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Design Analysis of Rural Roads in Terms of Safety and Operational Considerations

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ABSTRACT

The way toward recognizing, dissecting, and treating roadway security issues on nearby and rural roads depends vigorously on the accessibility of street wellbeing information. Crash reports finished by law requirement officers are consolidated with roadway trademark and movement volume information accumulated by activity building or open works staff to recognize crash history, break down hazard factors, set up needs, and assess medicines. Law authorization and designing organizations need to cooperate nearly to comprehend the prerequisites for security information and the significance of this data in creating plans and projects to treat street wellbeing issues. India is a nation with one of the most astounding rates of car accident casualty and damage and 70% of these fatalities occur on rural roads. The target of this examination is to recognize the noteworthy elements affecting damage seriousness among drivers engaged with crashes on two sorts of major country streets in India: two-path, two-way streets and expressways.

Keywords: Road safety, rural roads, factors, hazards.

INTRODUCTION

This India is a nation with a high rate of street car accident casualty and damage. As per insights from the Forensic Medicine Organization of India, between 2006 to 2016, car accidents brought about a normal of 24 000 individuals (i.e. 3 people for every hour) dead and around 240,000 cases harmed, yearly. A lot of research has been completed with a specific end goal to comprehend the conditions under which drivers and travelers will probably be slaughtered or all the more seriously harmed in a car accident, and to perceive the components influencing the seriousness of crash-related wounds. In this manner by anticipating crashes and furthermore by lessening their seriousness, the general driving security circumstance might be moved forward. Shyam Sunder Yadav utilized 2001 crash information for Delhi, to set up the connection between damage seriousness and driver/vehicle qualities, interstate/natural factors and crash factors, and inferred that the most critical variable related with crash seriousness is the vehicle sort. Smash Singh played out an investigation of the connection between backside crashes happening at signalized crossing points and a progression of potential movement chance variables. Dissecting the 2001 crash database, they found that backside crashes are over-spoken to in the higher speed limits (45– 55 mph), and the peril of a backside crash is more noteworthy amid daytime, in wet and dangerous street surface conditions, with male drivers, and drivers more youthful than 21 years of age. Another investigation identified with the capital, demonstrated that speeding and ignoring walkers' privilege of way were the most causes expanding damage seriousness.

More than 90 percent of travelers in India go by street, and provincial streets assume a huge part in this transportation. Moreover, in India 70 percent of the fatalities occur on provincial streets. So the need to direct a concerned report is evident. The principle target of this investigation is to recognize huge components impacting damage seriousness among drivers engaged with crashes on country streets in India.

The examination has been talked about on all the crash information, relating to a 3-year time span (2006-2016), on two noteworthy sorts of rustic streets: two-path, two-way streets and turnpikes. Investigating two unique examples of streets with such land immensity and huge measure of information is practically obscure among all the past examinations.

Mountain country streets had grown quickly as of late, yet additionally caused auto collisions as often as possible in the meantime. By review, the paper examination the reasons which caused the mountain provincial streets traveler transport auto collisions, for example, absence of assets, over-burden, security offices blemish, and so on. At last set forward countermeasures including account ensure, security offices, division's participation and wellbeing training.

Low-volume provincial streets can likewise be dangerous because of the assortment of vehicle sorts that utilization them.. Utilizing the data accessible in the Fatality Analysis Reporting System (FARS) database, Madsen condensed five years of late crash history from nine Midwest states (Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, North

Dakota, South Dakota, and Wisconsin). He accentuated two perilous circumstances: backside crashes over a peak vertical bend, and broadside/sideswipe crashes where a ranch vehicle driver endeavored to make a left turn without seeing a vehicle that was endeavoring to pass. Madsen presumed that 75% of the harmed people and 60% of those executed in these sorts of accidents were tenants of the nonfarm vehicles. The absence of retro reflective signs and taillights on moderate moving vehicles was distinguished as a noteworthy contributing component for cultivate gear crashes. Vehicle velocities can likewise introduce security worries on low-volume streets.

LITERATURE REVIEW

Many studies have examined the causes of traffic road accidents the world over. But, there is no consensus on their causes. This section reviews the existing literature on the effect of environmental factors on road traffic accidents. The main findings of the reviewed literature and any research gaps identified are discussed below.

However, Kashani et al (2012) revealed that weather and road surface conditions, shoulder type and road width, lighting as well as location type are less important variables, influencing the injury severity by traffic crashes than the use of seat belt, cause of crash and collision type. A study of traffic accidents at hazardous locations of urban roads in Jordan indicates that road accidents represent a major social and economic problem that causes a lot of losses in lives and injuries. This study found that logarithmic and linear statistical models could efficiently and practically predict the expected number of accidents, injuries, fatalities and their associated types as functions of numerous independent variables. It was found that the most important contributing factors to traffic safety issues at urban roads were geometrical, behavioral, traffic condition and environmental factors.

