

Analytical Study of Traffic Conditions and Manmade Features on Road Safety in Various districts of Haryana

Pankaj Dahiya

M.Tech Scholar (Civil Engg.), CBS Group of Institutions, Jhajjar, Haryana

ABSTRACT

Road Safety is a multi-sectoral and multidimensional issue. It incorporates the development and management of road infrastructure, provision of safer vehicles, legislation and law enforcement, mobility planning, provision of health and hospital services, child safety, urban land use planning etc. Road safety management is a major concern in India. This paper contains the data collected from NH-71 highway on the section from Rewari to Jind in Haryana, their analysis and results are derived. The study is divided in four sections, at each section study is conducted by accidental statistics reports and usage studies which further contains accumulation studies and duration studies.

The results and recommendations reported in this study will help the administration, the planners and the traffic engineers in evolving better road safety techniques in these areas, also on the same pattern this can be used for other sectors of Haryana state.

Keywords: Traffic, road, management, national highways, signals.

INTRODUCTION

Road crashes take away the right to life of 3,000 people every day. This is a global humanitarian disaster, and it is man-made. (Global Road Safety Partnership Annual Report 2015) Road safety is one of the most important problems in our society. Every year 1.2 million of people are killed and between 20 and 50 million people are injured in road accidents. If current trends continue road traffic accidents are predicted to be third leading contributor to the global burden of Disease and injury by 2020.

India had earned the dubious distinction of having more number of fatalities due to road accidents in the world. Road safety is emerging as a major social concern around the world especially in India (Shivkumar and Krishnaraj). Accidents are a drain on the national economy and may lead to disablement, death, damage to health and property, social suffering and general degradation of environment.

To minimize the no of crashes by any kind and severity expected to occur on the entity during a specific period is known as road safety. Accidents and the fatalities on road are the result of inter-play of a number of factors. Road users in India are heterogeneous in nature, ranging from pedestrians, animal- driven carts, bi-cycles, rickshaws, hand carts and tractor trolleys, to various categories of two/three wheelers, motor cars, buses, trucks, and multi-axle commercial vehicles etc., The vehicle population has been steadily increasing because of change in the style of living of people. Increase in vehicle population with limited road space used by a large variety of vehicles has heightened the need and urgency for a well thought-out policy on the issue of road safety. In India the rate of accident is directly proportional to growth of vehicle population.

Road accidents are a human tragedy, which involve high human suffering. They impose a huge socio-economic cost in terms of untimely deaths, injuries and loss of potential income. The ramifications of road accidents can be colossal and its negative impact is felt not only on individuals, their health and welfare, but also on the economy. Consequently, road safety

has become an issue of national concern. Road Safety is a multi-sectoral and multi-dimensional issue. It incorporates the development and management of road infrastructure, provision of safer vehicles, legislation and law enforcement, mobility planning, provision of health and hospital services, child safety, urban land use planning etc. In other words, its ambit spans engineering aspects of both, roads and vehicles on one hand and the provision of health and hospital services for trauma cases in post-crash scenario. Road accident in India is shown in Table 1.

Table 1: Road accident in India (2004-2015)

Number of Road Accidents and Number of Persons Involved: 2002 to 2015					
Year	No of Accidents		Number of Persons		Accident Severity
	Total	Fatal	Killed	Injured	
2004	4,07,497	73,650	84,674	408,711	20.8
2005	4,06,726	73,589	85,998	435,122	21.1
2006	4,29,910	79,357	92,618	464,521	21.5
2007	4,39,255	83,491	94,968	465,282	21.6
2008	4,60,920	93,917	105,749	496,481	22.9
2009	4,79,216	1,01,161	114,444	513,340	23.9
2010	4,84,704	1,06,591	119,860	523,193	24.7
2011	4,86,384	1,10,993	125,660	515,458	25.8
2012	4,99,628	1,19,558	134,513	527,512	26.9
2015	4,97,686	1,21,618	1,42,485	5,11,394	28.6

Source: Road statistics of India (2015)

Road Safety & Various Causes of Accident

Road traffic safety refers to methods and measures for reducing the risk of a person using the road network being killed or seriously injured. The users of a road include pedestrians, cyclists, motorists, their passengers, and passenger sofon-road public transport, mainly buses and trams. Best practice road safety strategies focus upon the prevention of serious injury and death crashes in spite of human fallibility. Safe road design is now about providing a road environment which ensures vehicle speeds will be within the human tolerances for serious injury and death wherever conflict points exist. The various causes of accidents may be due to three factors shown in fig 1.

