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ROAD SAFETY AND ROAD SAFETY AUDIT OF RURAL ROADS IN INDIA: A REVIEW

Engineering

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ABSTRACT

India is a large country, and highways play a significant role in the country's development India is compounding and road traffic wounds (RTI) have been expanding in recent years. A Road Safety Audit (RSA) is a formal technique for evaluating wellbeing execution examination of a current or future road or crossing point by an autonomous review group. Road wellbeing reviews can be utilized as a part of any period of venture advancement from arranging and preparatory building, configuration, and development. RSAs can likewise be utilized on any estimated venture from minor rustic roads to between state National Highways. RSAs can be seen as a proactive minimal effort way to deal with enhance wellbeing. The purpose of this study is to uncover flaws, improve design characteristics, and improve road credibility. All these aspects were considered in a critical review, which depicted the scenario of accidents occurring on various Indian roadways, as well as their causes and solutions.

KEYWORDS

Road safety audit, improving design aspects, accidents, geometric design, national highways.

INTRODUCTION

A road safety audit is the continuous monitoring of the safety factor of new and existing highway and traffic management scheme, which involve improvement of existing layout. The fundamental goal of road safety audit is to insure that there is less future problems on highway. It is necessary to reduce road accident and work towards the road safety. To apply the road safety audit in real life, the first thing is to know the geometric features of highways. Objective of the RSA is to evaluate ventures for potential mishaps end/lessening on the premise of road client learning, characteristics and aptitudes, day/night, wet/dry road conditions. Since our roads are planned and built by striking a financial harmony between wellbeing, openness, environment, economy and locally accessible material and expertise, RSA may decide the setback in security, however will most likely be unable to rectify the lacks in asphalt outline, waste, and proper space standard and so forth. RSA depends on the guideline of an autonomous audit. The procedure uncovers the inclusion of Client, Designer, Auditor and the Road User. This paper proposes a review of road safety studies related to road safety monitoring systems in order to synthesize the outcomes and identify the challenges in this field of research.

Critical Review:-

Arun n S Bagietal et al (2018) focuses on identified accident prone areas on the road from FIR, studied the effect of roadway geometrics and traffic conditions on the road stretch and development of statistical relationship between accident rates and numerous factors causing accidents. The scope of the study was to reduce accidents on road network, reducing severity of accidents and the need for costly remedial work is reduced. The road selected for the study is Bannerghatta road (12 km). The accident analysis was done from four years data. Floating car method survey was conducted to find the speed at every kilometer of the stretch. The accident particulars pertaining to the study stretch was collected from the respective police stations. The accident data form as prescribed by IRC has been prepared to collect the necessary information such as date, time, location, whether the accident was fatal, vehicle damage and injured. The data was collected for a period of four years, i.e. 2008 to 2011 from the Traffic Police Station. The date, time, approximate place, types of vehicles involved etc., are entered in the First Information Report (F.I.R) and details are recorded in case diaries.

Shalini Kanuganti et al (2016) carried out a study to determine the priority of safety requirements of a certain category of rural roads, viz., Pradhan Mantri Gram Sadak Yojana (PMGSY) roads in the Jhunjhunu district of Rajasthan, India. Multi-criteria techniques were used to quantify the safety levels. Further analysis was done on the road having the worst safety features to rank various stretches. Analysis has been done in two phases. In the first phase the prioritization of roads for safety provision was carried out considering the total length of each road as an alternative and the most critical road was identified. In the second phase, the road found critical from the first phase was considered for detail analysis. The entire stretch of the road was divided into stretches of 1 km and the stretch-wise prioritization of roads for safety provision was determined. The methodology suggested can be used to determine the level of contribution of parameters towards safety hazard.

Xuchun S. Tu et al (2016) A review of the crash history has identified that the run-off-road crash is one of key crash types in Queensland, Australia. Hazards on both sides of a carriageway are identified a potential risk exposed to road users. This study says that, a proper roadside design plays an indispensable role to ensure a more forgiving road environment to reduce the likelihood and severity of run-off-road crashes.The applicability of RISC for developing the road safety improvement program needs to be evaluated through gaining a greater understanding of the correlation between the severity index and the crash reduction factor. The effectiveness of a road safety treatment can be expressed as either a crash reduction factor (CRF) or a crash modification factor (CMF).

