A Comprehensive Review on Highways Security in India and their Analysis

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ABSTRACT

Government of India has launched a major programme to expand and improve highways in India since 2000. Seventy thousand kilometres of National Highways (NH) are maintained by the National Highway Authority (NHAI). Through the National Highway Development Programme (NHDP), NHAI is upgrading nearly 49,000 km of NH. Twenty four thousand km of highways have been upgraded. Upgradation includes increasing the number of lanes (e.g. from four to six), converting undivided roads to divided highways, and adding paved shoulders to 2 lane roads. The major motivation behind highway upgradation has been improving inter-city and interstate connectivity through capacity enhancement as well as improving highway safety.

In this paper, the author has studied the various similar type of highways accidents and security aspects on national highways in India.

Keywords: highways security, accidents, highways analysis.

INTRODUCTION

Number of injuries and deaths due to highways accidents has steadily increased globally and in India as well. Highways fatalities have emerged as a serious threat to human life and are causing a serious challenge to highway planners, designers and construction agencies. This has placed the added responsibility on all the stakeholders in highway sector to think seriously in providing safe highwayss by all means.

Highways transport is vital to the economic development and social integration of the country. Easy accessibility, flexibility of operations, door-to-door service and reliability have earned highways transport an increasingly higher share of both passenger and freight traffic vis-à-vis other transport modes. All the trunk highwayss in India starting from Kashmir to Kanyakumari & Mumbai to Kolkata are connected by high speed corridors through various schemes such as Golden Quadrilateral and North South Corridors by National Highway Development Project (NHDP), the ambitious project of the Government covering 18,000 Kilometers of heavily trafficked national highways which has been Constructed with the best practices in respect of design, Construction, maintenance, and audit of highways security. While feeling proud of the above, Accidents and Highways crashes had cost the Indian Subcontinent a huge loss of about Rs.75000 crores every year.

This review was undertaken to synthesize the available published studies on road safety done in India upto January 2017 and categorize them according to four themes - urban, highways, national trends, public transport. This section includes a systematic review of the published papers according to the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). The electronic database searches included Google Scholar and Elsevier. A hand search enabled a look through the bibliographies of the retrieved articles. The search screened published and unpublished articles, working papers, dissertations, reports documented or published upto Jan. 2015.

Highways Security Concern

Nearly 80% of highways accidents are attributed to the human error of momentary judgment (primarily drivers and vulnerable highways users i.e. pedestrians, cyclist, rickshaw/cart pullers) which is observed to be directly proportional to the degree of mental stress/anxiety of the highways user. The primary reason of omission and commission is observed to be over speeding. Overloading an economic constraint and deficient highways geometry, lack of setback/ sight distance are among other reasons causing accidents. In our country about 70 percent are vulnerable highways users. Huge loss of life in addition to loss of property is causing every year. It is regretful that in India, there are hardly any emphases on research/study to assess the behavioral aspects of different categories of highways users, especially the vulnerable highways users. The factors responsible for accidents are very complex in nature; however these can be divided in to four major categories i. e. the driver, the highways, the vehicle and the environment. Realizing the fact that more than 90% loss of lives in highways accidents occur in developing world which has less than half of the world's vehicles, the UN has declared a Decade of Action for Highways Security 2011-2020.

LITERATURE REVIEW

Homel and Wilson (2007) describe an American approach of using all available resources for enforcement at high accident times and places. Security Council of proportional allocation of manpower where police allocation is proportional to the number of accidents occurring during This is in contrast to another approach by the US National that day or shift that it is a waste of time to assign any officers to low traffic or low accident times even if it is a high frequency accident location [9].

Cashmore (1985), Using 1983 Federal Office of Highways Security estimates of costs of accidents for fatalities, major and minor injuries, estimated that the random breath testing represented in 1983 a saving of $88.78 million in fatality costs,
$31.8 million in injury costs totaling $120 million. The two year cost savings were totalled at $218.3 million. Figures were based on pre-random breath testing six year predictions of expected number of fatalities and injuries. The 1984 estimates totaled $98.3 million.

Sharma Abhinandan (2015) summarizes research findings which suggest that improving the highwayss and the highways side to make a more forgiving environment is an expensive but more effective way to improve highways security than attempting to change human behavior [18].

