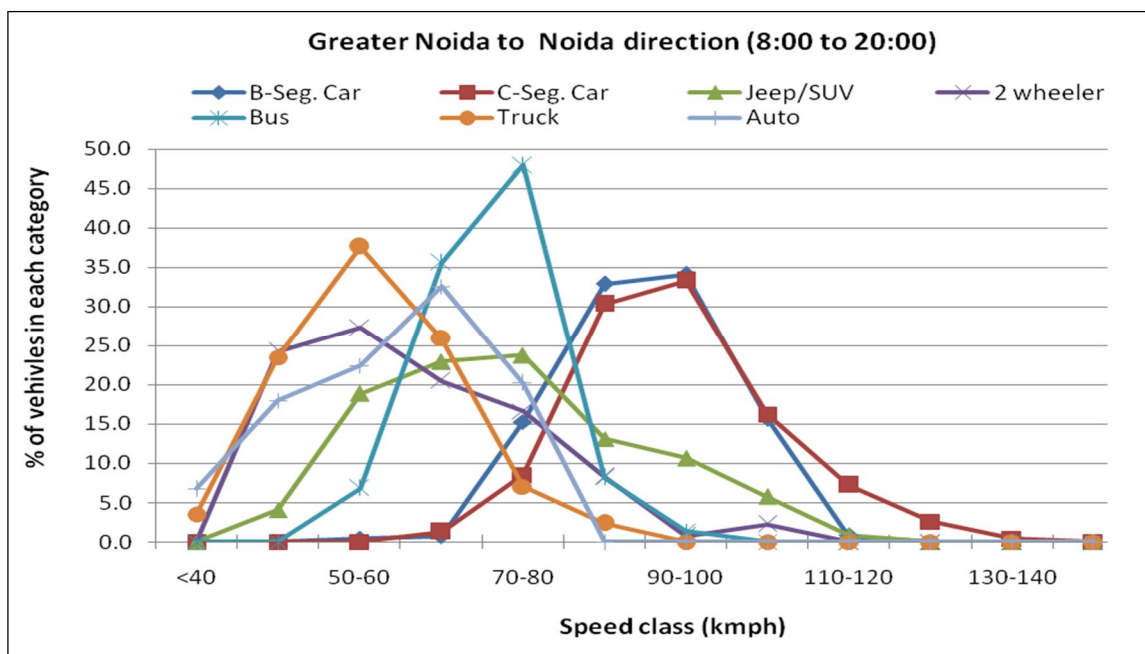


Figure 9: Speed Distribution of Vehicles at Badauli in Noida to Greater Noida Direction

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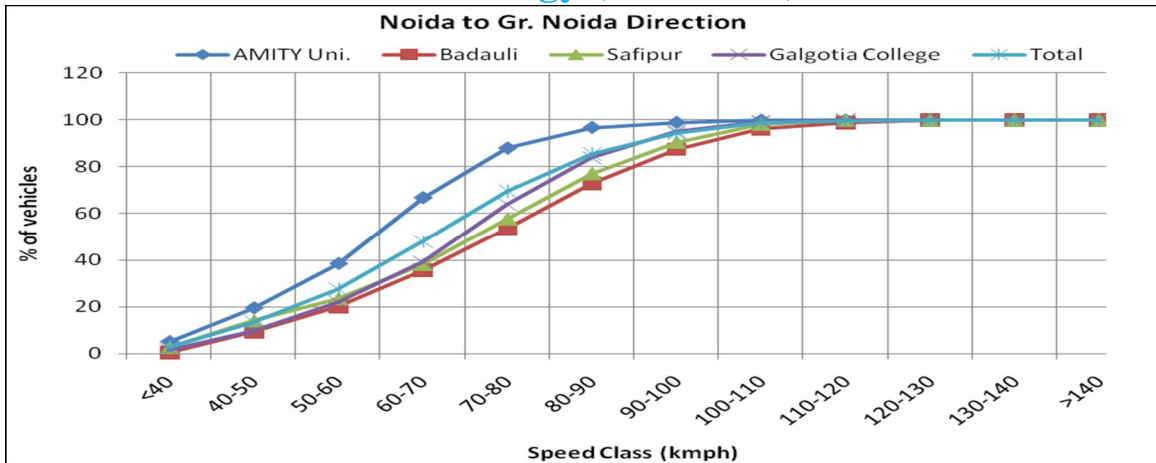


Figure10: Speed Distribution in cumulative % of Vehicles in Noida to Gr. Noida Direction

G. Road Users' Opinion

The opinions of the road users obtained by interview are collated and analyzed in Excel and results are obtained. Fig.11 to 15 shows the personal details like age, education, occupation and their opinion. About 76% of the road users are youngsters. About 29% drivers are illiterate which is the mass expected to be lacking in understanding road sign and other instructions. About 50% of the respondents are in private services and 29% are the students of nearby educational institutions. As per opinion, main cause of accidents is careless driving (45%) followed by high speed (40%), others (7%), road geometry (4%) and environmental conditions (3%).

