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Study of Causes of Accidents Due to High Vehicle Density and Road Conditions and their Remedial Actions

Paramjeet¹, Mr.V.K.Ahuja²

^{1,2} S.B.M.N. College of Engineering, Maharshi Dayanand University,
Rohtak-124001, India

Abstract: India is a developing country and safety of road is still in a premature stage. Accident severity is increasing in increasing order due to increasing in vehicle population. Accident leads to disablement, death, damage to health and property, social suffering and general degradation of environment. The road accident situation in India is alarming. Records show that there is one death at every 2.75 minutes because of road accidents. The high accident rate is largely attributed to the inadequacy of the highways and other main roads to meet the traffic demands, road user behavior, vehicle defects, poor road geometrics and visibility. Road accidents inflict heavy economic loss to the country. Road Safety is necessary to reduce accident involving both human and vehicles there by making the road more safe and user friendly to traffic. NH-71A is one of the major connectivity from Panipat to Bawal which caters to the need of transportation of light goods to heavy goods and passengers. Study area was undertaken on road NH-71A from Panipat to Rohtak. The no of accidents is rising up every year due to increasing vehicles population. The location in a roadway where the traffic accident often occurs is called a black spot. The accident data is analyzed using accident frequency and severity index method. The safety deficiencies were detected to minimize accidents and save the road users. The deficiencies along with the measures for further improvement have been presented in this thesis.

Keywords: MORTH, CAGR, ADT, ANOVA, NH, FIR, Indian Road congress.

I. 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 2012) 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(Torregrosa et al.,2012) 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 (Shiv Kumar and Krishna raj 2012). 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, bicycles, 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

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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

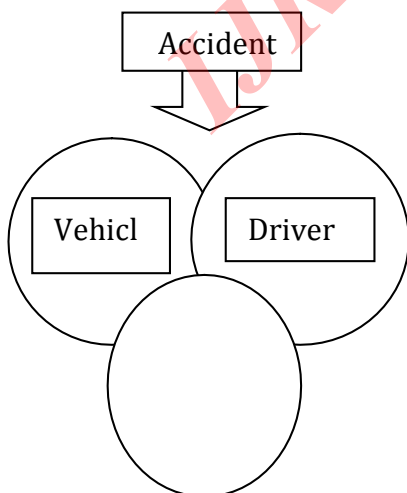
II. LITERATURE REVIEW

Road Safety & Causes of Accidents

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 passengers of on-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 1.1

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



Many factors **Environment** has a measurable influence on driving behavior and traffic safety on Rohtak-Bawal Highway. These include, but are not limited to,

- (i) 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.
- (ii) Traffic factors like speed, volume, density, capacity, traffic mix and variation.
- (iii) Vehicle deficiencies, such as defective brake, headlight, tyres, steering and vehicle condition.
- (iv) Road condition like slippery or skidding road surface, ravel, pot hole, ruts etc.
- (v) Road design such as inadequate sight distances, shoulder width, no of lanes, improper curve design, improper lighting and traffic control devices.
- (vi) Weather condition like fog, heavy rainfall, dust, snow etc.
- (vii) Other causes such as enforcement, incorrect sign and signals, service station, badly located advertisement, stray animals etc

Accident Theory

Collision may be of two types:

- (i) Collinear Impact
- (ii) Angular Collision

Further collision is divided into two types:

- (i) Rear end collision
- (ii) Head on Collision

Two theories –

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(i) Poisson Impact theory

(ii) Energy Theory

Poisson impact theory- It is based on compression and restitution. Suppose two vehicles traveling at initial speed v_1 and v_2 collide and obtain a uniform speed say u at compression. After compression is over the final speed is u_1 and u_2 .

Thus according to Newton's law:

Reaction force $-F = m_1$ and action force $F = m_2$

$m_1(u-v_1) = -pc$ $m_2(u-v_2) = pc$

Where $pc = \int$ is compression impulse and TC is compression time.

Driver Characteristics

- (i) Age, Gender & Personality
- (ii) Perception
- (iii) Alcohol & Drugs
- (iv) Speed
- (v) Fatigue
- (vi) Cell Phones

Vehicular Characteristics

- (i) Tyre defect
- (ii) Brake failure
- (iii) Overloading

Environment Characteristics

- (i) Road elements
- (ii) Surface Discontinuity
- (iii) Road side features
- (iv) Signs & Signals
- (v) Fog & Smoke
- (vi) Volume

3. NEW PROPOSED SCHEME

The only information available for accident studies is the FIR (First Information Report) lodged in the police stations. The data from these records of last ten years (2004-2013) were extracted from the FIR record filed under IPCno.279/337/338/304(A). Vehicles those involved in accidents and reported in the F.I.R. The categories of vehicles include tempo, auto, mini-truck, minibus, Tata indica, Tata-407, trecker, motor cycle, tanker, tailor (articulated vehicle), truck and bus.

(i) Red light should be there at every crossing.

(ii) Signs & Signals should be there at every crossing.

4 CONCLUSION AND FUTURE SCOPE

(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) Heavy vehicles like truck are involved in maximum number 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.

(3) Stretch IV has the highest number of accidents which accounts for 34.1% 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.

(4) Stretch I have the second highest no of accidents accounts for 32.5% 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.

(5) Number of accidents in stretch II accounts for 29.6% of total

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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.

(6)Stretch III has minimum no of accidents accounts for 3.7% of total accidents. Speed limit reduction near junction should be reduced to prevent accidents.

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