According to IRC Guidelines, (2016) Highways fatalities in India during the year 2015 consumed almost 1,42,379 lives which is about 10% of World fatalities. Many more are severally injured. The worrying factor is that the highways security scenario is worsening in the country. Accidents, fatalities and casualties have increased at the rate of almost 5% during last 20 years and death rate per vehicle is 10 to 20 times higher in India compared to countries like Sweden, Norway, Japan, Australia, UK and USA. [7].

Reid (2004), In some states, the through movement to the main line approach to the intersection is also denoted by pavement markings or other lane delineation devices so left-turning-turning traffic stays in its respective lane. For instance, the Department of Transportation implemented advance warning signs to inform drivers of the special lane configuration. The seagull layout is more commonly known as a continuous green T-intersection (CGT intersection).

The work presented in [4] takes advantage of some mouth geometrical features to detect yawning. The work in [5] proposes the detection of the face region using the difference image between two images. Driver'syawn is then detected based on the distance between the midpoint of nostrils and the chin. [6] Uses Gravity-center template to detect the face. It then uses grey projection and Gabor wavelets to detect the mouth corners. Finally LDA is applied to classify feature vectors to detect yawning. [7] It presents a system where the face is located through Viola-Jones face detection method in a video frame. Then, a mouth window is extracted from the face region, in which lips are searched through spatial fuzzy c means (s-FCM) clustering.

In [8] there is an advantage of two cameras: a low resolution camera for the face and a high resolution one for the mouth. It then uses haar-like features to detect driver's mouth and yawning is detected by the ratio of mouth height and width. In [9] a method is adopted for yawning detection based on the changes in mouth geometric features. The work in [10] driver's drowsiness is determined using vehicle based measures, behavioral measures and psychological measures which makes this a hybrid drowsiness detection system. Shows detection of drowsiness based on head movement and

geometrical features of mouth is proposed. Experiment was conducted on sample size of 50 video clips and observed that head movement contributes about 8% and yawning contributes about 49%.

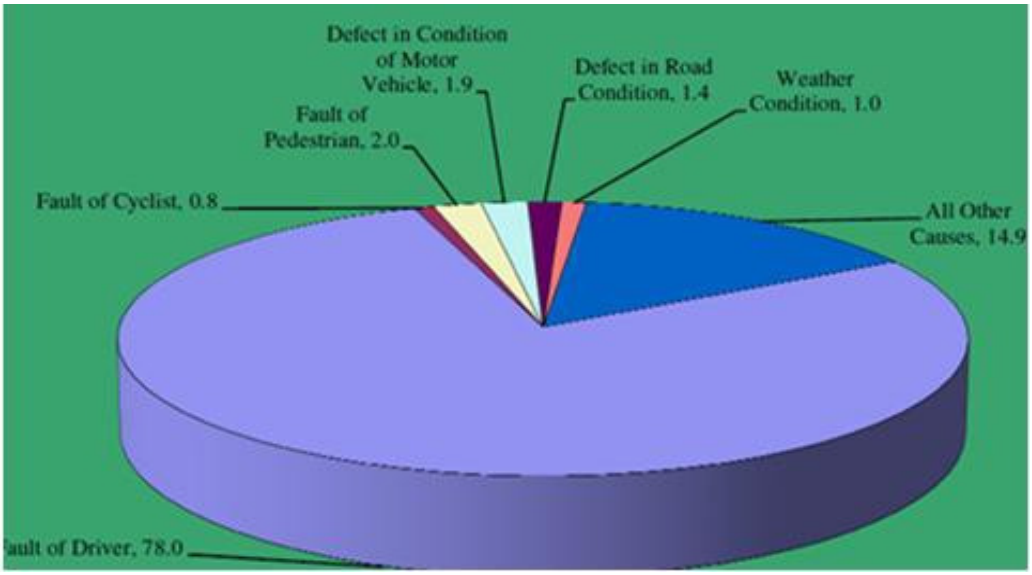

Figure 1: Cause of road Accidents: 2016

Radalj et al. (2006) utilised a "before and after" experimental study.For each seagull intersection, they investigated the total number of crashes before the construction and the total number of crashes after the construction; the nature of crashes as well as the severity of crashes. The effects of the design of seagull intersection with respect to the angles and median widths were also examined with respect to each of the above areas. He also found that the median width did not significantly affect the number or severity of crashes. On the other hand, the nonstandard angle seagull intersections appeared to be associated with a change in the type and severity of 19 crashes occurring at the treated intersections. Their finding suggested that the angle could be the most important factor in the design and installation of the seagull intersections [6].

