

Identification of Road Accident by using Black Spot Method Between Panthaghati to Dhalli Road

Nikhil Chauhan, Rajat Sharma, Amreen Khatun

Abstract: In India road accidents are very serious problem because of large population and high traffic density of vehicles. Most of the road accidents occur mainly due to the negligence of driver and poor infrastructure only a few accidents occur due to the technical error of vehicles. The main purpose of this research paper is prevention of road traffic accidents and improvement of road safety in Shimla. Road safety is very important aspect of today's life, so it is important that everybody should aware about road safety. To do this study a section of 12km length is chosen between Panthaghati to Dhalli in district Shimla on NH 5 where accidents black spots are identified for the section by analyzing secondary data used to prevent road accidents. In this study primary data is used for observing the road conditions and secondary data is used to find accidents black spot. Black Spot is a point or a place on the road where road accident occurs repeatedly one after another which is known as accident black spot. To identify these black spots we use weighted severity index (WSI) method. It is one the most reliable and effective method for determining the most proven accidents black spots. Shimla is a hilly area and it has narrow roads, blind curve and black spots which increase the chances of road traffic accidents. In past recent years road traffic accidents are increasing in Shimla and this study deals with identification of major issues causing road traffic accidents. This research paper helps to improve the road safety in Shimla because in this study the analysis has been done to identify the major problems responsible for gradually increasing road accidents. This research paper is also used in future research paper as reference purpose and it will also provide an overview to other researchers who want do their research on similar kind of topics.

Keywords: Economy, Road accident, Black Spots and Road Safety Secondary Data, Mitigation.

I. INTRODUCTION

Road safety is very important for every human bring. In India road traffic accidents are increasing very rapidly and yet we don't have any permanent solution for prevention of road accidents but we can only reduce them at certain levels. There is an increase of 2.3% in road deaths as compare to previous year^[1]. According to the report young people and teenagers are most venerable towards road traffic accidents^[2]. Every day lots of people died on the roads because of road accidents. The number of deaths on the world road remains always high in past few year^[3]. Shimla is a hilly region and situated at the foot hill of the Himalayas due to which Shimla has very unique geography. It is a capital city the state of Himachal Pradesh. Because of less air and rail connectivity roads are the primary source of transportation in Shimla around which increases the probability of occurring road traffic accidents.

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In a past 10 years the accident growth rate of Shimla is increased gradually. As per one article published by **Times of India in June 21, 2019** in past 10 year from 2009 to 2018 Himachal Pradesh has recorded total 30,993 road accidents in which 11,561 people were killed while 53,909 were injured^[4]. Shimla has lots of black spots, deep valleys and blind curves, that's why so many road traffic accidents occur in recent years. The another article published by **The tribune on October 23** said that there are as many as 652 accidents back spots in the state of Himachal Pradesh and out of which 87 black spots alone exists in Shimla^[4], which is a major concern to everyone who live in Shimla. The roads of the Shimla were not designed as per the future traffic requirements. At present Shimla is a very famous tourist place and population of vehicle is also increasing day by day which means that the Shimla need to expand their road infrastructure so that the traffic can move efficiently especially during the apple seasons. The weather condition of Shimla is also not very favorable for deriving specially during the winter season because at that time heavy snow fall occur in this region and chances of skidding and slipping increases which father lead to road accidents. As it's already known that the Shimla is a capital of Himachal Pradesh. Many people from nearer areas came here for different purpose such as education, hospital, and other social work which increases the volume of traffic in the city and traffic congestion situation arises. There are many places in Shimla where public transport buses are always being over crowded. This is very dangerous for the safety of passengers and it needs to be stop immediately.

II. OBJECTIVE OF THE STUDY

1. To find the solution for Prevention of road accidents in Shimla.
2. To improve the road safety in Shimla.
3. To reduce traffic congestion and parking problem in Shimla
4. To find the accidents black spot and analyze them by suggesting a suitable solution to reduce accident in Shimla.

