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Analysis of Accident Prone Zones on Mohali-Sirhind-Patiala Road

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Abstract: The frequency of traffic collisions in India is amongst the highest in the world. The death rate in India is about 10 to 20 times higher than high income countries like Japan, Australia, UK and USA. The fatality rate in road accident in India has increased from 36 fatalities per million persons in 1980 to 140 fatalities per million persons in 2015. In Punjab, numbers of deaths due to road accidents in 2016 were 4893 whereas 4414 persons were injured in these accidents. The present work is aimed at identifying the various accident prone locations on SH-12A Patiala- Sirhind-Mohali road. After the preliminary data collection, three most accidental prone sites have been selected for the study. The accidental data for these sites has been analysed along with the traffic volume study and spot speed study. Traffic volume data and spot speed data has also collected for the selected site. The comparison of the fatal and non-fatal data has been done. From Traffic volume data classification of the vehicles and PCU values of the traffic has been carried out. The findings of the study show high percentage of the fatal accident. Spot speed data analysis shows the over speeding of the vehicles above the permitted speed on the sites. The classification of the Vehicles for the total data collected shows that the share of 2- wheelers and Cars is about 93% of total vehicles. The interrelation of the various other accident parameters like Service road width, setback distance of trees and Bus bay etc. can be done by combining with the accidental data for further detailed study of the accident causes .

Keywords: Traffic volume ,Passenger Car Unit, Radius of curve , Radar Gun, Accidental Prone Zones. Road Markings.

I. INTRODUCTION

The problem of accident is very acute in highway transportation due to complex flow pattern of vehicular traffic, presence of mixed traffic along with pedestrians. Traffic accident leads to loss of life and property. Thus the traffic engineers have to undertake a big responsibility of providing safe traffic movements to the road users and ensure their safety. Road accidents cannot be totally prevented but by suitable traffic engineering and management the accident rate can be reduced to a certain extent. For this reason systematic study of traffic accidents are required to be carried out. Proper investigation of the cause of accident will help to propose preventive measures in terms of design and control.

A. Accident Situation in Punjab

As per NCRB (National Crime Records Bureau) report on suicides and accidents in various states in 2016, the numbers of road accidents in Punjab have increased from 6391 in 2015 to 6702 in 2016 suggesting an increase of 4.9%. Among the north Indian states, Punjab stands at number two position in the number of accidents with Haryana witnessing 11287 accidents and J&K and HP registering 5847 and 3010 accidents.



Fig. 1.1 Road Network of Punjab

B. Accident Study

For finding the accident prone locations, the first step is to collect the accident data. From several police stations there is need to collect the accidents data to find the accident locations, number of accidents; from which fatal/non- fatal accidents can be divided.

C. Traffic Volume Count

A traffic count is a count of vehicular traffic, which is conducted along a road, path. A traffic count is commonly undertaken either automatically or manually.

- 1) *Manual Counting*: In this method, the vehicular traffic is noted on field sheet which is used for manual counting.
- 2) *Automatic Recorders*: In this method, Video recorders and mechanical recorders are used to record the vehicular traffic.
- 3) *Photographic Method*: This method is for measuring flow and other traffic characteristics.

Traffic Volume Data is representing in the form of Passenger Car Unit (PCU).

- 4) *Passenger Car Unit (PCU)*: Passenger Car Unit (PCU) is a metric used in Transportation Engineering, to assess traffic-flow rate on a highway. A Passenger Car Unit is a measure of the impact that a mode of transport has on traffic variables (such as headway, speed, density) compared to a single standard passenger car. This is also known as passenger car equivalent.

The following PCU equivalents have been recommended for rural condition.

Table 1.1 PCU Equivalents as per Indian Practice

Vehicle Type	Value of PCU
Two- Wheelers	0.5
Cars	1
Buses	3
Trucks	3
Agricultural Tractors	4.5

D. Methods of Measuring Spot Speeds

- 1) Those that require observations of the time taken by a vehicle to cover a known distance
- 2) Radar speed meter which automatically records the instantaneous speed.
- 3) Photographic method.

