

# A Review on Impact of Roadway Conditions, Traffic and Manmade Features of Road Safety

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**Abstract** - The problem of accident is a 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.

**Keywords**- Road Traffic Accident, Road Safety, Accident Rate and Frequency.

## I. INTRODUCTION

According to the official statistics (National Crime Records Bureau), In India in 2008, 118,239 people were killed in road accidents. The death rate in India is about 10 to 20 time higher than high income countries like Japan, Australia, UK, and USA. In India the share of national highways and state highways is about 6 to 7 % of the total road networks but it cater to about 70 to 75% of total traffic. However in India only national highways comprises of only 2% of total road network, which account for 20% of total road accidents and 25% of total traffic fatalities. The management of accident risk is both a short-term and a long-term strategy, which requires support of central and state authorities.

The most effective way of managing accident risk is through the development of a „safety culture“. A safety culture is the beliefs and ideas shared by all members of an organization about accidents and their risk of happening and proper measure which are to be taken to decrease in the number of accidents. The year wise road accidents in India are shown in the table given below. Accident is an event, occurring suddenly, unexpectedly and inadvertently under unforeseen circumstances.

An accident may be defined as a collision occurred on a way or street open to public traffic (The collisions may be between vehicles; between vehicles and pedestrians; between vehicles and animals; or between vehicles and geographical or architectural obstacles) resulting in killing or injuring of one or more persons and involvement of at least one moving vehicle. „Accidents are not natural but

they are caused“ is a common cliché in the area of traffic safety. Thus if accidents are caused by some, surely the ones responsible for could be identified and appropriate remedial measures developed and implemented to the extent feasible. Accidents are not often caused due to ignorance, but due to carelessness thoughtlessness and over confident. Road accidents are associated with number of problems from person to the environment and vehicle the road, for proper study of the accidents each problem has to study separately.

Due to growth in urbanization in many developing countries there is increase in the number of vehicles to a large extent which led to increase in traffic congestion in many urban centers which ultimately increase the number of accidents on road network which were never designed for these number of traffic and traffic type. Therefore the number of accidents is more in developing countries like India, Ghana as compared with developed countries like USA & Japan. The deaths per 1000 vehicles registered in some developing countries are shown in fig 1.1.

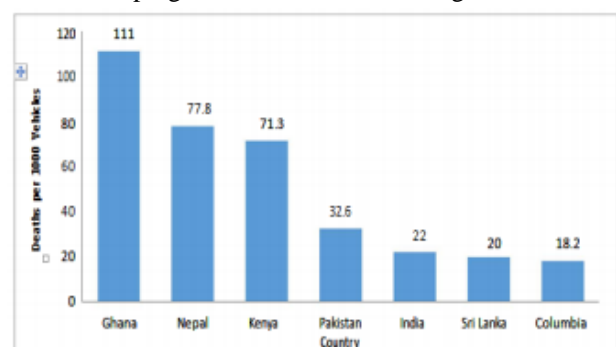


Fig.1. Comparison of death/1000 vehicles among various developing countries (source-Accidental Deaths &

Suicides in India Published by National Crime Records Bureau).

## II. LITERATURE SURVEY

Mahajan Himanshu Aabarao et al. (2019) The location of road where the maximum number of accidents occur is known as Black Spot. This paper deals with the study and analyzes the traffic safety situations in the section from Jalgaon to Bhusawal city on NH-6 in the state of Maharashtra. The stretch of 21 km is taken for study, the identification of road accidents and its causes. We have identified seven accident black spots and suggested the remedial measures on it.

MaenGhadi et al. (2019) study and compare the effect of methodological diversity of road network segmentation on the performance of different BSID methods. To do this, four commonly applied BS methods (empirical Bayesian (EB), excess EB, accident frequency, and accident ratio) have been evaluated against four different segmentation methods (spatial clustering, constant length, constant traffic volume, and the standard Highway Safety Manual segmentation method). Two evaluations have been used to compare the performance of the methods. The approach first evaluates the segmentation methods based on the accuracy of the developed safety performance function (SPF). The second evaluation applies consistency tests to compare the joint performances of the BS methods and segmentation methods. In conclusion, BSID methods showed a significant change in their performance depending on the different segmentation method applied. In general, the EB method has surpassed the other BSID methods in case of all segmentation approaches.

Maen Ghadi et al. (2019) to define a complex methodology to analyze black spot locations of road infrastructure network combining the benefit of both; Empirical Bayes method and K-mean clustering approach. In the first step, K-mean algorithm is used to define homogeneous accident clusters. The homogeneity is described in three terms: traffic conditions, geometric design of the road and accident characteristics. Then, Empirical Bayes method is applied to define black spots based on the determined clusters. Due to the combination of the introduced methods, a powerful technique is provided that is able to identify high-risk locations and cluster dependent segment length as the output of the model.

Sudipa Chatterjee et al. (2019) focused on identifying risk factors on this road type are of immense interest to most of the road agencies. Although these highways are more hazardous and account for more severe crashes, there is a lack of scientific safety assessment of such highways compared with multi-lane highways. Proactive

approaches, such as road safety audit, have been widely adopted by the government of India to reduce crash frequency and severity on highways. However, an effective road safety management program should exercise an optimal balance between reactive and proactive strategies to identify potential hazards and treat already existing hazardous sites. Through a case study on two two-lane highways, several risk factors were identified using the principles of road safety audit, and were mapped with the available crash data analysis to develop a risk matrix. This risk matrix was found to be helpful in the selection of countermeasure design in a more scientific way, targeting the frequent crash types and severities expected to result at the high crash sites. Finally, it was observed that integrating the findings from reactive analysis with proactive safety management is more beneficial, since they are methodically proven with historical crash records and provide the knowledge of plausible safety hazards at sites where similar features exist. The proposed methodology could be adopted by road agencies in India and other developing countries for effective proactive safety planning.

