

Road Safety on National Highways-Analysis & Recommendation

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ABSTRACT

As India is a developing country but safety of road is not in good stage. Due to increase in vehicle population, accident rate is increasing. Accident causes to damage to health and property, social suffering and degradation of environment, death, disablement. In India situation of road is alarming. Due to road accidents as records shows that there is one death at every 2.75 minutes. 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-1 is one of the major connectivity from Delhi to Amritsar via Ambala which caters to the need of transportation of light goods to heavy goods and passengers. Study area was undertaken on road NH-1 from Sonipat to Karnal with stretch Km 159/0 to Km157/0. The study Stretch is a major connectivity to no. of heavy industries. Due to increasing vehicles population numbers of accidents is rising. The location where numbers of accidents is always or often occurs is called as black spot. Using severity index method and accident frequency the accident data is analyzed. To save the road users and minimize accidents the safety deficiencies were detected. In this thesis the deficiencies along with the measure for the further improvement have been presented.

I. INTRODUCTION

Around 3,000 peoples killed in road crashes every day. According to Global Road Safety Partnership Annual Report 2011 it is man made and it is a global humanitarian disaster. In our society road safety is one of the most important problem which we are facing day by day. Between 20 and 50 million people are injured in road accidents and 1.2 million of people are killed every day and . If this 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.,2016)

In the world due to road accidents India had earned the wrong distinction of having more number of fatalities .Around the world specially in India road safety is a coming social concern .

Accidents plays a more serious effect on the economy of national and this may lead to social suffering damage to health and property, death, degradation of environment, disability, effect on memory, paralysis etc.

Road safety is sometimes used to to minimize the numbers of accidents or crashes with any kind and severity expected to occur on the entity during a specific period. Because of the correlation . accidents and the fatalities on road are inter linked with each other. Ranging from pedestrians , bicycles , trucks, trolleys , animal driven carts , rickshaw, various category of two and three wheelers, buses, cars, motor cycle road users in India are road users in India are heterogeneous in nature. Because of the change in the life and leaving style of peoples population of vehicles is steadily increasing and this increase in vehicle population with limited or less road space used by a large category of vehicles has increasing the need and requirement for a well measured policy on the matter of road safety. In developing country India vehicle population is directly proportional to the accident rate..

By measuring in terms of social and economic, road accidents impose a serious effect like ultimately death, human tragedy, disabilities, injuries and loss of potential income etc. As road safety is multi dimensional and multi sector so this has become an national issue of concern and it incorporates provision of safer vehicles, law enforcement, hospital service, health service, child safety, planning of land use , management and development of road infrastructure or we can say that it covers in one hand of engineering aspects of both, roads and vehicles and the provision of hospital and health services for trauma cases in post-crash conditions.

Causes of accidents and their contribution are as follows by previous report of statistics of Road accidents in India

Drivers fault-	78.0%
Defects in road condition-	1.6%
Defects in motor vehicle-	2.6%
Fault of bicyclist-	1.4%
Fault of pedestrian-	2.4%
Weather condition-	2%
All other causes-	11.0%

According to MORTH 2011 in India safety of road is very poor in the world and numbers of accidents in India has the largest in the world.

To reduce the numbers of accident safe design of road elements and most importantly awareness among road users is necessary.

OUTLINE OF THE REPORT

Work done in this thesis is shown according to this that the first chapter gives the overall information and understanding about the present accidents condition at national level which includes factors affecting accidents, their objectives, contribution etc.

Second chapter tells us about the review of literature which involves site selection, data collection etc. Third chapter shows methodology for adopted of data collection. Fourth chapter defines surface properties and data of study. Fifth chapter shows the accident investigation and analysis. Sixth chapter draws proper conclusion occurred from study and analysis for further work.

Road Safety & Various Causes of Accident

Road traffic safety is called as a method and analysis to reduce the risk of the persons, pedestrians, person using the network of road who being seriously injured or killed. Users of road can be of any kind like passengers of on road public transport, passengers of buses or rails, pedestrians, motorists, cyclists. Best strategies and focus should be provided on the road is that how to prevent serious injury, death as compared to human fatality.

Now in today's time providing safe road environment which ensures speed of vehicle within the limit from which these serious injuries, death, fatalities, conflict point can be reduced or neglected.