In the study, Radar speed meter is used to record the speed of the vehicles.

- 4) *Radar Gun*: A radar speed gun (also radar gun and speed gun) is a device used to measure the speed of moving objects. It is used in law-enforcement to measure the speed of moving vehicles and is often used in professional spectator sport, for things such as the measurement of bowling speeds in cricket, speed of pitched baseballs, athletes and tennis serves.



Fig. 1.2 Radar Gun

II. LITERATURE REVIEW

A. Ashish Dhamaniya¹ (2013)

Developed accident prediction models are developed under mixed traffic conditions. Two models have been developed. The first model is a city-based traffic accident prediction model. City population and vehicle ownership are the two parameters used to develop the model. A case study of Surat city in Gujarat is taken up. Total accidents occurred in the city are regressed with population and vehicle ownership. Second model is the urban-arterial-based accident prediction model. Past accident records of ring road of Surat city show that there are eight different locations on a 10 kilometer stretch of ring road where the accidents took place consistently. These locations are picked up as accident spots. As there are many contributing factors and causes to road accidents, a comprehensive study of road safety found that human error was the sole cause in 57% of all accidents and was a contributing factor in more than 90%. Keeping this in view a new term driver-pedestrian index is used to develop this model. Regression function of Microsoft Excel is used for model development. Both the models are checked with R-statistics and t-statistics. The models are further validated by using statistical goodness of fit (chi square test). Hence these models can be used to predict the number of accidents in future subjected to the same geometric standards. Keeping this in mind improvement measures can be taken up by the district authorities.

B. Vigneswari *et.al*, (2013)

Analysed that road accidents have a definite impact in terms of lives, welfare and traffic congestion, especially with increase in mobility and number of overall vehicles. At least 13 people die every hour in road accidents in India, the latest report of the National Crime Records Bureau reveals. In 2007, 1.14 lacks people in India lost their lives in road mishaps — that's significantly higher than the 2006 road death figures in China, 89,455. So it is necessary to control the accident rate. Hence accidents analysis is carried out in order to identify those areas where the accidents occurred frequently (Black Spot), Black zone, Black route etc. There are various methods used for analysis of accidents. Traditional analytical techniques deal mainly with the identification of accident sequence and seek unsafe acts or conditions leading to the accident, but it requires more time for analysis and also data cannot be uploaded on the spot. Since there are some drawbacks recent methods like web-based analysis methods can be used for analysis. Web GIS oriented platform process spatial data to provide end-users with a reliable tool to evaluate what roads have the highest accident density, the highest danger data and any other statistical indicator which can be extracted from attribute. This paper dealt with the analysis carried out for a selected corridor using RADMS which is one of the web based accident analysis method.

In this paper Jain *et.al* (2015) presented a device to detect rash driving on highways and to alert the traffic authorities in case of any violation. In past, lot of devices to detect rash driving on highways has been made. Most of the approaches require human concentration and involve a lot of effort, which is difficult to implement. In this paper we intend to design a system aimed at early detection and alert of dangerous vehicle driving patterns related to rash driving. The entire implementation requires an IR transmitter, an IR receiver, a control circuit and a buzzer. The speed limit is set by the police who use the system depending upon the traffic at the very location. The time taken by the vehicle to travel from one set point to the other is calculated by control circuit and displays that on seven segment displays. Moreover, if the vehicle crosses the speed limit, a buzzer sounds alerting the police.