Yikai Chen et al. (2019) proposed method was tested taking an expressway between Bengbu and Nanjing (a section of the G36 expressway) in China as a case study, and the results were validated against the data of crashes occurred on the expressway from December 2005 to February 2017. The results of the proposed method agree better with the crash data than the methods employed in previous studies in terms of goodness of fit and correlation analysis. This method provides a new tool for black-spot identification on highways during the design phase and while in service.

Yashir Ahmad Dar et al. (2018) the road transport has increased at a tremendous rate in recent years but the roadway facilities have not developed at the same rate. This lag in the development has resulted in overstrain of traffic on the existing roads. The overburden of existing roads has created lot of problems to road users, led to traffic congestion and road accidents. The road accidents have become one of the most common causes of deaths and injuries in the world. The rise in road accidents is due to increase in traffic volume, higher vehicular speeds, insufficient carriageway, bad roads, poor traffic control, drunk driving, less public awareness etc. As reducing traffic flow is not practically possible so the solution of this problem lies in providing modern and efficient road design and traffic control devices. In this study the attempts have been made to locate the accident prone spots on national highway NH-344 (Ambala to Dehradun) as it is vulnerable highway for accidents in Haryana state of India. As this highway connects various cities and towns like Ambala, Yamuna Nagar, Roorke etc. there has been an exponential growth in the number of vehicles plying through this area which has enhanced the number

of road accidents. The detailed causes of road accidents and their preventive measures have been studied to sum up this dissertation. Keywords: Traffic accidents, Black spots, weighted severity index.

Aditya P. Mehendale et al. (2018) the places where maximum number of accidents occurs are known as black spots. Various studies on road accidents indicate that the prevention of road accidents mainly involve conscious planning, designs, and operation of roads. One of the most important factors in this regard is the systematic identification and treatment of hazardous locations or the accident black spots. The various causes of accidents may be due to three factors: driver, vehicle, and road environment. So for this work, we have analyzed Sangli-Kolhapur Highway (50 km) which is located in Maharashtra state of India. From the accident data analysis, black spots are analyzed.

Ashwini G. Wankhede et al. (2018) India is a country with a high population. It needs excellent transportation system for it to grow. As road transportation enables door to door transportation and has greater density and distribution all round our country, it becomes a primary factor in transportation which is responsible for the economic and social growth of our country. Accidents on these roads obstruct the growth as it causes high economic loss and loss of life.

Mr. Sandeep Verma et al. (2018) study attempts to identify the most vulnerable accident black spots using weighted severity index (WSI) methods and also provide suggestion for improvements of spots. The study includes collection of data and prioritizing the accident prone location by using weighted severity index (WSI) methods. WSI method follows a system of assigning scores based on the number and severity of accidents in that particular location in the last few years. So the main objects of this study identify black spots and improvement in it.

Huy Huu Nguyen et al. (2018) reviews the evolution of criteria for black spot identification in terms of scope and aspects. On the basis of this review, a number of suggestions are made for the cases of developing countries in terms of black spot identification aspects. The general purpose of black spot identification is to identify high accident frequency locations on a road network to improve road safety. The next task is to sift through these locations to select the particular locations based on whose analysis the safety treatment is established. Thus, black spot treatment is a two-stage process: identification and safety analysis, with the former producing the enriched data for the detailed analysis done in the latter. Such analysis is to determine the true black spots, the safety aspects to improve, the cost of treatment, and the extent of the efficiency.

### III. ACCIDENT SCENARIO IN INDIA

The fast growth in the Road Transportation Sector in India has been a key element in the economic development of the country. But on the other hand this fast growth in Transportation Sector led in to increase in traffic accidents too. During 2008 India ranked fourth in the world among leading deaths due to accidents. In 2008 more than 1 lakh people die in road accidents and around 5 lakh people injured due to accidents in India. India's motor population is just 1% of the world's but her share of the world traffic accident is 6%. Though the accident rate is decreased during the last 25 years due to awareness among people education and safety programmers but still the accident rate is very high as compared to the developed nations.

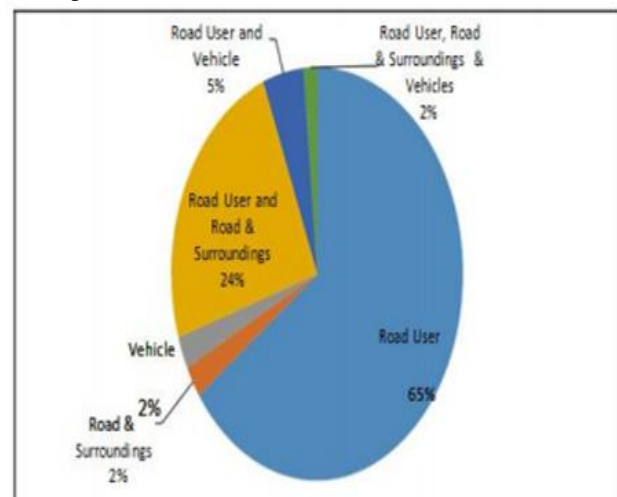


Fig.2. showing that most of accidents take place because of the fault of road user only (source-Accidental Deaths & Suicides in India Published by National Crime Records Bureau).

### IV. CONCLUSION

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 (2017-2018) were extracted from the FIR record filed under IPC No. 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, trailer (articulated vehicle), truck and bus. 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 2018. 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 2018 increased by 5.8 per cent and 2.4 per cent, respectively.

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