Francis John Gichaga et al (2013) This paper had reviewed the concept of the road safety audit and its stages. Objective of the RSA is to evaluate ventures for potential mishaps end/lessening on the premise of road client learning, characteristics and aptitudes, day/night, wet/dry road conditions. It suggested on outline and before planning of agreement archives, to evaluate itemized intersection design, markings, signs, signals, lighting points of interest, Detail Design of junctions, Design of geometrics, Cross-fall Marking and Signs, Side drains, Embankment slopes, Presence of clear zone, Traffic Signals Lighting.

Yannis T.H et al. (2014) reviewed the effect of traffic and weather characteristics on road Safety. Despite the existence of generally mixed evidence on the effect of traffic parameters, a few patterns can be observed. For instance, traffic flow seems to have a non-linear relationship with accident rates, even though some studies suggest linear relationship with accidents. The increasing use of real-time data not only makes easier to identify the safety impact of traffic and weather characteristics, but most importantly makes possible the identification of their combined effect. The more systematic use of these real-time data may address several of the research gaps identified in this research.

K Mesharam et al (2013) were presented an analysis of accidents on small portion NH-3 Indore to Dhamnod. The data for analysis is collected for the period of 2009 to September 2011.The trend of accidents occurring in urban portion (Indore) is more than35 % to rate of total accidents in each year. This may due to high speeds and more

vehicular traffic. In the present study area, the frequency of fatal accidents are 2 in a week and 6for minor accidents in a week. More number of accidents observed in 6 p.m. to 8 p.m. duration because in that time more buses are travels between villages and city. One fatal and five casualties are occurring per km per year in the study area. The volume of the trucks passing through study corridor is increasing by year. At Rajendra Nagar from 2000onwards the traffic is reduced due to the construction of by passes in that area.

R.R. Dinu et al (2011) presented Random Parameter Models for Accident Prediction on Two-Lane Undivided Highways in India. Based on three years of accident history, from nearly 200 km of highway segments, is used to calibrate and validate the models. The results of the analysis suggest that the model coefficients for traffic volume, proportion of cars, motorized two-wheelers and trucks in traffic, and driveway density and horizontal and vertical curvatures are randomly distributed across locations. They have concluded with a discussion on modeling results and the limitations of the present study.

P. V. Arundev et al (2016) Originated in Great Britain, the procedure of road safety audit is now being spread in several countries around the world. It can be incorporated in the framework of designing, constructing, and operating road infrastructure as a means for preventing accidents. A Road Safety Audit was conducted for 12 km in the Karamana - Kaliyikkavila road stretch and four black spots were identified. It was found that lack of information regarding construction zone approaching, lack of warning signs, lack of adequate parking facilities, insufficient road width and pollution seemed to be major problems in the road stretch under construction. On the basis of the results of Road Safety Audit, suitable rectification measures were also suggested, which are needed to be implemented in other parts of the stretch where construction is yet to commence.

Tummala Bharat Kumar et al (2018) aims to identify deficiencies, improving design aspects, enhancing credibility of the roads. Road safety audit is the formal methodology for getting accident potential and safety potential in the development of new road schemes and the schemes for the improvement and maintenance of the existing road facilities. Accident prevention and accident reduction are the two main strategies in the road safety. In this case study we analyses the NH-65 which is the major highway connecting vijayawda and hyderabad from the 270th km to 247th km. The highway carries considerable amount of traffic throughout the day and it has number of conflict points such as villages, industries. Detailed analysis of NH-65 will be carried out from the point of view of safety and geometric design aspects will be performed.

N. Naveen et al (2017) analyzes the factors effecting safety in rural road accidents from human, vehicle, road, external environment and the other factors, summarizes the connotation and the steps of rural road traffic safety audit. It divides the contents of rural road traffic safety audit into two parts: newly built and rebuilt rural roads & the existing rural road traffic safety audit. Finally, this project aims at these problems existing in implementation process of rural road & proposes the corresponding solutions to support the work of rural road traffic safety audit.

S. S. Jain et al (2009) aims to evaluate Road Safety Audit of a section of four-lane National Highway (NH)- 58 and will focus on evaluating the benefits of the proposed actions that have emanated from deficiencies identified through the audit process. After conducting RSA, it is found that trucks are parked on highway which reduces the effective width of carriageway and creating traffic hazards to high-speed moving traffics. Unauthorized median openings were found which should be immediately closed. Missing road and median markings to be done and speed signs should match with speed. Access and service lanes are also deficient which requires immediate improvement. The most Vulnerable Road User (VRU) i.e., pedestrians and cyclists' facilities near habitation are lacking and needs to be facilitated on priority.