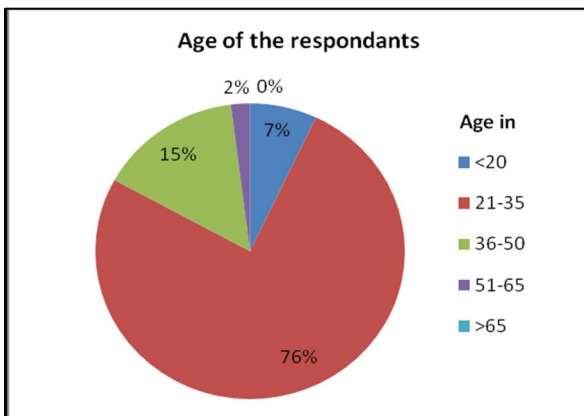


Figure 11: Age of respondents

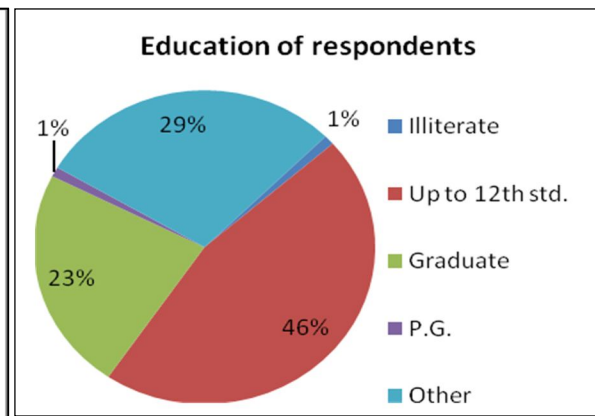


Figure 12: Education of respondents

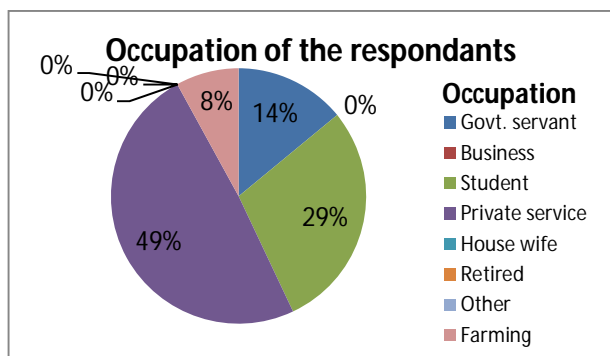


Figure 13: Occupation of respondents

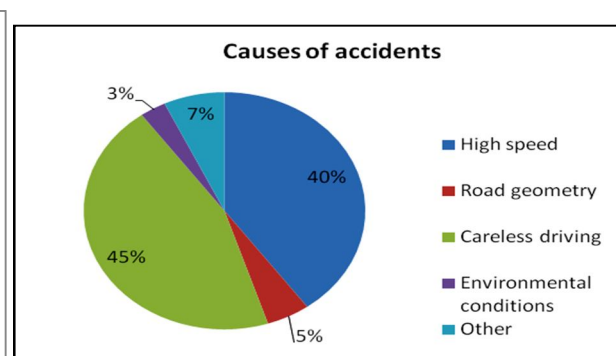


Figure 15: Users' opinion for causes of accidents

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IV. PROBLEM IDENTIFICATION AND REMEDIAL MEASURES

A. Problem Identification

The study stretch is a six lane divided highway with about 1.5 m paved shoulders on both sides and about 3 m wide median covered by barbed wire fencing. Road sides are with about 0.6 to 0.9 m railing to control the access. Cross movement facilities for the vehicles are provided at villages. Bus shelters are provided near villages and major stops. Road is open for all users whether fast or slow. There is no establishment specially meant for enforcement and access control on the road. Figure-16 shows an accident observed during field visit.