The various causes of accidents may be due to three factors shown in fig. below

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

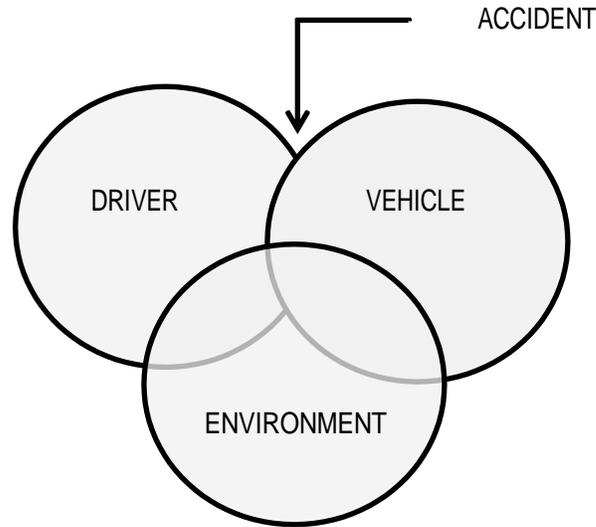


Fig 1: Causes of Accident

OBJECTIVES OF STUDY

Expansion in the road network, surge in motorization and a rising population of a country contribute towards increasing numbers of road accidents, road numbers of registered motor vehicles in the country and the country's population have increased at a compound annual growth rate (CAGR) of 3.4 per cent, 9.9 per cent and 1.6 per cent, respectively, during the decade 2009 to 2017. During the same period, the number of road accidents in the country increased at a CAGR of 2.1 per cent. Similarly, the number of road accident fatalities and the number of persons injured in road accidents in the country between 2009 and 2017 increased by 5.8 per cent and 2.4 per cent, respectively.

Very little work has been done in India to analyze accidents on two-lane roads.

The major objectives of the present work are listed below

To study the annual, monthly, daily and hourly variation in accident rate on selected Stretch of urban two-lane road.

To study the effect of traffic volume, density and capacity on accident rate on urban Two-lane road.

To study the maintenance of road surface and shoulder on rate of accident.

To develop an accident prediction model based on AADT, road condition, road side Features

REVIEW OF LITERATURE

Many factors may exhibit a measurable influence on driving behavior and traffic safety on two-lane highways. 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, gravels, pot hole, nuts 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.

Driver characteristics

Age

Age plays an important role in occurrence of accidents. Riders and non riders on roads are of different ages.

According to National Highway Traffic Safety Administration (NHTSA) older riders possess a greater risk of accidents or fatalities. According to NHTSA in 2011, 56% of riders killed in accidents were of age 40 years and for individual killed in motor cycle accidents average age is 42 year.

According to NHTSA earlier fatalities among young riders have declined but today young riders are still at high risk when we consider both fatalities and injuries. According to CDC death and injuries is more prevalent among riders between the age of 20 to 29.

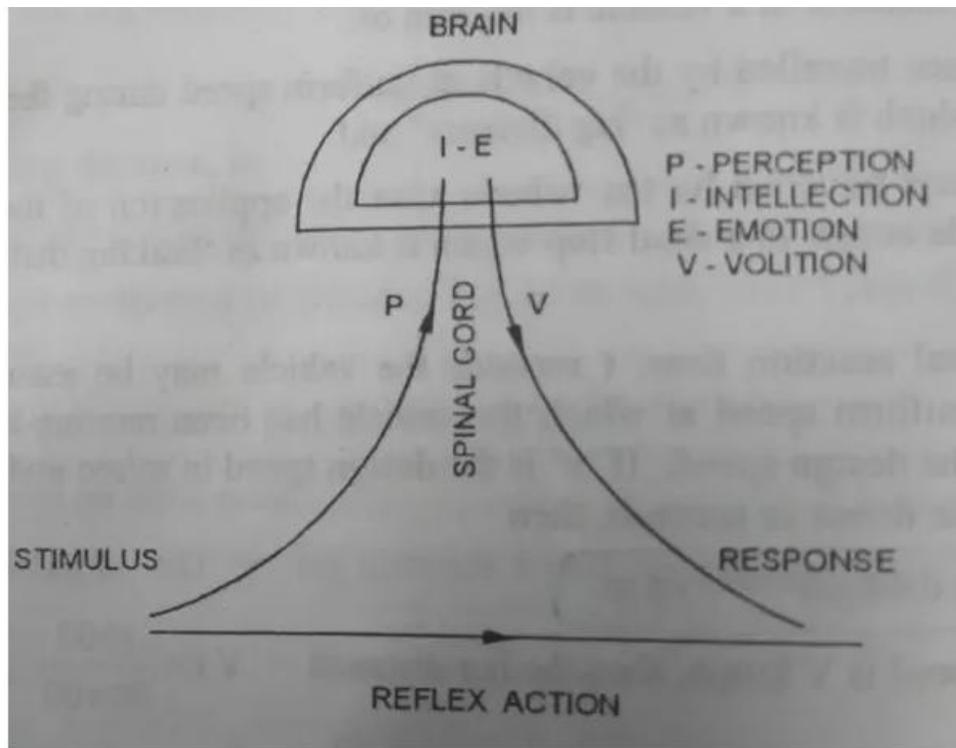
There is no doubt that risk and skills play an important role in driving but age also plays a most important role in the accidents. The ability to ride a motor cycle, truck, car, bus etc. may become more difficult over a time with older riders also an older body may not be as strong when it comes to healing and recovery if an accident does occur. Simply we can say that due to less resistant body and aging fatalities of old riders may be more.

