Literature Review on Accident Studies at Intersections

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ABSTRACT

Although the phenomenon of high motorization growth rate accompanied by rapid expansion in road network and urbanization over the years, has significantly contributed in raising the road accident rate resulting into injuries, fatalities, disabilities and hospitalization. The Scope of the work consisted of conducting a literature review, assimilating accident trends statistics, establishing variables of influence and determining significant casual patterns.
Keywords: Accident, Road, Transport

I. INTRODUCTION

Transportation is the movement of people, animals and goods from one location to another. Transportation forms a vital part of the infrastructure for economic and social development of a country.

Modes of Transport include air, rail, road, water, cable, pipeline and space. Among these transportation by road is the only mode which could give maximum service to one and all. Road transportation has also the maximum flexibility for travel with reference to route, direction, time, and speed of travel etc. that is not available to other modes of transport. Road network alone could serve the remotest villages of the vast country like ours.

Although the phenomenon of high motorization growth rate accompanied by rapid expansion in road network and urbanization over the years, has significantly contributed in raising the road accident rate resulting into injuries, fatalities, disabilities and hospitalization. All of these, in turn cause severe socio-economic costs to the country. Traffic hazards, exposures and risk factors have also increased over the years.

II. METHODS AND MATERIAL

A. Literature Review

The Scope of the work consisted of conducting a literature review, assimilating accident trends statistics, establishing variables of influence and determining significant casual patterns.

Many researchers have devoted their work in the area of road accidents and traffic safety aspects. Works have been undertaken on accident characteristics, accident forecasting and better roadway and vehicular design for the improvement of road safety in different traffic and roadway conditions.

1. Development of accident prediction models for safety Evaluation of urban intersections

C. Minachi, Jebaselwin Gladsen, S. Kalaanidhi and K. Gunasekaran. (May 2015, Chennai) This study is attempted to develop Accident Prediction Models for signalized four arm and T intersections in urban areas. In this study, 106 intersections in Chennai were chosen and their volume count data were obtained from the previous studies for the development of Accident Prediction Models.

2. Analysis of Sight Distance, Crash Rate, and Operating Speed Relationships for Low-Volume Single-Lane Roundabouts in the United States

Brian Zirkel et al. (2013, United States) This paper explores the relationship between sight distance parameters, crash rates, and operating speeds at low-volume single lane roundabouts in the United States. The understanding of the interaction of design, operations, and crash performance is a step forward in the development and application of performance-based standards for roundabouts. The specific objective of this paper is to quantify the relationship between crash rates, sight distance parameters, and operating speeds to present an approach to establishing performance-based standards that highway practitioners can adopt in roundabout design. Geometric, traffic, and crash data were collected on 72 approaches to 19 low-volume single-lane roundabouts in six states. The data for these sites were broken into two groups based on the posted speed limit (at 40 km=h and greater than 40 km=h). In addition, the associations between different sight distance parameters, crash parameters, and operating speed data were investigated.

The research findings provided insight into relating the operational and safety effects of sight distance geometry at roundabouts. This research also identified a methodology that provides guidance as to the development of performance-based standards that rely on a better understanding of these relationships. In general, the research findings were consistent with previously conducted studies and indicated that exceeding sight distance thresholds increases the risk of crashes occurring. It was also found that exceeding sight distance thresholds yielded greater speed differentials between the approach and the entry to these roundabouts. The results of this research can advance the state of practice in understanding the relationships of sight distance design attributes, operational characteristics, and safety metrics for low-volume single-lane roundabouts, which is necessary to the creation of performance-based standards.

3. Quantitative Analysis on Angle-Accident Risk at Signalized Intersections.

Yinhai Wang and Nancy L. Nihan (2005, Tokyo) He demonstrated how a new modeling methodology can be applied to intersection angle-accident risk evaluation with data collected from 81 signalized intersections in the Tokyo Metropolitan area. A risk model for such angle accidents was developed with the occurrence mechanism considered in this study. Unlike most existing accident models, human factors, which caused about 95% of all the traffic accidents, can be considered quantitatively in this model. Very specific flow data, regulation data, geometric data and accident observations of each approach were applied for calibrating the model using a modified negative binomial regression. Nineteen explanatory variables were found significantly affecting angle-accident risk at signalized intersections. Such estimation results may help to improve traffic safety at signalized intersections in metropolitan areas.