- (i) Driver
- (ii) Vehicle
- (iii) Environment

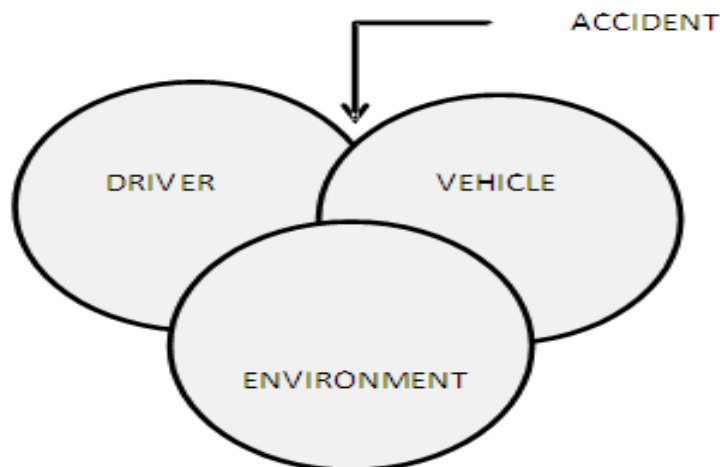


Fig 1. Causes of Accident

Outline of the Report

The work has been documented in the following manner. The first chapter gives overall understanding about the present accident scenario at national level. It also includes the importance of the two-lane roads, factors affecting accident and their contribution, and defines objectives of the study. Chapter two is comprised of review of literature. Site selection for data collection, methodology adopted for data collection are discussed in third chapter. Chapter four depicts traffic and surface properties data of Study stretch. Chapter five is comprised of accident investigation and Black Spot analysis. Significant conclusion drawn from study and further work are given in chapter six.

LITERATURE REVIEW

Many factors may exhibit a measurable influence on driving behavior and traffic safety on two- lane highways (Bhuyan). These include, but are not limited to,

- Human factors such as improper judgment of road ahead and traffic, driving under the influence of alcohol or drugs, driver education and experience, young driver, age and sex.
- Traffic factors like speed, volume, density, capacity, traffic mix and variation.
- Vehicle deficiencies, such as defective brake, headlight, tyres, steering and vehicle condition
- Road condition like slippery or skidding road surface, ravel, pot hole, ruts etc.
- Road design such as inadequate sight distances, shoulder width, no of lanes, improper curve design, improper lighting and traffic control devices.
- Weather condition like fog, heavy rainfall, dust, snow etc.
- Other causes such as enforcement, incorrect sign and signals, service station, badly located advertisement, stray animals etc.

Alcohol and Drugs

The leading cause of traumatic death is motor vehicle accidents, falling accidents and blunt trauma. The use of drugs such as alcohol or illicit such as opium, cocaine increases the risk of trauma by traffic collision. Other drugs such as benzodiazepines increase the risk of trauma in elderly people.

Alcohol causes deterioration of driving skills even at low levels and the probability of accidents increases with rising blood alcohol levels. Alcohol needs no digestion and is absorbed rapidly into the blood stream; about 10% to 15% of alcohol users develop alcohol dependence and become alcoholics. After drinking, the judgment power of the driver gets impaired which is a threat to road safety. Due to its effects, driver tends to take more risks, becomes more aggressive and takes a longer reaction time. The relative probability of causing accidents increases with the rising blood alcohol levels keeping road safety at stake. (Sivakumar and krishnaraj)

Another study funded by the Swedish National Road Administration reveals that impaired driving is an important road safety problem, and the characteristics of drivers impaired by alcohol or drugs are relevant to targeted interventions. The study considers young driver's socio demographic attributes: age, sex, class of origin and educational attainment, based on national young Swedish drivers (1988–2000) followed up in police registers for their first motor vehicle crash. Driving under the influence of alcohol or any other substance is forbidden in Sweden. The legal limit for drunken driving is 0.2% concentration in blood, or 0.10 mg per litre in breath. For aggravated drunken driving, the corresponding limits are 1.0% concentration and 0.50 mg/l, respectively.

The limit for any substance classified as a narcotic is zero. (Vaez and Laflame) Anne et al., summarized that fatalities during a crash rises when drinking age is lowered and fatalities during a crash rises when drinking age is lowered and fatalities decreases when drinking age is raised. He showed a relationship between minimum legal drink age and highway crash relationship. He concluded that lowering drinking age to eighteen will increase fatalities rate among young people. Peter and Robert conducted a roadside survey using alcohol breath analyzer and found that drivers with BAC < 0.04 were responsible for night traffic injury crashes which was low level drinking(one or two drink) using regression analysis.

Campos et al.,(2013) analyzed breath test of 4234 drivers during 2009-2012 in brazil after a new traffic law imposed since 1989 i.e. BAC limit 0.08g/using logistic regression he found that there was a 45% decrease in driver behavior and traffic death decreased by 63% downtown and 14% on road.