Bhushan Rajendra Deshmukh et al (2019) focus of this is on PRADHAN MANTRI GRAM SADAK YOJANA which is mostly used in rural area. Site visit and collection of information were performed from well experienced engineers as well as contractors of PMGSY scheme. For analysis of this study questionary survey was conducted and three methods of MCDM was applied to study the interaction and relation of one factor over another. The results of this study described that the depending upon the PMGSY engineers and contractor's feedback. We can decide safety impact factor that affect safety assessment of PMGSY road from this engineer's point of view in nashik district.

Krunal Baraiya et al (2017) found that over 1.3milion people dead by road accident but there is no safety for them in our country. The accidents are linearly increasing. These accidents can be reduce by road safety audit with involved better safety measure, good serviceability, proper geometric design of a location, traffic signs, signals, markings, street lighting, bridges, culverts, proper parking management, removing side obstacles from the road ,etc. Road safety audit will reduce the road accident and increase the life of people. It has been observed the road accident, condition of road, condition of signal of this road and had counted the numbers of different types of vehicle and made the graph regarding to that data. On NH-48 where 721 accidents in the duration of 2011 to 2015.

Manish.D. Katiyari et al (2014) analysis of one of the major arterial street of Nagpur city will be undertaken. The location of interest for the analysis is Wardha Road from Morris College Square to Airport Intersection. The roadway carries considerable amount of traffic throughout the day and it has number of conflict points such as merging of traffic from flyover. A detailed analysis of Wardha Road will be carried out from the point of view of safety and supplemental analysis regarding the traffic growth and accident analysis will also be performed. The project aims to identify deficiencies, developing mitigating strategies, improving public relations, enhancing credibility of the roads and calculating the crash rate of intersection or length of roads.

Francis John Gichaga et al. (2016) paper had reviewed the concept of the road safety audit and its stages. Objective of the RSA is to evaluate ventures for potential mishaps end/lessening on the premise of road client learning, characteristics and aptitudes, day/night, wet/dry road conditions. It suggested on outline and before planning of agreement archives, to evaluate itemized intersection design, markings, signs, signals, lighting points of interest, Detail Design of junctions, Design of geometrics, Cross-fall Marking and Signs, Side drains, Embankment slopes, Presence of clear zone, Traffic Signals Lighting.

ZarulazamEusofe et al. paper had examined the current institutional arrangements for the management of road safety in Malaysia in a systematic manner. It focused on road safety funding and seemed to provide an insight into how funding factors may affect both the effectiveness and the efficiency or road safety management. The study followed an exploratory approach based on semi-structured interviews targeting key stakeholders in road safety management such as policy makers from various government agencies, private sector representatives and academia. The paper presented a systematic analysis for the assessment of road safety management applicable in countries where financial resources are limited or reduced, focusing on road safety funding and seeking to provide an insight into how appropriately designed funding mechanisms may affect both the effectiveness and the efficiency of road safety management.

Jeena Johny et al (2019) This paper is focused on influence of alignment parameters in the accidents rate. A methodology is suggested for evaluating two-lane highway uniformity and safety through alignment parameter. Previous five years (2013-2017) highway accident data were gathered from respective police stations of nearby area. Alignment indices of the 33 sections were found out. With significant variables different trials of modelling were done. The dependent variables are Minor accidents, Major accidents, Fatal accidents, Total accidents and EPDO. The Ratio of curve length to tangent length, Ratio of curve length to road length, Average curve length, Average Tangent Length, was found to be the most influencing variables on the accidents on horizontal curves have strong relations on accidents.

Snehal Bobade el at (2015) Studied on identification of highway accidental locations on NH-9 i.e Pune-Solapur Highway and Mumbai-Pune Expressway by method of ranking. Study area was selected from 76 km to 78 km for experimental investigation on Mumbai-Pune Expressway as pilot study. According to data collected by MSRDC, more number of accidents is witnessed from km 76 to km 78 in recent past. The top three vital parameters were small secondary road meeting the main highway in a steep slope, right turns of road on down slope,

footpath or cattle crossing. Based on the ranks calculated after giving percentages of black spot the location or area is identified as black spot.
Sudipa Chatterjee et al (2019) The purpose of this research was to uncover the critical safety hazards that were discovered during RSA on two major two-lane undivided highways in West Bengal, India. RSAs was carried out in five stages: (i) planning, (ii) preliminary design, (iii) detailed design, (v) building, and (vi) operation and maintenance of an pre-existing road. Here 137-kilometer-long NH 117 was chosen as the study region. During the audit, the team observed the type of geometry and traffic behavior at the site that might result in an accident of varying severity. Hazardous aspects were divided into three categories by the RSA team: road geometry, road infrastructure, and road users. The most accident-prone areas on both routes were discovered to have horizontal curves. Finally, it was discovered that road users lack a fundamental understanding of road safety.