Tang, J., Levett, S. (2010), concluded that badly designed intersections were very likely to result in an increased number of crashes and increased severity of the crashes. They suggested that well-designed seagull intersection configuration could potentially result in a reduced number of crashes involving medical treatment in the best possible scenario, but a confirmation was only possible with further research [9].

Highways security audit must access project on the basis of highways user knowledge, attributes and skills, day/night and wet and dry highways conditions. Security audit is only a study of security aspects and an auditor may indicate highways security problems inherent in designs that conform to our highways standards. This is due to fact that our highways standards are an expression of a socio-economic balance between highways security accessibility, environment and economy. The goal of highways security audit is to ensure that all new highways projects – and major operating and maintenance activities on existing highwayss – are assessed from the standpoint of highways security, so that any parameters of the project that are unsuitable from the standpoint of highways security are corrected in time. The benefits of conducting highways security audit are that: [10].

i) The likelihood of accidents on the highways network can be reduced.

ii) To minimize the risk and severity of accidents by elimination of security hazards.

iii) Highways security is given greater prominence in the minds of highways designers and traffic engineers.

iv) The need for costly remedial work is reduced, and

v) The total cost of a project to the community, including accidents, disruption and trauma, is minimized.

A more recent study investigated police reports of fatal crashes on selected locations on 2 lane NH8, 4lane NH24, and 6laneNH1 (Tiwari, G., 2015). The results for modal shares of those killed on these locations are given in Table 9. In the 1998 study of highways the proportions of motor vehicle occupants and vulnerable highways users were 32 and 68 per cent respectively, whereas the numbers for urban areas were 5%-10% vehicle occupants and the rest were vulnerable highways users (Table 9). Though the motor vehicle fatalities are higher on highways than in urban areas, as would be expected, the differences are not as high as in western countries. A vast majority (68%) of those getting killed on highways in India comprises vulnerable highways users and this fact should be the guiding factor in future design considerations. Data from three highway segments from 2009-2013 show a similar pattern. Pedestrian and MTW proportions are very high except on the six-lane highway where the proportion of truck.

ANALYSIS OF GURGAON FARIDABAD ROAD

Keeping in view the horrible situation of highways fatalities it is very much incumbent upon the stake holders to find suitable ways and means to reduce these accidents drastically. The 4 E'sof Highways Security measures to reduce the accidents may be grouped as.

Highways Engineering

The geometry of the highways influences the highways user behavior. The defective geometric design like inadequate width of carriageway & shoulders, improper super elevation, sharp embankment slopes, inadequate sight distance, poor horizontal/ vertical geometry, blind intersection, narrow & weak bridges, absence of signs, improper lighting, etc. cause accidents. In addition, the physical condition of highways such as riding surface, skidding, potholes, ruts or any other constraints of space by the structures which could not be shifted during the improvement of the highways, the geometric standards get compromised, leading to highways accidents. If proper warning signs are not installed on these vulnerable locations, the possibility of accidents always remains on these locations.

The highways engineering measures are physical improvement of the existing highways system by identifying all high accident locations available with police record to ensure effective sight distance, geometrics improvement , skid resistance, intersection features, decongestion by providing bypass or grade separator, separation of traffic flows, providing pedestrian over/ under bridge, highways lighting etc. [16].

At design stage, the objective of functional design is to arrange the physical elements of the highways so as the best suit the requirements of the user and the vehicle in providing inherent security & efficiency. The elements that make up functional design are vehicle speed, human reaction time, space & time, right of way, centrifugal force, spirals, curvature, super elevation, grades, pavement width, shoulders, channelization, highwaysway cross section, guard rail, highwaysside furniture, reflectorisation, traffic signs and electrical illumination. Skilful utilization of these elements in proper combination is the task of a highway engineer considering security of all highways users and provides long term solutions.

Vehicle

The type of vehicle, its operation characteristics such as acceleration/deceleration rate, braking efficiency, lighting, etc. influence the highways user behavior and cause accidents. The vehicle defects that result in accidents can be failure of brakes, steering system, tyre burst, axle breaking etc. [17].