III. METHODOLOGY

It is one of the most important parts of any research paper. This provides a brief idea about what is the procedure used by any researcher to do his research. In this study 1st step is, choose a suitable study area which carries all kinds of vehicles load throughout the years and 2nd step is collection of data (i.e. primary and secondary data).

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The primary data is collected by the field visits and secondary data is collected from near area police station. After that 3rd step is analyze that collected data. In which primary data is analyzed by the field visits and secondary data is analyze with the help of weighted severity index (WSI) method. It is one the most reliable and effective method for finding the most proven accidents black spots. In 4th and last step we use Google earth application picture to show the various black spots places/locations which are derived from the analysis of secondary data with the help of WSI method. At the end we also calculate the accident density and accident rate to understand the behavior of road traffic accidents in a proposed study area.

1. Calculation for determining the accidents black spots locations.

To identify the most proven accidents black spot between Panthaghati to Dhalli section we use **Weight Severity Index (WSI)** method. The formula of WSI method is given blow:-

Weight Severity Index (WSI) = (5 x K) + (3 x SI) + (1 x MI)

Where: K is number of persons killed in road accidents.

GI is number of persons injured during accidents.

MI is number of miner injured persons during road accidents.

Now by Applying WSI formula on secondary data (i.e. collected from police station) we can find most proven accidents black spot location or place between Panthaghati to Dhalli section.

Here are different black spot locations derived by the WSI:

1) Dhalli:-

$$\text{WSI value} = (5 \times 1) + (3 \times 25) + (1 \times 22) \\ = 5 + 75 + 22 = 102$$

2) Dhalli Tunnel:-

$$\text{WSI value} = (5 \times 2) + (3 \times 20) + (1 \times 19) \\ = 10 + 60 + 19 = 89$$

3) Bhattakufer:-

$$\text{WSI value} = (5 \times 1) + (3 \times 22) + (1 \times 16) \\ = 5 + 66 + 16 = 87$$

4) Mehli:-

$$\text{WSI value} = (5 \times 2) + (3 \times 10) + (1 \times 9) \\ = 10 + 30 + 9 = 49$$

5) Malyana:-

$$\text{WSI value} = (5 \times 0) + (3 \times 12) + (1 \times 10) \\ = 0 + 36 + 10 = 46$$

2. Calculation for Accident rate (R) and Accident density (D).

$(R) = A/L$, where A is number of accidents and L is length of the section (in Km).

$$\text{Accidents Rate (R)} = 101/13 = 7.75$$

$(D) = A/L \times T$, where T is number of year, A is number of accidents and L is length of the section (in Km).

$$\text{Accident density (D)} = 101/13 \times 5 = 1.55$$

IV. STUDY AREA

A section of 13 km between Panthaghati to Dhalli on N H 5 is taken as a study area. This section of highway is also being called the bypass road of Shimla. This bypass road is very important for Shimla because it reduces the traffic volume at inner roads of the Shimla and carries the all heavy vehicles loads throughout the year. During the apple season

this bypass road has traffic congestion problem because at that time a lot of heavy apple trucks passes through here. The picture of study area is shown in figure.1 [5]

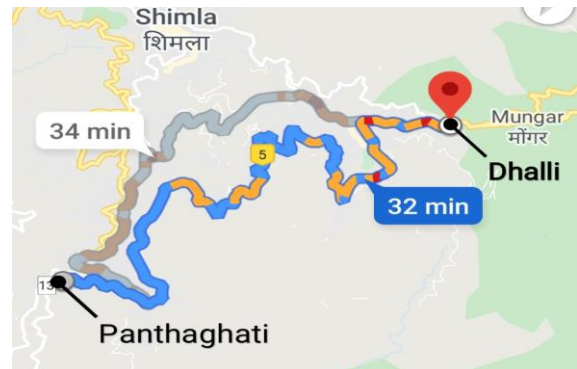


Fig. 1: Study Area

V. COLLECTIONS OF DATA

In this study secondary data is collected from Dhalli police station and Chotta Shimla East police station because these two police stations come under this study area. The kind of data obtains from these two police stations are given blow:-

Data collected from police stations:-

- Type of road accident
- Time and date the of the accident
- No. of death during the road accidents
- Age of the driver who involved in road accident
- No of Minor injuries during the road accidents
- Location of the nearby hospital
- Location of the road accident
- Type of vehicles involved during the road accident.