On the other hand prone to more injuries because they participate in far riskier activity than older drivers while some injuries resulting in fatality.

Injuries and fatalities occur in young drivers often due to less age and knowledge towards roadway conditions. If we talk about the accidents that occur due to truck drivers there are many more reasons available but first priority is age. According to Federal Motor Carrier Safety Administration, in the year of 2014 during riding large truck 657 people passed away among them 90% were drivers.

However during the same year 3,697 larger truck drivers were part of a deadly accident. Among drivers 6% (216) were 66 years old or older than this while 5% (202) were no older than the age of 25 years. This data shows that truck accidents involve various ages, some of them were old and some of them were young.

Perception



PIEV PROCESS

Perception is the time required to perceive an object or situation.

Usually we can say that perception is the time required for the sensation received by the eyes or ears to be transmitted to the brain through the nervous system and spinal chord. Perception works on the time required of message received to the brain and when ever message is received or we can say sensation is received then work has to be done by the driver.

Alcohol and Drugs

Alcohol and drugs also plays a most important role in road accidents while they are driving on highways or on National highways. Young male persons have high risk of casualties in car accidents when they have consumption of alcohol or durgs. According to a survey in US prior to the interview in 2015 about 1 in 7 americans aged 12 or older (33.5 million persons or 14.2 %) drove under the influence of alcohol. In this survey male were nearly double as females (18.8% VS 9.9%) have driven under the influence of alcohols and drugs. Reported of driving under the consumption of alcohols and drugs at least once in the prior year among these young adults under the age of 18 to 25 more than 1 in 4 (26.6 %).

Motor vehicle accidents are the leading cause of traumatic death, blunt trauma and falling accidents. Such alcohols, drugs, cocaine increase the risk of fatalities or casualties by traffic collision.. Some other drugs like benzodiazepines increases the risk of trauma in older persons.

Even at low level consumption of alcohol affects the driving skills and this leads to increases the level of blood and alcohol as this absorbed rapidly in blood stream then it results in occurrence of accidents and loss of life too. Consumption of alcohol or drug even in low quality affects the judgment power of driver and which leads to dangerous in road safety. Due to this reaction time of driver becomes increase and driver become aggressive and this whole thing leads to increasing of numbers of road accidents.

Speed

Driving speed is the important part on the highways and national highways. The theory behind assigning certain speed limits and building roads is that the chances of accident is to be occur if the variation is greater in speed of vehicles from the average speed of vehicle in traffic. So due to this result, duty of engineer is to designed efficient road which would avoid much of stop and go style of driving.

To set the speed limit government should use 85th percentile rule as this theory tells us that even if no speed limit sign boards were planted, 85 percent drivers would drive below that limit.

Additionally, the NTSB called for law enforcement agencies to carry out a national anti-speeding campaign, similar to the national "Click It or Ticket" campaign concerning seatbelt usage. Finally, NTSB also called on carmakers to create, introduce, and implement technology in their vehicles that alerts drivers when they go over the speed limit and perhaps even slows them down automatically.

Result of this occurs that if speed of vehicles increases then chances of accidents also increases.. Driving any vehicle below the designed speed on highways and national highways does not leads to any accidents. Speed of the vehicles sometimes also depends on the tiredness of the driver as if journey is long then driver should take proper rest so due to this he/she should drive safely and sufficiently..

Cell phones

In today's society cell phone have become an integral part of the every day but the use of excess cell phones also creates problems. it not only affects the health of the peoples some times it leads to accidents also. This contribute the question that what is the role of cell phones in accidents.

A study from the NSC (National Safety Council), CDCP (Centre for Disease Control and Prevention) revel that true danger of cell phone while driving..

For example accidents occurs of auto is 25% and people increased their risk of life when they are using cell phones is 400 percent.

A report in 2013 of NSC's annual estimate of cell phones crashes helps to capture the dangers of texting and driving. That report shows that around 341,000 motor accidents occurs on that year due to texting and driving.

