



Traffic Accident Analysis Of Road Segment In Yavatmal City

¹Swastik.V.Yadav, ²Apeksha.G.Chaudhary

¹M.tech Student, ²Assistant Professor

¹Transportation Engineering,

¹G H Rasoni University, Amravati, India

Abstract: Road traffic accidents are increasing expeditiously in India with the increase in traffic density. An accident is the result of factors such as road defects, human errors, engineering defects of the vehicles, non-availability of pedestrian facilities, cyclist facilities, and circumstantial factors such as weather conditions, visibility, etc. Accidents cause death, disablement, damage to property and health, social suffering, and also general degradation of the environment. A Literature review is conducted by the traffic agencies and the public concentrates at measures to reduce such accident severity to reduce the fatality rate. The locations of high risk where crash tends to occur over time are hazardous. The analysis of traffic signals and road safety devices present on the road using geodetic techniques.

Index Terms - Accidents analysis, Fatalities, Road Safety.

I. INTRODUCTION

Accident Severity has been increasing expeditiously year by year. Road transport is an essential aspect in the field of transportation in India. Road transport system plays an important role in uplifting the national economy of India. There is expansion in vehicular mobility, urbanization, use of vehicles and length of the road networks over the years, so as to fulfill the demands of road transport. But this expansion also led to increase in numbers of vehicular crashes as well as road fatalities. Every day, countless commuters embark on journeys along our roads, each trip carrying the potential for both smooth travels and unexpected hazards. Within the complex tapestry of transportation networks, certain segments emerge as focal points for accidents, drawing attention to the critical need for thorough analysis and proactive measures. It is within this context that we turn our focus to the Traffic Accident Road Analysis of Segment. This analysis represents a concerted effort to scrutinize the intricate web of factors contributing to accidents within this specific segment. By dissecting each incident with precision and rigor, we aim to transcend mere data points, uncovering the underlying patterns and root causes that shape the safety landscape of our roads. Through meticulous examination of accident reports, eyewitness accounts, and environmental factors, we seek to paint a comprehensive picture of the challenges faced by road users traversing this segment. From hazardous road conditions to behavioral patterns of drivers, no stone will be left unturned in our quest to unravel the narrative behind each collision. But our endeavor does not stop at mere diagnosis. Armed with insights gleaned from our analysis, we endeavor to chart a course toward tangible solutions aimed at mitigating risks and enhancing safety along this segment. Whether through targeted infrastructure improvements, educational campaigns, or enforcement measures, our goal is to forge a path toward a future where accidents become a rarity rather than a norm. Ultimately, this analysis serves as more than just an academic exercise—it is a testament to our collective commitment to fostering a culture of road safety. By shining a spotlight on the challenges and opportunities within Segment, we hope to inspire action, ignite dialogue, and catalyze change that reverberates far beyond the confines of this stretch of road. A Road accident is a adverse consequence related with expansion in road network, urbanization and increased vehicular usage in the country. Road accidents have

an adverse impact on the life of individuals, property and surroundings. The steep growth of traffic on the Indian roads in recent years has caused a sharp increase in the incidence of traffic accidents. As a proper acceptable solutions for all classes of road safety have not been identified, particularly isolated roads and less-traffic rural, a hierarchy of control should be imposed, similar to classifications used to enhance occupational safety and health. Globally, Road Traffic Injuries are considered a major public health problem. They are one of the main causes of deaths, disabilities and hospitalization as well as adversely affects the socio-economic costs to society. As per the Global Burden of Disease 2016, road injuries are the 8th leading cause of death in India which has risen by 22.5% as compared to the year 2015. It is among the top ten causes of death and disability combined, which is measured by DALYS (Disability Adjusted Life Years). Road traffic injuries claim more than 1.3 million lives each year and have a huge impact on global public health and development. This has become one of the major global issues across world and can worsen in years ahead if no significant measures are taken to curb it. Road safety should therefore become a major concern for people at all levels in the world. Studying of the traffic injuries on the basis of data and evidences available can help in the reduction of the mortality rate and increase in the safety on the roads.

