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# A REVIEW ON CORRELATION OF TRAFFIC VOLUME WITH ACCIDENTS

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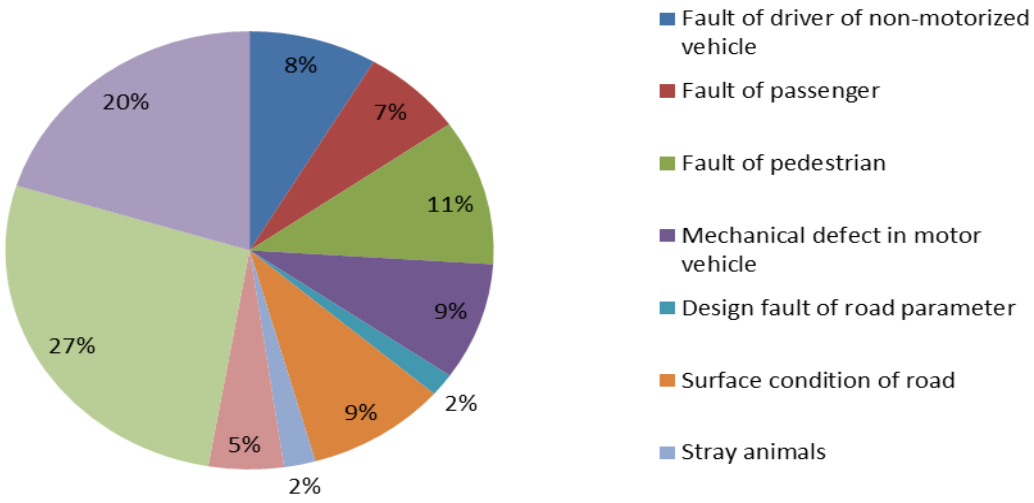
***Abstract- There is an enhancement in number of vehicles on Indian highways which has burst by more than 600 percent from the last 15 years which result in traffic congestion and increase in number of traffic accidents. The place on road where maximum numbers of accident occur is said to be Black Spot. In India black spot are identify throughout the country in order to reduce the accidents rates by 60 percent till 2020. Many of the developing countries in this world restrain the causes of road accidents by accepting a versatile approach to road safety that required wide range of measures such as traffic management, intelligent transport system, safer vehicle, law execution, effective and quick accidents responses and care team etc.***

***Keywords— Road accidents, Black Spot Identification, Need of Accident Analysis, Facts of Accidents, Remedial Measur.***

## INTRODUCTION

In order to study previous work on road accidents and factors influencing road accidents, many Journal and conference paper were referred and relevant literature is examine for review through various methods. We focus on general phenomenon of road accidents and its characteristic measure. Accidents on road are major causes of accidental death in India, resulting in unnecessary sorrow and suffering. Road accidents are resulting due to interaction of various factors, some of them are design parameter, vehicles and human population and their interaction on road, environmental factor and avoiding road safety measure etc. Road accidents cause serious injuries, casualty, disorder and sometime permanent hospitalization with serious socio-economic losses across the world. While considering all this points road safety has become a serious issues. As per the U.N report 2011-2020 year has become the decade of action on road safety. India is focusing on Brasilia Declaration and commits to reduce number of fatalities and road accidents by 50 percent to 2020. Sorate et al. studied on the human factor which increase the cases of road accidents and these includes drunk and drive as significant parameter. Apparao (2016) suggested that road geometry and road environment are an important factor in accidents. This chapter deals with the need of accidents analysis, facts of road accidents and their remedial measures.

| **Factor responsible for Road accidents** | **Total number of Accidents** | **Person Killed** | **Person Injured** |
|---|---|---|---|
| Fault of driver of motor vehicle | 4,03,598 | 1,21,126 | 4,14,794 |
| Fault of driver of non-motorized vehicle | 6,546 | 2,250 | 7,620 |
| Fault of passenger | 5,200 | 2,181 | 4,535 |
| Fault of pedestrian | 8,298 | 3,091 | 7,465 |
| Mechanical defect in motor vehicle | 6,688 | 2,823 | 6,956 |
| Design fault of road parameter | 1,289 | 589 | 1,217 |
| Surface condition of road | 7,158 | 2,983 | 6,579 |
| Stray animals | 1,604 | 629 | 1,307 |
| Poor light condition | 3,834 | 1,631 | 4,477 |
| Other causes | 20,858 | 7,312 | 23,380 |
| Causes not known | 15,580 | 6,170 | 16,303 |
| Total | 4,80,652 | 1,50,785 | 4,94,624 |




**LITREATURE REVIEW**

Apparao et al. (2013) [2] conducted a case study of traffic accident on stretch of 63 Km on NH-58 from Meerut to Muzaffarnagar (Km 75-Km 138) in Uttarakhand State to identifying the high rate accident point. The authors used GIS software and safety deficient areas were identify on the highway corrective measures could be implemented to those black spots. The authors concludes that the maximum number of accident occurred during the weekends that may be due to heavy traffic density which was going toward the Haridwar and Rishikesh route. From the investigation it was evident that the maximum number of accident occurred in August and December due to the heavy rain in August and hog in December and the peak hours for crashes was in between 02:00 -16:00 pm. The Crash ratio method was used for the prioritizing Safety Development program.