The study found that winding uphill/downhill road was the roadway geometry with the highest rate of RTAs. This roadway geometry limits the driver's vision and causes difficult control of vehicle at crash time with subsequent increase in fatal RTAs risk Well-designed roads with separate lines for pedestrians and cyclists are much safer than those without such facilities. Sometimes barriers to discourage pedestrians to motor roads reduce the rate of injuries. Road signs should be clear by themselves and should convey an unmistakable message to the driver. It has also been observed that accidents mostly occur on broader roads than narrower ones.

In India it was reported that better roads have resulted in excessive speed and reckless driving resulting in an increase rather than reduce death toll on national roads. There is also a relationship between seasonality; weather and time factor in road traffic accident occurrence. Fatal accidents have been reported during winter season. For instance, a study carried out by Kong et al (1996) has revealed that most of the accidents occur at night or in weekends during the Northern winter (e.g. October to December). Shibata et al. (1994) observes that informal tertiary sector activities along the road side tend to increase exposure risk to traffic accidents. In addition, improved road quality may lead to behavioral adjustments in terms of more risk prone driving.

According to the study by Shankar et al (1995), rainfall plays a significant role in road traffic accidents. They argued that higher rates of fatalities resulting from road traffic crashes in poor weather could be explained by (a) poor visibility due to rainy or snowy weather (b) the road surface which may be more slippery thereby reducing the vehicle-roadway friction. He showed a definite association of adverse environmental conditions such as rain, fog, and wet pavement as well as driving in daylight with traffic crashes. The most contributing factors to accidents at hazardous locations on urban roads were speed, degree of curvature, road surface type, traffic properties, number of horizontal and vertical curves, lighting conditions and roadway geometry. The traffic accidents study in Jordan adopted an engineering approach to examine the causes of road accidents in the hazardous locations of urban areas in Jordan. The present study adopted a geographical approach to analyse the effect of environmental factors on road accidents at black spots in the City of New Delhi. Lankarani et al (2014) in a study in India revealed that environmental factors are major causes of road accidents. It was established that dusty weather had the highest death rate compared to other weather conditions.

The major causes of RTAs were behavioural, environmental, vehicular and governance factors. He further noted that these factors influenced one another and a single solution or an arbitrary set of un-researched measures cannot resolve the complex issues in RTAs particularly in urban areas like New Delhi. The present study examined to a large extent how environmental factors cause RTAs. The study does not consider how the inter-dependence of the social, environmental and governance factors causes RTAs. In India, Ishwar Prasad (1996) observes that development and expansion of road transport system has been revolutionary promoting efficient and quick exchange of goods and services between distant places which would not be accessible by any other cheaper and convenient mode of transport. This development has led to increased road traffic accidents in Kenya. Among the key recommendations proposed by Ishwar Prasad (1996) are that drivers of Matatus and their proprietors should be well trained and informed on traffic management and made aware of road safety issues.

He recommends that roads should be regularly maintained to make them motorable and to reduce road traffic accidents and all road users should be made aware of the importance of road safety in order to minimise RTAs. The

recommendation by Ishwar Prasad (1996) takes cognizance of the fact that there are some environmental and governance factors that to a larger extent affects road safety on rural roads in one way or another.

MATERIALS AND METHODOS

Rural Roads Analysis

Crash, roadway, and traffic data are combined to analyze crash patterns for the purpose of identifying high-crash locations, crash trends, and potential improvement strategies. There are a number of methods that can be used to characterize crash patterns, including crash frequencies, rates, severity of crashes, location of crashes, overrepresentation of certain types of crashes in the data set, and driver actions such as speeding, failure to yield the rightof-way, and impairment. The results of the data analysis are examined to determine patterns in crash types, locations, and potential causes.

Improvement strategies or safety countermeasures are selected to treat identified safety problems. There are many potential strategies available to treat problems depending on the contributing factors. Safety professionals generally classify these into four categories: engineering, enforcement, education, and emergency response (4E's).5 Crash patterns and characteristics provide a basis to understand the type of actions needed to treat a particular safety problem. For example, analysis of crash data at an intersection may suggest the need to modify the geometric design or traffic control to reduce a high frequency of right-angle crashes. A high frequency of crashes related to speeding may indicate a need to increase enforcement. A comprehensive approach is generally the best option.

The methodology for data collection being used in this type of studies is based on both qualitative and quantitative methodologies within a framework of a case study approach. Interviews, focus group discussions, observations and review of secondary data, were also done. The study used triangulation to obtain data from multiple sources to adequately address the research objectives from different points of view. Triangulations strengthen reliability and validity of the research.

Study Area

This study should be carried out in any chosen rural road area which may be a developing or a developed city.

Data collection

The methods of data collection used in this type study included on-site observations and study of accident scenes and environmental features of road accident black spot sites. The Police Traffic Department keeps records of traffic accidents in each area. These records provided useful data on road accident black spots in the Rural area. Major Black spots are selected using systematic sampling method. Every second black spot was picked for study from the list of six black spots. The road accident black spots are distributed throughout the City which made it difficult for the researcher to cover all of them. But the ones selected were considered representative enough. Interviews are also held with key informants in the City such as Traffic Commandant in the City and Ministry of Transport and Infrastructure officials. Key informants are selected using purposive sampling method. Focus Group discussion (FGD) involving representatives of key stakeholders such as traffic police, PSVs/Matatus drivers, PSV SACCOs, Private vehicle drivers and Traffic police officers in the respective police bases within the sampled road accident black spots provides additional information on possible black spots and causes of traffic crashes in that area.