The various measures are being provided in vehicles to improve the security are speed governors, light blinkers, hand brakes, mud guards, air cushions, accident sensors, etc.

Enforcement

The traffic police plays a vital role of enforcement such as over speeding, obey traffic signs & signals, fastening seat belts, drunk driving, etc.

To enforce the various rules regarding regulations of traffic the involvement of traffic police/ administration is essential so to reduce the accident enforcement of rules necessary. Similarly there are some traffic rules which are necessary to be followed by the pedestrians and vehicle owners which are also to be enforced by traffic police/ administration.

Education

The accidents rates can be reduced significantly by educating the highways users. The highways security campaign in print & electronics media, highways shows, school/college curriculum, etc are few of the ways to educate highways users. The highways users responsible for accidents may be drivers of one or more vehicles, pedestrians, passengers and animals.

Analysis Report

In the recent decade the districts of Gurgaon and Faridabad have emerged as new economic centers and growing at very rapid pace. Also the tourists from all over India and abhighways coming from Delhi side use these highwayss to reach Surajkund Craft Fair, Damdama Lake, Tourist Complex Sohna, Bird Sanctuary Sultanpur and to reach Rajasthan to see the historical places. The 140 crushers in these two districts generate large volume of heavily loaded trucks carrying quarry material/crushed material and use the project highwayss to reach their different destinations.

On account of above prevailing conditions, the existing connectivity in these two districts especially between Gurgaon-Faridabad, Ballabgarh-Sohna and few of the connecting highwayss seem to be shrinking. Citing this situation, the Haryana Government has under taken the work for development of these highwayss on BOT basis.

Gurgaon Faridabad (GF) highwayss start from Gurgaon Mehrauli Highways about 2 km west of Delhi border at Sikanderpur and ends at its junction with Pali Bhakri highways. Length of this stretch of the project highways is 24.31 km. The MCF highways having length of 6.10 km take off from Km 21 of Gurgaon – Faridabad highways leading to Surajkund, New Delhi. The crusher zone highways of approximately 3.10 km length is also included in project highways. Thus the total length of the Gurgaon – Faridabad project highways comes to 33.510 km. [23].

Ballabgarh-Sohna (BS) highways starts from Ballabgarh situated at km 35 of Delhi – Mathura Highways NH-2 and ends at its junction with Rewari - Palwal at km 53.5 of NH-71B. The length of this highways is 28.575 km with zero at Ballabgarh and passes through Pali, Dhauj & Sirohi and terminates near Sohna situated on NH-71B. The stretch of highways having length of 4.10 km from Pali village to its Junction with Faridabad – Gurgaon Highways is also considered as part of this highways. Thus length of BS project comes to 32.675 km. [24].

Thus, total length of this package comprising of GF and BS highwayss comes to approximately 66.185 km. For the fulfillment of the above mentioned project, a Concession Agreement between the Government of Haryana through the PWD B&R Branch (Client) and GF Toll highways Pvt. Ltd (Concessionaire) was signed on 31th January, 2009.

CES India Pvt. Ltd. was appointed as the Independent Consultant for the project who has now been replaced with M/S AECOM Asia CO. Ltd for completing the balance work and during the OMT period of the project. The Project will be entirely funded by the Concessionaire.

The date of issue of provisional certificate is 29th June- 2015. This provisional certificate is issued with the approval from Haryana PWD (B&R) Branch Pursuant to Sub-clause 16.5 of the Concession Agreement

CONCLUSIONS

It is found in this study that certain standards like design speed, curve radius and development of intersections have not been adhered to. All the highways markings have faded away which should be re- marked with thermoplastic paint, proper cat eyes and delineators should have been provided. The Unauthorized gaps in central verge in four laning portion should be plugged immediately, bushes and shrubs should be planted in the central verge to avoid head light glare during night. The speed breaker is not of proper shape and design which should be reconstructed as per IRC standards. The shoulders are full of wild jungle growth and puddles.

The pot holes developed in highways crust require to be repaired immediately. The audit would have identified such issues in time leaving scope for making due amendments to update the design parameters in tune with standards and specifications. At this stage only compromise solutions could be put in place taking a toll on operational efficiency and security.

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