Ashwini et al. (2017) [3] conducted a case study to identify and analyze the black spots on NH-7 from Madiwala to Electronic City Stretch, Bangalore and four black spot were identified. The identified black spot were used for the study purpose and their data were compared with the IRC specification. The accident were generally caused due to various factor, related to human, road and vehicle but the human factor, cover driver, pedestrian and passenger was more dominant in compare to the road and vehicle factor in traffic accidents. The authors found that the road factor could be easily controlled as compare to the human factor by making a specified geometrical design parameter, it was even possible to remunerated the other issues and reduce traffic accidents by taking safety measure. The authors suggested to use enforcement measures, while indicating the accident zone, speed limit, warning and regulatory sign board to be installed.

Chen (2012) [4] utilized the Geo-coding technology and VRS-GPS positioning technology to determine the road accidents with the Geo-spatial information. On their link in between road network element and traffic accidents two way cooperative relationships was determined by the spatial relationship computation and this relationship is used to analyzed the factor that resulting in the accidents. Geo-coding method was build on the space positioning technology, which provides the geographical position information in term of geographic coordinate that would be used in GIS and in VRS-BASED. Based on the detailed study the authors illustrated the link between black spot and road network component in graph diagram which help to identify the main causes of road accidents. The authors provided some remedial measures to avoid such kind of cases.

Ghadi and Torok (2017) [5] carried out the case study on the road of Budapest, Hungary using accidental data from year 2013- 2015. The authors combined the advantages of both crash frequency and severity method by directly counting the number of crashes with high severity and effectiveness; fatal and severe injury crashes on that particular road. For the case study, the authors differentiated two different road with similar road characteristic (i.e. number of lanes), but difference in their average speed. The average speed on first road was in between 90-130 km/hrs. for the stretch of 281 km that connects the capital Budapest with Nyiregyhaza city in the northeast of Hungary and for the second road section the average speed was 50-70 km/hrs. for the stretch of 50 km from Isaszeg to Vac in the best-side.

The authors compared result using different techniques, i.e. sliding window method and the spatial auto co-relations methods and then the Empirical Bayesian approach was used to compare these two methods. The authors found that in low speed urban areas, road accident were more common near the conflicts area like intersection and pedestrian crossing locations. The authors further concluded that these areas could be analyzed using the local and global index techniques. The authors further concluded that the sliding window method was preferred in high speed roads and the spatial auto correlation method for low speed roads.

Ghaffari et al. (2012) [6] studied the reliability analysis method to determine the black-spots. Reliability analysis works on framework method to examine the probabilistic behavior of engineering issue, so that crashes with their probabilistic distributed nature could be applied. The authors compared it with the commonly implemented Frequency and Empirical Bayesian methods using stimulated data. The authored used crash occurrences for 30 sites in 16 observation period were simulated.

Hinsu and Raval (2015)[7] carried out the study on Ashram Road approach at Paladi cross road to Vadaj cross road in Ahmedabad city for the identification of black spots. For the study the authors took 4.9 km stretch, the data was collected from various nearby police station from 2010-2014. The black spot were identified on the basic of collected data. The authors statically analyzed the morbid causes of accidents like vendor stand near foot path, improper vehicle parking on the road, unavailability of speed beaker and signal at the entry of minor road, etc. The authors suggested the remedial measures to avoid the causes of accidents.

Kumar et al.(2016) [8] conducted a case study to identified the black spots on NH-21 from the Baddi to Nalagarh. For the study purpose, the authors took accidental data from the nearby police stations. The data was examined on the basis of maximum number of accidents as compared to the severity of accidents and black spot were identify accordingly. On the basic of direction of flow of traffic, type of vehicle and traffic intensity traffic volume was calculated. The authors suggested collision diagram to identify the location of accidents. In maximum number of cases over speeding and heavy traffic were the major causes of accidents. The authors suggested various remedies for the identified the black spots.

Lohan and Pal (2017) [9] proposed a case study on road accident in year 2017, there were five lakhs road accident in India out of which resulted in death of more than 1.3 lakhs people which translated that one road accident in every four minutes. To statically analyzed the situation the authors took a stretch of NH-65 of 110 km i.e. from Hisar to Kaithal to identify the main causes of road accident and to take some necessary step to avoid such kind of road accident by adopting the traffic rules and regulation, design quality of roads, implementation of intelligent transport system, law enforcement, effective and quick accident response and care.