Numbers of accident increases in younger driver especially peoples in the age of between 21 and 24 as they used the cell phone behind the wheels most likely to drive while sending a mail or a text.

A study shows that average time to send a text message is 5 seconds while according to the journal of Adolescent Health, for only 2 seconds a driver can safely take their eyes off the road.

These studies reveals that and peoples already knows that using of cell phones while driving is not good thing or habit. Using of cell phones leads to fatal accidents on a regular basis and peoples who refuse to put their phone down while driving risks to the life of the other persons whom they are driving with.

VEHICULAR CHARACTERSTICS

Vehicle plays an important role in a crash. This may be due to defective wheel alignment, tyre bursting, brake failure, overloading, one or two head light defect, back light defect, indicator defect, steering defect etc. Defect in any type of these leads to serious accidents while driving of vehicle of highways or on national highways.

Sometimes a smaller failure of vehicle may also leads to a big or fatal accidents on highways or national highways.

Tyre Defect

One of the most active safety components on vehicles are tyres of any vehicle. Several studies have found that and as far as study is concern failure of tyre has impact on road traffic accidents. According to a survey in the Takoradi Township in the western region of Ghana, a research method was used in collection data, four hundred and fifty questionnaires were personally administered to commercial drives in the study area.

The study found out that there were four major causes of tyre failure: overinflation, under-inflation, wear and overloading of vehicles. The result further shows that tyres fail on the road, because more than 89 percent of drivers in the metropolis are not familiar with tyre information and most especially legal requirement on the minimum tyre tread depth in millimetres as enshrined in the legislative instrument in Ghana. It is recommended that the National Road Safety Commission intensify its campaign on the need for all commercial drivers to understand the importance of knowing and adhering to the Legislative instrument on tyres and how it can reduce Road Traffic Accidents, in order to achieve the Vision 2020 which aims to reduce road traffic accident by half by the year 2020. Index Terms- Tyre failure, under inflation.

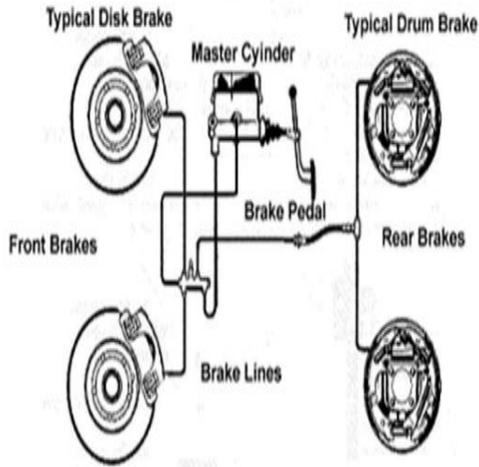
Generally motor vehicles tyres are provided as either tubed or tubeless while pneumatic tyres serves 2 important purpose on all vehicle, it minimize the transmission to the road vehicle shocks associated with travelling over rough road surfaces and it provides the vehicles with a frictional contrast surface on the road.

Brake Failure

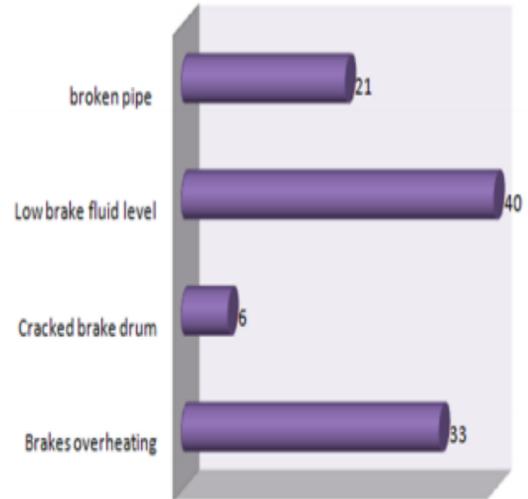
In worldwide road traffic injuries and deaths are a growing public health concern. Various studies and research shows that accident imposes high intangible cost (pain, grief and suffering).Vehicle accident can be fatal and constitute a high economic burden. As surveyed done and no. of accidents found that 83% break failure result in accident.

According to the report of WHO (2004) road accident are the second leading cause of death globally among young people.