Data analysis

Data is analyzed using many statistical tests like Pearson chi-square goodness of fit test. This inferential statistical technique is also used for testing the two hypotheses formulated for the study. Data on observations of the presence of road side activities and their encroachment on the pedestrian sidewalks is also analyzed using descriptive statistics. Base on the various information's from the respondents, it can be seen that all of the respondents which were interviewed (100 percent) reported that road accidents at black spots in cities occurred during dry weather conditions.

SAFETY COUNTERMEASURES ON RURAL ROADS

Local road agencies often do not have the resources needed to adequately address safety problems on the roads they own and operate. The Local and Rural Safety Program provides national leadership in identifying, developing, and delivering safety programs and products to agencies, elected officials, governments and other stakeholders to improve safety on local and rural roads.

Addressing safety on local and rural roads presents several challenges including:

1) Safety issues are often random on local and rural roads;
2) Strategies to address local and rural road safety are diverse and draws from several safety areas.

Alternative Methods for Safety Information

Storing, retrieving, and processing crash data can be time consuming and costly. Electronic data processing systems can reduce the burden. However, local and rural agencies often times do not have the financial or staff resources required to develop or maintain a system. In such cases, compiling and storing crash reports can be accomplished by combining manual and electronic data processing. For example, one county government reported using high school interns to enter crash data into an Excel spreadsheet for processing. University students may be available to assist in developing and designing a system in exchange for college credit.6 This can reduce development costs for local and rural road agencies while providing a level of electronic data processing capability. As an alternative to formal crash databases and crash reports, agencies, police officers, and maintenance staff may be consulted to identify high-risk locations. Physical evidence such as skid marks at a crash site and maintenance records indicative of crash-related damage could be used to identify existing safety problems and sites for potential safety treatment. Local residents may report problem locations to the local engineer and public officials, who can identify locations based on citizen complaints. Road Safety Audits7 can also be used to identify and make recommendations to mitigate the safety issues identified.

While it may take more effort to collect data from the aforementioned sources, methods exist to address lack of complete crash data. For example, roadway features that are generally related to particular crash types might be identified as candidates for systemic, low-cost treatments in the absence of crash data. Identifying higher risk locations based on the presence of roadway features with known risk can be useful in identifying the need for safety treatments on a system-wide basis.

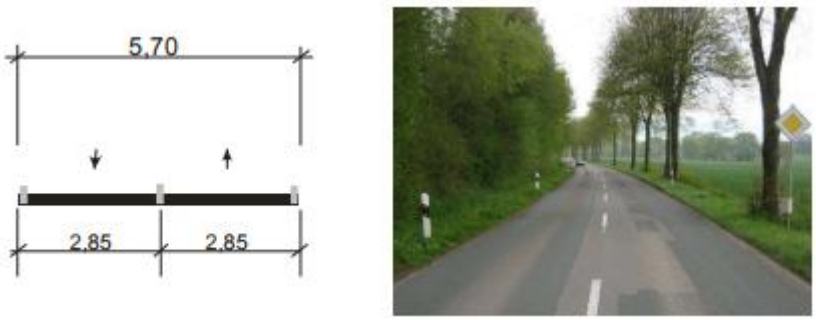

Figure 1: Test track before the remarking

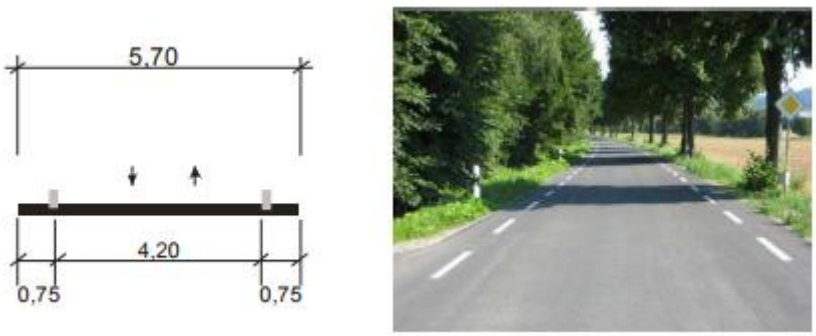

Figure 2: Test track after the remarking

CONCLUSION

This study has discussed on the rural road safety. The analysis results revealed seat belt use, cause of crash and collision type as the most important variables influencing the injury severity of traffic crashes. To deal with these problems, intensifying police enforcement by means of mobile patrol vehicles, constructing overtaking lanes where necessary, and prohibiting the crossing of pedestrians and livestock and the driving of unauthorized vehicles on freeways are necessary. Moreover, creating a rumble strip on the two edges of roads, and paying attention to the design consistency of roads can be a helpful factor in order to prevent events such as "overturning" and improve the overall safety of freeways.

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