CONCLUSIONS

The paper provides the results of various field works done on the road traffic accident in various countries have been reported in this paper. This literature study helps the researchers to have a nut shell view about the effect of RTAs and the safety measures to be followed to avoid RTAs. Multifaceted review of various literatures has shown that accidents occurrences are the effect of multiple human, vehicle and environmental elements often interacting in a complicated manner to generate the initiation of the event.nBased on the review of various studies, findings are concluded as follows: -

1) No segregation of traffic existed along the project highway.
2) Facilities for pedestrians and other vulnerable road users were not as per prescribed standards.
3) Presence of hazardous objects such as trees, portable concrete crash barriers, broken kerbs and footpath, etc.
4) Visibility obstructions to various shoulder mounted road signs and gantry signs.
5) Non-standard road signs were used at many locations.
6) Road signs and markings missing at important locations such as intersections, sharp horizontal curves, service road entry and exit ramps, median openings, etc.

Road safety audit is better option to reduce road accident and save the peoples life. Is also provides better safety, better serviceability, good comfort and consumption of less time.

REFERENCES:

[1] Arun S Bagi,(2016*), IOSRJMCE*, ISSN:2278 -1684
[2] Shalini Kanuganti (2016), *Road safety analysis using multi criteria approach: A case study in India* Transportation Research Procedia, 25:4653-4665
[3] Xuchun S. Tu (2016), *Application of RISC for Road Safety Program Development*, Transportation Research Procedia 25C (2017) 1925–1935.
[4] Francis John Gichaga (2013), *Road Safety and Road Safety Audit in India: A Review.* International journal of civil engineering and technology ISSN: 2347 – 4718.
[5] Yannis T.H (2014) *A review of the effect of traffic and weather characteristics on road safety*, International journal of engineering research & technology, 72C:244-256.
[6] K Mesharam, Amir Ali Khan (2013), *Accident analysis and road safety audit: a case study on NH-76*, IOP Conference Series 1086 (2022) 012025.
[7] P. V. Arundev, B. K. Bindhu (2016*), Road Safety Audit on Karamana Kaliyikkavila Road (NH 66)*, International Journal of Engineering Research & Technology, 2278-0181.
[8] Tummala Bharat Kumar, Chukkapalli Jeswanth Chowdary (2018), *Road safety audit: a case study on NH-65*, International Journal of Engineering & Technology, 69-74.
[9] N Naveen (2017), *Road Safety Audit of Rural Roads International Journal of Civil Engineering and Technology 752-761*.
[10] S S Jain (2011), *Road Safety Audit for four Lane National Highways*, International Conference on Road Safety and Simulation, E-ISSN:2321-9637.
[11] Bhushan Rajendra Deshmukh, Dr. Madhav P. Kadam (2016), *Road Safety Analysis Using Multi Criteria Approach For Rural Road In Nashik Dist.*, International Journal of Scientific Development and Research, ISSN: 2455-2631.
[12] Krunal Baraiya, Nekzad Umrigar (2017), *Road Safety Audit: A Case Study Navsari to Chikhli National Highway 48*, International Journal of Latest Engineering and Management Research, ISSN: 2455-4847.
[13] Manish.D. Katiyari, S D Ghodamore (2014), *Road Safety Audit: A Case Study for Wardha Road in Nagpur City*, Int. Journal of Engineering Research and Applications, ISSN : 2248-9622.
[14] Francis John Gichagaetal. *Road Safety and Road Safety Audit in India: A Review*. ISSN: 2347 – 4718.
[15] ZarulazamEusofe., *Assessment of Road Safety Management at Institutional Level in Malaysia*, IATSS Research.
[16] Jeena Johny A, Jisha Akkara (2019), *Two lane highway consistency based on alignment indices*, International Journal of Advanced Research in Computer and Communication Engineering, 8(1):2319-5940.
[17] Snehal U Bobade, Jalindar R Patil, Raviraj R Sorate (2015), *Identification of Accidental Black spots on National Highways and Expressways*, International Journal of Research in Advent Technology, E-ISSN:2321-9637.
[18] IRC: SP: 88-2010. "Manual on Road Safety Audit". Indian Road Congress, New Delhi, India.