K.shwetha, K.s.b. parasad (2015) inferred that in India pedestrian fatalities constitute around 50-60% of total fatalities and 30-40% of all reported road accidents occur on National Highways. Pedestrian safety study would provide a useful input to design roads accordingly so as to prevent pedestrian fatalities at urban areas in India. In comparison with other road user groups, pedestrians are involved in a significant number of fatal and injury accidents due to various reasons. Today with new appreciation for the value of a balanced transportation system, planners and designers are paying more attention to pedestrian travel. Walking is the glue that holds our urban transportation system together. It is a necessity to take care of pedestrian safety in a fully fledged way rather than controlling the pedestrians. It is more accurate to assess pedestrian safety by how many people actually walk on streets and what factors improve or worsen pedestrian safety. The present study is based on the accident data collected from three police stations into which the whole study stretch comes under. This paper focuses on the number of pedestrian accidents occurring in these five years for the whole study stretch for each and every area on highway. The area has been categorized for its accident proneness based on the number of accidents occurring in each area. Various general reasons for the causes of pedestrian accidents have been found for the reason behind pedestrian accidents. The paper has been concluded with simple basic reasons behind these pedestrian accidents.

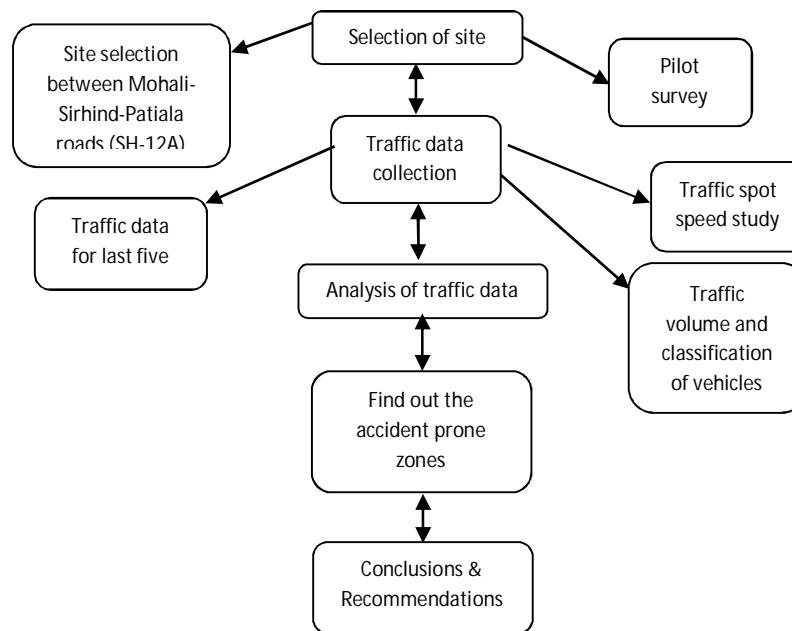
Satria *et.al*, (2016) found that a significant unexpected outcome of transportation systems is road accidents with injuries and loss of lives. In recent years, the number of studies about the tools for analysing accidents and road design has increased considerably. Among these tools, Geographical Information Systems (GIS) stand out for their ability to perform complex spatial analyses. However, sometimes the GIS, has been used only as a geographical database to store and represent data about accidents and road

characteristics. It has also been used to represent the results of statistical studies of accidents but, these statistical studies have not been carried out with GIS. Owing to its integrated statistical-analysis capabilities GIS provides several advantages. First, it allows a more careful and accurate data selection, screening and reduction. Also, it allows a spatial analysis of the results in pre and post-processing. Second, GIS allows the development of spatial statistics that rely on geographically-referenced data. In this paper, several GIS tools used to model accidents have been examined. The understanding of these tools will help the analyst to make a better decision about which tool could be applied in each particular condition and context.

III. OBJECTIVES OF THE STUDY

The main objective of the present study is to study and analyse the various accidents prone zones on Mohali-Sirhind-Patiala road (SH-12A).