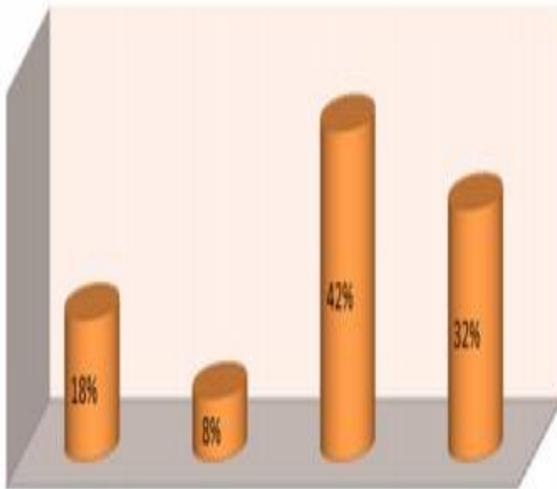
Ineffectiveness of brake is due to tyre pressure, not working of automatic brake adjuster, brake fluid, vehicle overloading, cracked break drum, unevenness, overheating of brakes etc.



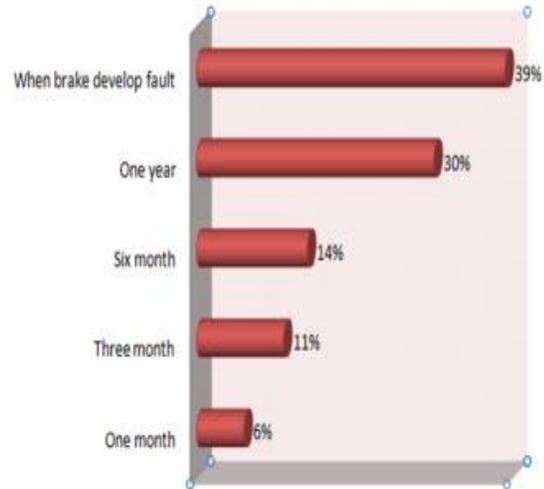
Hydraulic braking system



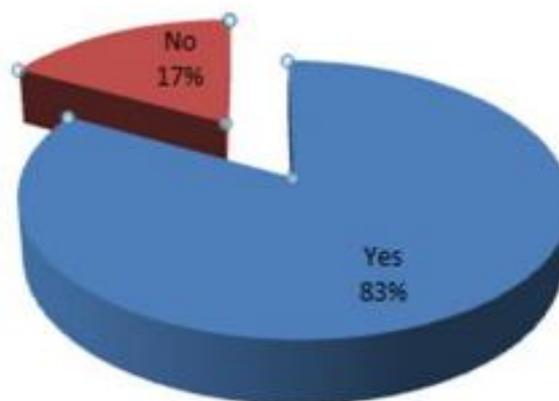
Causes of brake failure



Vehicle pulling to one side when brake applied



Brake service period



Brake failure result in accident

Overloading

Overloading of the vehicles leads to the increases the chances of road accidents. Following aspects shows how overloading impose on accidents:

- By overloading of vehicles it will contribute to the occurrence of crashes and also high maintenance cost to the vehicle, brake, tyres, and high fuel consumption.
- Due to overloading vehicle will be less stable and it will take more time to stop and this leads to sometimes crashes.
- Due to overloading driver's control and operating space in the overloaded vehicles are diminished and it accelerate the chances of accidents.
- Tyres become overheat and wear rapidly due to overloading and this may leads to chances of dangerous and expensive failure, blow-outs etc.

ENVIRONMENT CHARACTERISTICS

Road Elements

The most significant factor that affect behavior of driver and perceived safety is roadway design. Roadway design element are such as shoulder width, guardrail and roadway geometry (curvature) by taking objective driving measures (speed and lane position) and subjective measure(perceived safe driving speed and estimated road safety) into account. Study shows that the shoulder width had a significant effect on actual speed and lane position but when a guard rail had a significant effect on perceived safe driving. Sometime roadside vegetation also a significant factor that affect behavior of driver. As roadside vegetation provides numerous environmental and psychological benefits to the driver, various previous research and studies shows that due to natural landscape stress and frustration of the driver decreases but crashes which is due to the collision with tree are increases or we can say that twice as likely to result in a fatality. Thus due to this proper location of planted vegetation is also necessary.

Road Side Features

Somchainuek et al., (2013) investigated road side safety on Thai NH. The result showed that speeding vehicles were involved in roadside crashes accounted for about 70% of the total crashes and 30% of road side crashes were due to road side trees.

Jinsun and Doohee (2003) established a relationship between accident severity and roadside features. The result shows that run-off-roadway accident can be reduced by avoiding cut side slopes, decreasing the distance from outside shoulder edge to guard rail, decreasing the no of isolated tree along road way section and increasing the distance from outside shoulder edge to luminaries poles. Run-off road way accident is a complex interaction of road side factors such as presence of guardrails, miscellaneous fixed object, sign supports, tree groups and utility poles along the road way.

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