Figure 16: Accident observed during field visit



Figure 17: Crossing the barrier with bicycle

Some of the main problems identified based on data analysis, field observations and opinion of the road users are lack of traffic discipline, high speed, mix traffic with high speed differential, less traffic volume than the road capacity, lack of pedestrian crossing facility, lack of access control, lack of maintenance and wrong road design concept of expressway with road side development. Figure 17 to 27 themselves describe these problems.



Figure 18: Wrong side driving



Figure 19: Parking on the road lane

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Figure 20: Mix traffic



Figure 21: Auto over loaded with passengers



Figure 22: Risky crossing at AMITY Uni.



Figure 23: Pedestrians crossing the road at Pari chowk



Figure 24: Passenger vehicles at Pari chowk

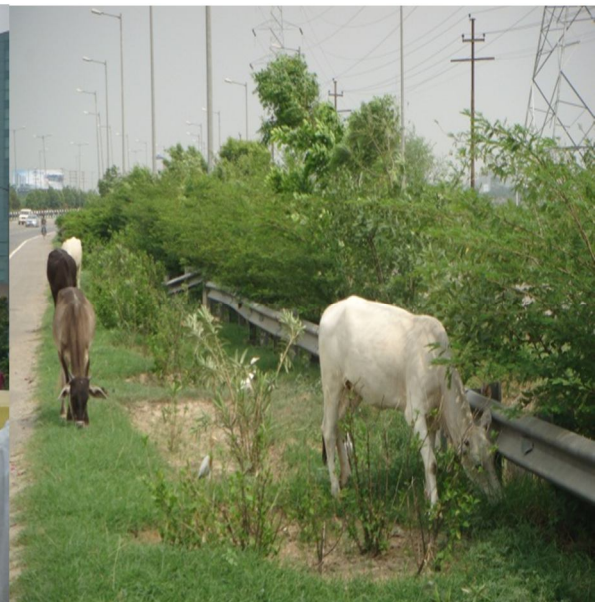


Figure 25: Cattle grazing on shoulders

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Figure 26: Gap in the median for road crossing



Figure 27: Township beside the road

B. Remedial Measures

As discussed in problem identification part, major problems are high volume of pedestrian traffic across the road at many places, traffic indiscipline, high speed, heterogeneous traffic and lack of access control. These problems can be reduced or eliminated by proper law enforcement, adequate pedestrian facilities, improvements in road design and awareness of traffic discipline and road safety in road users.

V. CONCLUSIONS

A. Main observations for the accidents are:

- 1) Traffic volume on the road is in the range of 2000 to 2500 vehicles per hour in most of the day hours and it is less than 1000 vehicles per hour in night hours in each direction. This is very less than the capacity of a six lane divided highway leading to a freeway condition resulting in high speed driving.
- 2) During night hours, truck volume and speed of fast moving vehicles like cars and trucks shoot up to dangerous condition.
- 3) Road is having developed side lands with residential townships, commercial, educational and industrial complexes. This development is in fast stage and within short time, the road side lands are going to be fully developed which will generate high traffic volume with large amount of cross road movements.
- 4) Road is designed as access controlled expressway with concept of road side land development which is contradictory. Instead, the road needs to be designed like urban arterial road with sufficient facilities for cross road movements considering local requirements.
- 5) All slow and fast moving vehicles are allowed which results in heterogeneous traffic with complex characteristics.
- 6) Passenger vehicles like bus and auto are allowed to ply with local passengers and bus shelters are also provided with unplanned and unsafe gaps in the median without any warning and informatory sign and symbols.
- 7) High rate of pedestrian fatalities is due to lack of road crossing facilities.
- 8) High rate of rear end collisions and fatalities is due to heterogeneous traffic in freeway with fast and slow moving vehicles plying randomly without specified lanes.
- 9) Traffic discipline and access control is not up to the mark necessary for high speed expressway.
- 10) To reduce the accidents following recommendations may prove useful:
 - a) Start campaign for traffic awareness
 - b) Provide FOB near at the locations where pedestrian cross traffic is high.
 - c) Establish dedicated staff for traffic discipline enforcement.
 - d) Prohibit or provide separate lane for slow moving vehicles.
 - e) Provide emergency response system for immediate medical treatments.
 - f) As road is functioning like urban road, redesign the road as urban arterial road with lower speed limits.

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