VI. RESULT AND DISCUSSION

A. Analysis Of Primary Data

Primary data is collected by the filed visit. This data collection mainly includes type of road, name of road and length of the road. The other things which also include in this primary data are road condition, traffic condition and maintenance of the road.

Name of road – National Highway 5

In Shimla it's also called **apple mandi Bypass road**.

Traffic Condition –January to July this by pass road has normal traffic volume, but from August to October it has high traffic volume because at that time apple season is at on their peak.

Type of road –2 lane bituminous road

Total Length of the Highway – 660.2 km (But for study purpose 13km length is taken between Panthaghati to Dhalli in Shimla)

Road Condition between Panthaghati to Dhalli in Shimla



Fig.2. Detritions of the road edges (Near Malyana)



Fig.3. Settlement of the road because of poor compaction (Near Mehli)



Fig.4. Absence of traffic light and traffic signals at Mehli junction



Fig.5. Poor Drainage condition (Near Shanan village)

All these figures shows condition of the national highway 5 between Panthaghati to Dhalli is not very good, it need immediate maintenances at various places. So that traffic can move smoothly and efficiently. Absence of traffic signs and signals at various junctions such as Mehli, Panthaghati, Dhalli tunnel and Bhattakufer has also been noticed.

B. Analysis Of Secondary Data

Table- I: Year wise accident data of study area

Year	No. of accidents
2015	13
2016	14
2017	14
2018	36
2019	24
Total	101

This table shows that 101accidents took place in between 2015 to 2019 and year 2018 has highest number of accidents per year [6]. From this table it’s understandable that road traffic accidents are increasing year by year although 2019 has less accidents as compare to 2018 but if we compare this with rest of all previous years each one by one then these accidents definitely increasing. From figure 6 it’s easy to understand the accidents variation between Panthaghati to Dhalli.

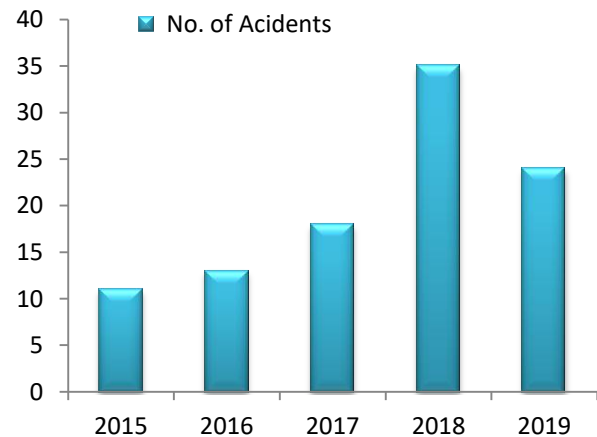


Figure.6. Yarely Variations in road traffic accidents from 2015 to 2019

It shows that there is continuous increase in road traffic accidents between Panthaghati to Dhalli. This is because of several reasons such as increase in vehicles population at every year, bad road infrastructure, poor parking facilities, and lack of strong law enforcement, weather conditions like snow or fog and poor design of the road. In Shimla vehicles are parked alongside the roads which create the traffic congestion on the roads and this will also increase the chances of road traffic accidents. To overcome this problem a proper parking facility is required at certain interval. The absences of traffic lights and traffic signals at junctions are also contributed toward road traffic accidents. The blind curve should be widened and roads should be designed as per the future traffic requirements.