II. LITERATURE REVIEW

The Literature review of relevant literature published earlier, technical papers by various agencies is carried out. In this literature review attention is given about how to analyze traffic accidents. The purpose of this literature review is getting an overview of different concepts related to traffic accidents. To achieve this purpose, study results given by various authors are mentioned here in this literature review.

TRAFFIC ACCIDENT ANALYSIS

Dr. Jayaprakash G. Hugar; Dr. Mirza Muhammad Naseer; Dr. Abu Waris; Muhammad Ajmal Khan (2020) have proposed scientometric study covering all research publications indexed in Clarivate Analytics Web of Science database on Road Traffic Accidents, which had India in the address field. It accessed the contributions on "Road Safety", "Road Injury", "Traffic Accident" and other related areas. The bibliographic data on the topic was retrieved from the Web of Science on 23rd January 2020, without any limit on timespan, using the following search query. The majority of scholarly publications were published in the form of articles. From 2006 to 2018, number of publications increased rapidly from 11 to 182 publications, which was the most productive year for the researchers. Majority of the publications were written by multiple authors while publications were from single author. The most prolific authors were Tiwari, G. and Mohan, D. with 18 publications each. The study by Sundar and Ghate supported the study of Shami and conveyed that among all countries. India had the highest number of deaths due to road traffic-related accidents. Road accidents were the sixth leading cause of death in the country and there were nearly 1,40,000 deaths from road accidents in 2012. Despite being a major public health issue that affects the most vulnerable and the most productive sections of society, road safety had not received the attention it deserved.

Marco Montoya-Alcaraz, Alejandro Mungaray-Moctezuma, Julio Calderon-Ramirez, Leonel Garcia and Cynthia Martinez-Lazcano (2020). This methodology integrates representative data gathered from accidents of a case study with pavement surface condition data; the performance of the geometric design, that is, degree of curvature and inappropriate slopes; and an analysis of traffic signals and road safety devices present on the road, using geodetic techniques in order to determine risk areas that promote accidents and generate a risk reduction plan to support future decision-making that guarantees better performance for the users of this road. All of the results must be integrated to achieve a better understanding of road safety and to make technical and operative proposals that promote road safety in areas that presented higher levels of risk during a period of analysis. This project is located in the mountain range of Baja California, Mexico, on the Centinela-La Rumorosa highway and integrates accidental and pavement surface condition data, geometric design performance, analysis of traffic signals, and road safety devices present on the road using geodetic techniques. It is concluded that this procedure contributes to determining risk areas that promote accidents and generates a risk reduction plan to support future decision-making that guarantees better performance for road users.

Younus Maqbool, Ankit Sethi, Jagdeep Singh (2019) Says that India is a growing country. With the increasing population, the number of vehicles has expanded in the country during the last one decade. Though road networks also improved, mounting pressure on roads from an expanded vehicle population has aggravated safety issues. Authentic data about road accidents is not available, still, preliminary data indicate that Indian roads are witnessing a higher incidence of road accidents. It is a well-known fact that Health of the Nation is more important than the wealth of the Nation". Hence, Road safety is an important public health concern and attention must be given on Road safety measures. Strict adherence to road safety measures reduces road accident injuries and road accidents. Road related accidents are undoubtedly the most frequent and, overall,

the cause of the most damage. The main reasons for this are the extremely dense road traffic and the relatively great freedom of movement given to drivers.