4. Crash rates at intersection

Eric Green, Kenneth. R. Agent (2003, Kentucky) The objectives of his study were to develop a database of intersections, match traffic crashes to these intersections, calculate crash rates for various types of intersections, and identify intersections with the highest crash rates. Following procedure was used: a) identify intersections b) assign crashes to these intersections. c) Determine entering traffic volume. d) Calculate a crash rate for each intersection, and e) calculate a critical rate factor (CRF) for each intersection.

He identified about 7000 intersections with almost 19000 crashes related to these intersections for the three year period of 2000 through 2002. Analysis identified 428 intersections that had a CRF of one or more while only 36 intersections had a CRF above two. As would be expected, the crash rates were higher in urban than in rural areas.

An Excel spreadsheet containing a list of all intersections of two or more state-maintained roadways was developed. The spreadsheet also contains crash and volume data for each intersection. After those intersections with the highest critical rate factors were identified, improvements for that were implemented. He developed a database of intersections and matched traffic crashes to these intersections to calculate crash rates for various types of intersection, and identify intersections with highest crash rates. The results

showed intersections with highest crash rate factors and measures were suggested respectively.

5. Accident prediction models for urban unsignalised intersections

Lakshmi M Divakaran, Sreelatha T (2013, Kottayam, Kerala)

Their Accident Prediction models were developed for the unsignalised urban intersections. Accident Prediction models for three legged intersections and four legged intersections were separately developed. Previous Accident Prediction Models for intersections predict the number of accidents for the intersection as a whole. This model can predict the number of accidents for each approach leg of an intersection. By knowing the factors that affect safety, he suggested that we can do proper treatment and upgrading.

This paper lays emphasis on accident studies on the 40 km long National Highway - 5 section between Anakapalli and Visakhapatnam, in the State of Andhra Pradesh, India. They had undertaken a study on NH-5 between Anakapalli to Visakhapatnam during the year 2003 and it runs through urban, semi urban and rural areas. The accident data for the past five years were collected form the concerned police station and analyzed thereafter.

The data revealed that 64 deaths and 373 injuries were recorded between January to December, 2002 and 20 deaths, 82 injuries were recorded between January to June, 2003. The analysis of the data from safety point of view indicated that the vehicle drivers are the single major factor responsible for the accidents as they fail to perceive the situation ahead because of poor reflexes, fatigue, inexperience or being under the influence of intoxicants. The accident data for the section indicated that two wheelers are the ones who mainly suffer the fatalities and major injuries, which is around 35% followed by trucks 23% involved in accidents. The reasons for the accidents can be attributed to the lack of signage, raised median cover with trees/bushes, making pedestrians not visible to driver, improper design of pedestrian crossing, frequent median openings, and lack of enforcement to control wrong side movements. There are however, other factors, which contribute directly or indirectly to the accidents include road, vehicle, road user and environmental factors.

From the results of the analysis, it can be concluded that this National Highway section needs improvement from safety point of view. A large number of accidents have been occurring over such a small section of 40 km length. Proper traffic guidance and control system to guide road users ensuring safe movement of vehicles has been recommended and some of the facilities such as pedestrian crossings and median openings, acceleration and deceleration lanes were re-designed in order to improve the safety of the road and minimize the accidents.

III. CONCLUSION

Research studies present in the paper take us to a fact that if accidents are caused by some, surely the ones responsible for could be identified and appropriate remedial measures can be developed and implemented to the extent feasible. Some Accident Prediction Models not only helped in predicting the number of accidents and evaluating alternate measures but also help in evaluating the effectiveness of a treatment. It is proven that Accident Prediction Models are the key for evaluation of improvement measures using before and after analysis. Realizing the importance of the Accident Prediction Models, many countries have developed them and included them as a part in their economic evaluation

IV. REFERENCES

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