Mor (2016) [10] identified the black spot on Sonipat to Kharkhoda road for a stretch of 19.1 Km using the last four year accidental data that was collected from the near-by police stations. The accidental data consisted of number of accidents in particular areas. The authors examined different parameter: time of accident, type of accidents, vehicle involved in accidents and location of accidents. The accidental data was compiled in excel sheet and then analyzed on the basic number of accidents, fatal and non-fatal accidents, accidents based on time period, proportion of victims of accidents, severity of accidents, accidents prone areas and causes of accidents and etc. Using weighted severity index method (WSI), accident prone location was identified which was calculated as per severity of each case. Various remedial measures were suggested by the authors to identify for the black spots.

Mor and Sood (2017) [11] carried out the study to identify the black spot on Panipat to Kharkhoda road for the accidental analysis data were collected from nearest police stations for last four year and the traffic volume was collected from the toll plaza Panipat. The authors adopt the severity index method to identify the black spot on the stretch on the basis of analysis the authors suggested remedial measure to avoid such kind of cases. The authors founded some relationship in between the accidents and traffic volume on that particular road.

Naidu et al. (2011) [21] conducted a survey on NH-5 Vishakhapatnam city, Andhra Pradesh for the stretch of 10 km and the data was collected from the respectively police station for the last three year. The data was analysis according to the severity of the accident i.e. fatal, injury or property damage and according to the accident contributory factor, according to the accident category i.e. pedestrian, left angle, head on collision etc. and black were identify from the last five year and the hole review was done at identified location. Spot speed method was conducted and the data was further examined on the basic of daily, timely and monthly variation of accident, gender wise review, vehicle wise distribution and the age limit variation of accident. Based on the detailed study authors suggested some remedial measure to avoid such kind of cases.

Singh and Dhattarwal (2004) [13] investigated 450 cases of deadly road accident in Rhotak during one year duration 2000 to 2001.The authors statistically analyzed the morbid features of type of injury, pattern and distribution of injuries, body part involved, deadly injuries and causes of death. The authors inferred that 28.7% cases were in pedestrian which is commonest group of victims ,which was preceded by multi utility vehicles (25.8%) and two wheeler (23%). The contribution of National highway was 31.6% and for State highway it was 27.1% of total accidents. Human error was the most remarkable for the road accident. The authors emphasis on proper training of vehicle user by authorized centers and suggested that the administration should strictly enforcing traffic rules and proper ratification in law to avoid drunk and drives.

Sorate et al. (2015) [14] carried out study on NH-4, stretch of 14.5 Km from New Katraj to Chandani Chowk to identify the accident black spots, for the analysis the data was collected from the N.H.A.I and from the nearest police station. Accident black spots were determined by coordinating the existing data with the results obtain from the survey, further the data was examined by the three different methods: Method of Ranking, Accident Density Method, and Weighted Severity Method. Author suggested some corrective measures like speed limit board, fitting of cat eyes and road reflectors, providing the road humps before the junction to avoid such kind of cases.

Tawar and Dass (2017) [15] carried out the study on the stretch of 17.4 km on NH-65 from Hisar City to Behbalpur Village in the state of Haryana, for the identification of black spots. The authors took last five year accidental data from the N.H.A.I and near police station. The data was compiled in excel sheet with respect to yearly, monthly, hourly, user type, vehicle, age, seasonal of accidents and the data showed that the maximum number of accidents occurred in the year 2011-2015. The authors attributed that less visibility and lack of streets light was the most common causes of accidents. The authors further observed that heavy vehicle contributed in maximum number of accidents. The authors further concluded that two-wheelers and pedestrian were the main victim of accident. The authors suggested various improvements to avoid such kind of accident.

Vivek and Saini (2015) [16] carried out a study on the stretch of 29 km in district Una, Himachal Pradesh. The study was build on primary and secondary data. The primary data contained physical parameters of road i.e. detail of road inventory and signage inventory. Using the moving observer method, traffic volume, speed and delay study were carried out on specified black spot. The secondary data consisted of accident susceptible location using the weighted severity index method, which followed a system of assigning score depend on the number of accident. With the help of this method, five black spot were identified the secondary data was further use to analyze as per vehicle type, during day or night time and etc.

## CONCLUSIONS

Through this literature survey the various studied conducted on black spot identification were studied and it was concluded that the topic of black spot identification is of utmost importance for the safety of road users depending upon geometric design parameters considered during the design of highway. Two-wheeler, pedestrian, cyclist etc are most affected in road.

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