IV. METHODOLOGY



V. STUDY AREA

The study area of the thesis is Mohali- Sirhind- Patiala road. The road map is given below:

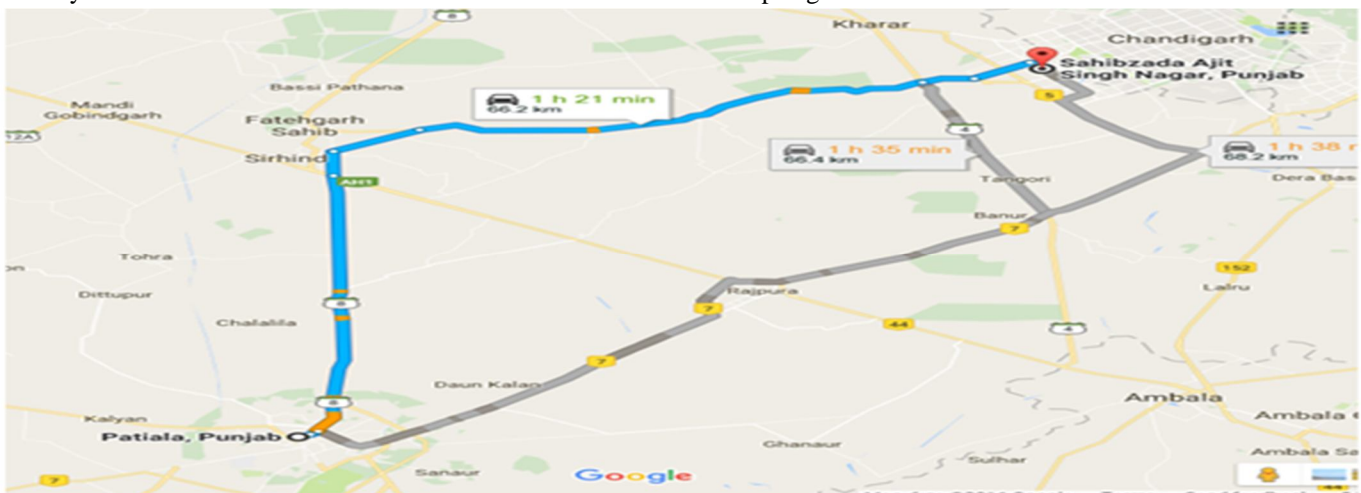


Fig 5.1 Road Map of Patiala to Mohali

VI. ACCIDENT PRONE ZONE AREAS

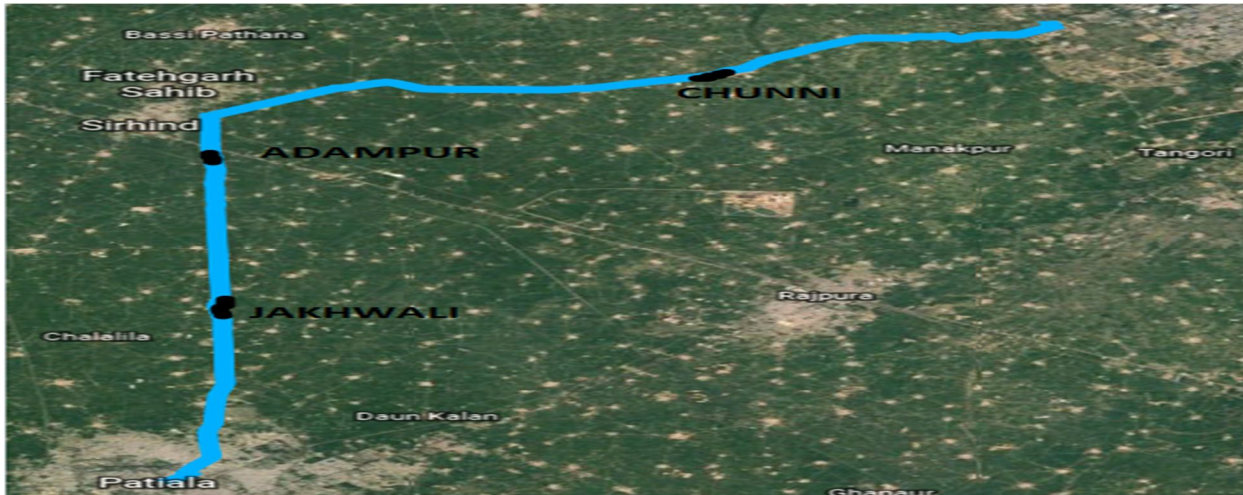


Fig 6.1 Prone zone areas from Google Earth

VII. CONCLUSIONS

The following are the conclusions of this study

- A. Three sites Jakhwali, Adampur and Chunni have been found as accident prone locations from the study conducted. In these locations, the fatal accidents are 33% of the total number of accidents. Table 5.1 and Fig.5.1 show the site wise data of fatal/non-fatal data.