Longo et al., analyzed blood sample for alcohol, cannabinoids (THC), benzodiazepines from 2500 injured Australian drivers. He found drivers tested positive for alcohol only, benzodiazepine only. The combination of alcohol and cannabinoids and Combination of alcohol and benzodiazepines were more culpable for the crash than drug-free group. Analysis of Results for crashes are shown in Table 2.

Table 2: Alcohol and Drugs

Drug Combination	Single Vehicle (% culpable)	Multiple Vehicle (% culpable)
Alcohol only	95.7	79.7
Cannabinoids only	90.9	42.9
Alcohol + Cannabinoids	100	83.3
Benzodiazepine only	80	65.6
Stimulants	100	66.7
Alcohol + Benzodiazepine	100	85.7
Stimulants + Cannabinoids	-	100
Other combination	100	100

Labat et al., conducted a new study during 2011-2012. They found urine ethanol as positive in 50 cases, cannabinoids in 85 cases, opiates in 41 cases, amphetamines in 3 cases, cocaine in 1 case, buprenorphine in 18 cases, methadone in 5 cases and benzodiazepines in 4 cases. Drugs in particular ethanol and cannabinoids are responsible for fatally injured drivers.

Labat et al., (2008) studied post-mortem blood and urine sample of 1047 victims of traffic fatalities between 2000-2006 in UK. Out of these 54% of total victim were found to be positive for drugs and/or alcohol. 63% male pedestrian between the ages of 17-24 were involved in road traffic accident. Alcohol and cannabinoids were common substances among victim group. The presence of drugs and/or alcohol was of similar frequency in those victims in control (55% of driver, 48% motorcyclist, 33% cyclist) and not in control of a vehicle (52% of car passenger, 63% of pedestrians). He found some other drug like anti-psychotics, diabetic drug, heart drug and anti-inflammatory in the victim group.

Rio et al. studied the blood samples reports of 5745 Spanish drivers killed in road accident during 1991-2000. He found psychoactive drugs among 50.1% of those driver killed in road accidents. Mainly alcohol (43.8%), illicit drugs (8.81%) and medicinal drug (4.7%). For one every three cases (32%) a BAC over 0.8g/l was recorded, cocaine (5.2%), opiates (3.2%) and cannabis (2.2%) were three illicit drugs most frequently detected. Among medicinal drugs were benzodiazepines (3.4%), antidepressant drugs (0.6%) and analgesics (0.4%)

Keall et al., investigated the effect of alcohol, driver age and influence of passengers of driver fatal injury in New Zealand. They calculated risk factor as follows $\text{Relative risk} = (\text{Risk associated with BAC}) \times (\text{Risk associated with age}) \times (\text{Risk associated with passenger})$. A logistic model data was fitted for drivers under 200mg/dl (2%) which showed that risk at all BAC levels were statistically significant higher for drivers aged under 20 and for drivers aged 20-29 (three times) than for driver aged 30 and over.

ACCIDENT INVESTIGATION AND BLACK SPOT ANALYSIS

Accident no-1

Accident type: Head-on collision

Location: Kosli

Date and Time: MAR 30, 2015; 4.30PM

Vehicle 1: Tata Truck no HR-06/ B-6545

Vehicle 2: Bajaj CT- 100 motor cycle no HR-05/U-3323

Fatalities/Injuries: One person dead and one person severe Injured.