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Table -II: Time for time of accident from 2015 to 2019

Time	No. of accidents
12:00-3:00 pm	12
3:00 – 6:00 pm	10
6:00 – 9:00 pm	23
9:00 - 12:00pm	17
12:00 - 3:00 am	10
3:00- 6:00 am	7
6:00- 9:00 am	7
9:00 -12:00 am	15
Total	101

The maximum accidents occurred during time between 6:00pm to 3:00am. Most of the accidents are occurred in night time as compared to day time. It often be seen that at a night time driver drive vehicle at a very fast speed which most of time responsible for the accident.

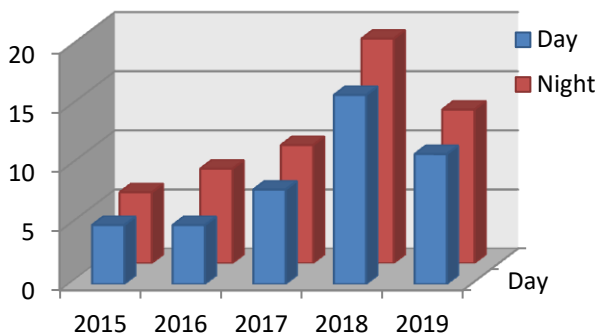


Figure.7. Day and Night accident variation from 2015 to 2019 between Panthaghati to Dhalli

The figure shows that most of road traffic accidents took place at night time. As we all know that at night time driver's drive vehicles relatively higher speed as compared to day time. This is mainly because at night time roads are more often empty or less traffic moves which encourage the drivers for over speed at night. The other reason for night time road traffic accidents is drink and drive. This drink and drive is also dangerous because in this condition drivers didn't have much control over the vehicles which will further lead to road traffic accidents.

Table -III: Type of accidents as per Severity

Injuries	No.
Minor Injuries	88
Killed	10
Seriously Injured	87
Total	185

This table indicates that total 185 road traffic injuries occur in year 2015 to 2019 and out of which 87 were serious injuries, 10 fatal deaths, and 88 minor injuries [6]. Male percentage of involving road traffic accidents are more than the females. There is a need to improve emergency medical

services. As per data males are more venerable towards road accidents shown in fig.8

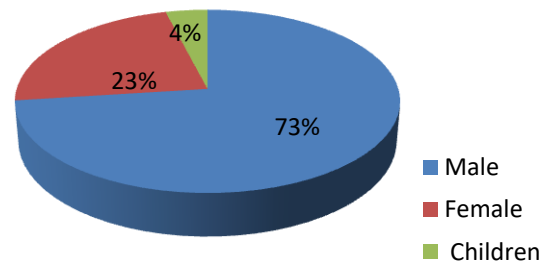


Figure.8. Gender wise accidents distribution between Panthaghati to Dhalli

It is clear from the figure that male percentage of involving road traffic accidents are more than the females. This is mainly because male drives vehicles more often as compared to female. In place like Shimla where driving is not a very easy task to do so only a few females try to do drive here. The other reason for less percentage of females in road traffic accidents would be that the females are more careful and fewer adventurers while they drive a vehicle. On the other hand males are meant to be more adventurers and more careless while drive the vehicle.

Table -IV: Type of accidents on NH 5: 2015 to 2019

Type of collision	No.
Head on collision	30
Veh..-ped. collision	18
Side on collision	38
Fall into valleys	15
Total	101

This table indicates that side on collision is most common type of accident collision followed by head on collision. This is mainly due to absence of traffic signals or signs at junctions, vehicles parked alongside the road, over speed and overtaking at curves. The place like Shimla where blind curves and narrow road are found be more often, at such condition high speed and overtaking would be very dangerous thing to do. This will definitely lead to road traffic accidents.