Table 7.1 Fatal/Non-Fatal accidents of prone zone areas from Patiala-Sirhind-Mohali from 2012 to 2016

Sr. No.	Location	No. of Accidents	Non- Fatal	Fatal
1	Jakhwali	35	23	12
2	Adampur	31	20	11
3	Chunni	34	24	10
Total	All sites	100	67	33

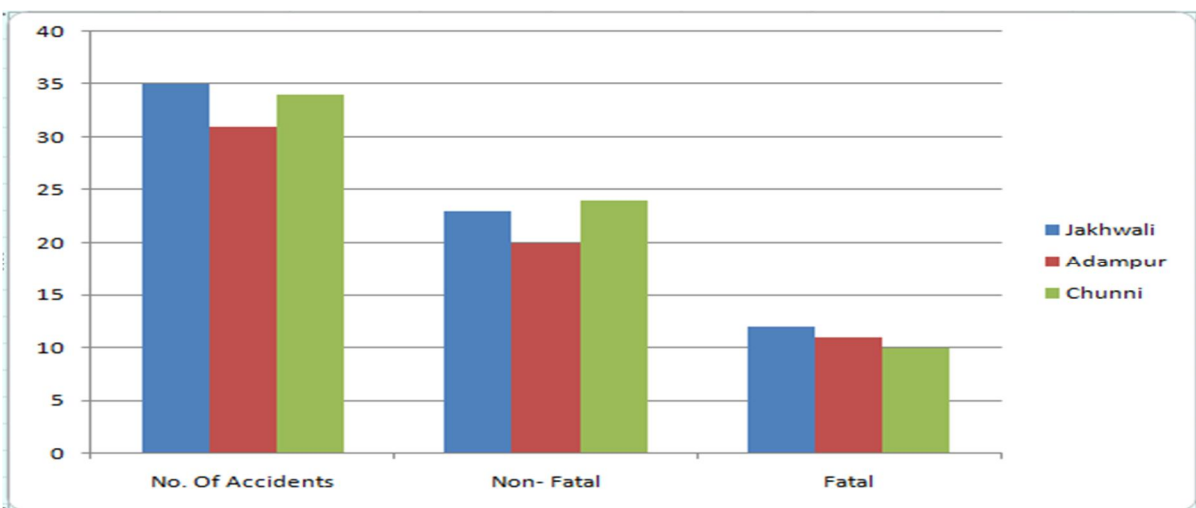


Fig. 7.1 Fatal/Non-Fatal accidents of accident prone locations from Patiala-Sirhind-Mohali

- B. The classification of the Vehicles for the total data collected shows that the share of 2- wheelers and Cars is about 93% of total vehicles. Average design speed of the vehicles at the accident prone locations have been found about 110 kmph, but according to IRC the design speed of the vehicles for state highway should be 80 kmph. The over-speeding of vehicles at these locations may be the major cause of accidents.
- C. The radius of curves has not been provided as per design standards of the road which further leads to accidents.
- D. Study also shows that there were not any speed regulation boards, proper markings, and any kind of sign boards placed to assist the traffic on the road.

VIII. RECOMMENDATIONS

Following are the recommendations of this study

- A. Improvement in geometric design should be done in order to minimize total number of accidents.
- B. Proper enforcement of rules and regulations with the help of traffic police should be imposed in order to reduce number of accidents.
- C. In this study the analysis has been done only for Mohali- Sirhind-Patiala road. More similar type of studies is required in future for different type of roads in Punjab.

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