Fig. 2: Accident diagram and photos of stretch I

Accident no: 2

Accident type: collision with tree

Location: Jhajjar

Date and Time: JUN 13, 2016; 12.30PM

Vehicle 1: Asok Leyland trailer

Vehicle 2: Bajaj Auto

Fatalities/Injuries: Two person minor Injured

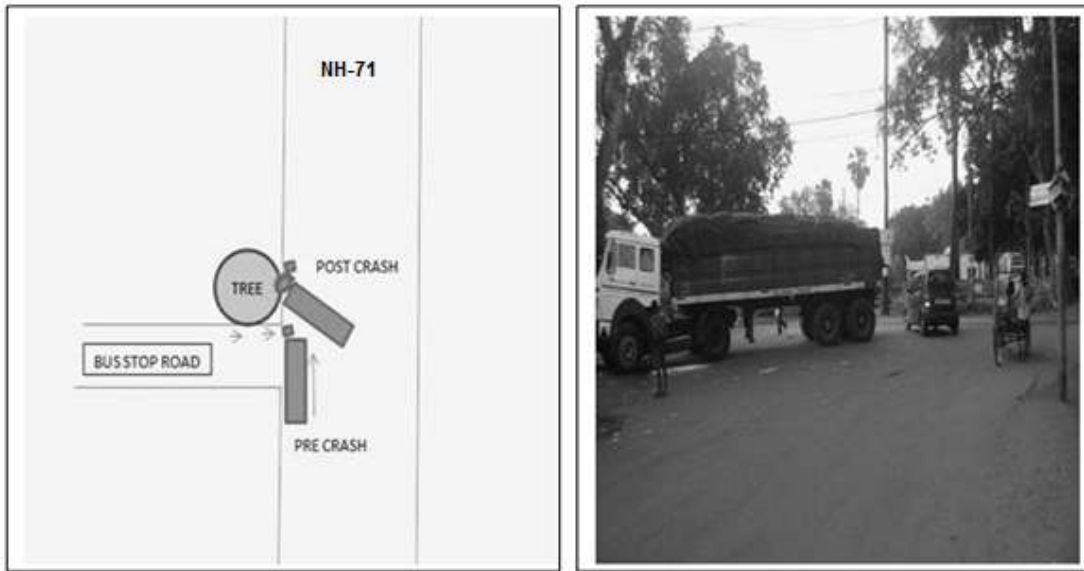


Fig. 3: Accident diagram and photos of stretch II

Accident no: 3

Accident type: collision with tree and compound wall

Location: Lakkan Majra

Date and Time: JUN 12, 2012; 6.10AM

Vehicle 1: Tata truck

Fatalities/Injuries: One person severe Injured and one minor injured



Fig 4: Accident diagram and photos of stretch III

Table 3: Statistical Validation of Model

Name of Stretch	Actual Value(Yi)	Value from Model(Y)	Error (e)	e ²
1	16	15.28	-0.72	0.5184
2	21	20.6	-0.4	0.16
3	2	1.83	-0.17	0.0289
4	28	27.76	-0.24	0.0576

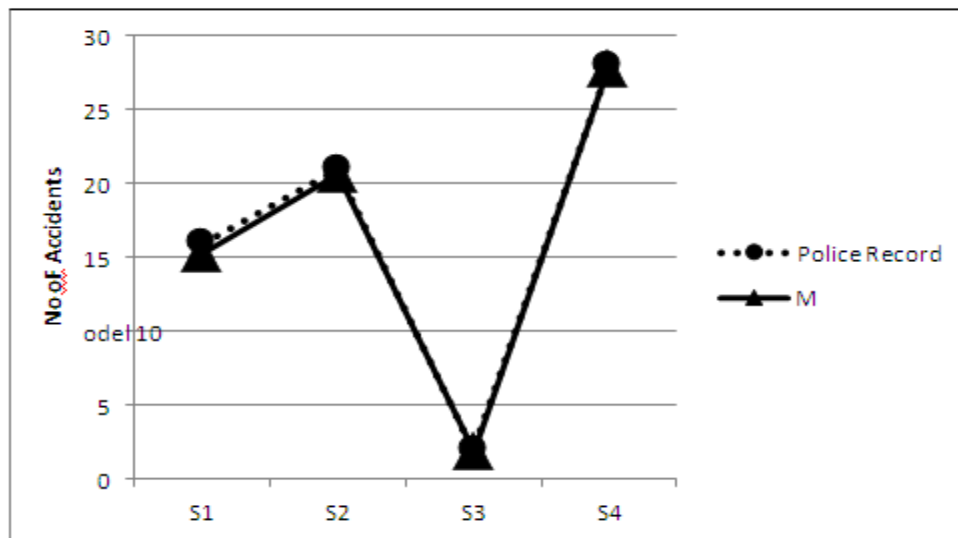


Fig 5: Comparison of observation and model data

CONCLUSIONS

- (1) The available literatures on accident analysis indicate that 77.5 percent of road accidents in India are caused due to driver's error.
- (2) Stretch I have the second highest no of accidents accounts for 41.6% of total accident. The accident rate can be reduced by providing signalized junction, junction improvement, and shoulder Clearance, installation of humps, shifting of poles, removal of trees near the edge of pavement etc.
- (3) No of accidents in stretch II accounts for 36.6% of total accidents. The accident rate can be minimized by clearing-off shoulders, reducing speed limit, junction improvement, providing Signals on the median, shifting structures on the shoulder.
- (4) Stretch III has minimum no of accidents accounts for 25.2% of total accidents. Speed limit reduction near junction should be reduced to prevent accidents.
- (5) Heavy vehicles like truck are involved in maximum no of accident on two-lane roads. It is estimated that fatalities caused by truck is 59 % followed by other (26%) and bike (7%) and jeep (5%) and bus (3%).Road safety awareness should be raised among road user.
- (6) Stretch IV has the highest no of accidents which accounts for 47.8% of total accidents. The accident rate can be decreased by road side clearance, proper maintenance of shoulders, lighting, and junction improvement. Speed limit should be brought down by providing humps near accident spots. Sight distance near curves should be obstruction free.

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