Table- V: Type of vehicle involved in accidents

Vehicles	No.
Bus	10
Car/jeep	37
Bike	22
Truck	17
Pick-up	14
Tractor	1

This table shows that cars and motor bikes are more involved in road accidents as compare to other vehicle. This is mainly because of over speed, in-experience of driving in hilly areas and lack of driving knowledge. The some main reasons which lead to road traffic accidents are shown in fig.9



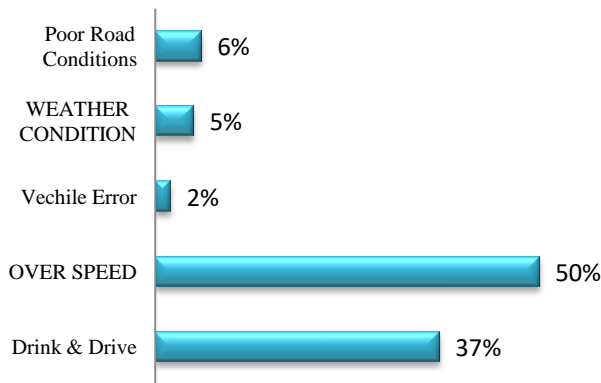


Figure.9. Main reason for road traffic accidents in Shimla

This figure shows that most of road traffic occurs because of over speed and drink& drive. These two are main human errors which are responsible for road traffic accidents in Shimla. This indicates that there is need to aware the people about road safety.

Table -VI: Month wise accidents data

Months	No. of accidents
January	10
February	4
March	12
April	2
May	4
June	9
July	6
August	16
September	12
October	11
November	12
December	3
Total	101

It show maximum number of accident occurs at the month of August. The main reason behind this is that there is an apple season between August to October and at that time lots of heavy vehicles such as trucks run between Panthaghati to Dhalli, so that's why so many road traffic accidents occurs in these months. After October winter starts in Shimla with heavy snow fall at upper Shimla areas. This snow fall also cause the road traffic accidents.

C. location Of Black Spot

Table- VII: location of black spot

Location	No. of Accidents	WSI value
Dhalli	24	102
Dhalli- tunnel	20	89
Bhathakuffar	17	87
Mehli	14	49
Malyana	13	46

Total 5 black spot locations are found between Panthaghati to Dhalli by using **Weight Severity Index (WSI)** method. The locations of these black spots are shown in figure 9 with different colours.



Figure.10. locations of black spots [5]

This picture containing a small circle of Orange, Red, Pink, light Green and Purple shows the locations of different black Spot between Panthaghati to Dhalli. These black spots locations are obtained by the help Weight Severity Index method.

VII. CONCLUSION

In this study it's clearly observed that there is an absence of road safety awareness among the people. The above analysis also indicates that this section of highway has high very high accidents rate and accidents density which is a grave concern of matter for road user. Here are the some important points concluded from this study:

- 1) The study concluded that maximum no. of accidents took place during the apple season in the months between August to October.
- 2) Majority of the accidents took place at blind curves and junctions because of high speed and overtaking.
- 3) It has been also observed from the study that more accidents occurs in night time as compared to day time.
- 4) Study indicates that maximum number of accidents occur because of cars, motor bike and truck.
- 5) In this study the most common type of accidents observed is side on collision followed by head on collision and then fall in to the valleys.
- 6) The study also concluded there is an absence of guard rail, traffic signals, drainage facility, road signs and pavement marking throughout the section.

FURTHER SUGGESTIONS FOR ROAD ACCIDENT PREVENTION

1. There is need to install speed-breakers, strong parapets and retaining wall alongside the road. These things will improve the road safety and reduce the chance of road accidents.
2. For batter visibility on blind curves we have to widen them, so that the vehicles can be easily seen from both sides of the curves and this will reduces the chances of road traffic accidents on curves.
3. The use of new technologies such as Sensor base technology on curves will be very helpful for reduction of road traffic accidents.



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4. Pedestrian crossing is required at places like Panthaghati, Mehli and Malyana.
5. Parking facilities are required at places such as Bhathakuffer, new apple mandi, Malyana and Panthaghati. So that the traffic congestion can be reduce in these places.
6. Need to install road traffic signs and signals between Panthaghati toDhali for smooth and safe flow of traffic.
7. Maintenance work such as filling of potholes, removal of cracks and removal of pumping or bleeding are required.
8. Traffic light should be installed at junctions such as Panthaghati, Mehli and new apple mandi and Bhattakufer.

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