Miss. Anjali M. More, Dr. M. R. Vyawahare, Mr. A.R Bijwe (2018) conducted research on road traffic accident analysis on NH-6 of Amravati city(Maharashtra), Accident Severity has been increasing rapidly year by year. Road transport is an important mode of transportation in India. The road transport system has contributed to the national economy of India. An Accident is the result of a combination of factors such as road defects, human error, engineering defects of the vehicle, non-availability of the pedestrian facility, cyclist facility, and circumstantial factors such as weather conditions, visibility, etc. Accident causes death, disablement, damage to property and health, social suffering, and also general degradation of the environment. A case study was taken on NH-6 of Amravati district in Maharashtra state. The annual, monthly, and hourly variations of accident rates on the road and vehicles involved in fatalities have been presented in the paper. The safety deficiencies were detected to minimize accidents on the road and save the road users.

ROAD SAFETY AUDIT

Omkar Gholap, Nikita Shinde, Vaishnavi Shelke, Navnath Navale, Kuldeepak Deshmukh, Ashutosh Kotkar (2018) Propose most of the studies are based on methods of assessment of road accidents. Their study includes accident data as main element of the research. Generally, Road safety Audit's methods improve the understanding of the safety performance of roads, they all require accident data. Safety Audit can be taken on new roads, existing or constructed roads. For carrying out Road Safety audit of the given section of road following methodology is adopted. Athanasios Galanis 2017, Dinesh Mohan 2017, Francis John Gichaga 2017, Luca Persia 2016 have studied types of roads and asses the road safety management and schemes for road improvement. Lorenzo Domenichino 2018 studied the urban road safety on vehicle speed reduction.

Muthusamy A. P, Rajendran M, Ramesh K, Sivaprakash P. (2015) Has assume critical factors affecting accident severity were featured in various reports. Kristle Young et al., (2007) reviewed the aspects on in-vehicle driver distraction, focusing on mobile phone use in particular, stated that this device has received the greatest attention in the driver distraction literature. The article also discussed the effect of in-vehicle devices on driving performance. Road traffic accidents are considered the most important general health concern, as it results in numerous injuries and deaths worldwide. India is one among the developing nation which experiences the highest rate of such accidents. Thus the traffic agencies and public concentrates at the measures to reduce such accident severity in order to reduce the fatality rate. The impact of traffic law enforcement on road accident fatalities in Botswana has been collected and drafted by Thuso Mphela (2005). In this study the impact of traffic law enforcement on fatalities in Botswana was assessed using multiple regression analysis using secondary data and interview data obtained from law enforcers.

ROAD TRAFFIC ACCIDENTS IN INDIA

Manisha Ruikar (2013) says that Road Traffic Accident can be defined as, 'An event that occurs on a way or street open to public traffic, resulting in one or more persons being injured or killed, where at least one moving vehicle is involved. Thus road traffic accident is a collision between vehicles, between vehicles and pedestrians; between vehicles and animals, or between vehicles and geographical or architectural obstacles.' Road traffic accidents are a human tragedy. They involve high human suffering and socioeconomic costs in terms of premature deaths, injuries, loss of productivity, and so on. Government of India describes national statistical trends and normalized indicators of road accidents, injuries & fatalities. This article highlights trends, indicators, interstate comparisons and the latest characteristics of road traffic accidents in India. While the official road traffic fatality data may be close to the actual number, the injury data are gross underestimates. As per bibliometric analysis, India contributed only 0.7 percent of papers on road traffic injuries and had less than one article on road traffic injuries per 1,000 road traffic-related deaths. To be effective, policies on injury prevention and safety must be based on local evidence and research. To be effective, policies on injury prevention and safety in developing countries must be based on local evidence and research, and designed to suit the social, political, and economic circumstances found in developing countries.

NEW APPROACH TO ACCIDENT ANALYSIS

Elvik (2008) argues that the operational definition of black spots is not universal. It has been observed that the definition criteria also affect the identification method used for black spot ranking and treatment. Most of the countries have used sliding window method to identify black spot locations on the road. However, there is no standard guideline to fix the length of the window. The duration of accidents record for the identification process is also varying from country to country. It is also evident that black spot identification is based on either the past few years' numbers of accidents or the rate of accidents.

Sorensen (2007) has reviewed several methods for identifying the black spot which are based on various crash-based principles. Crash principal-based identification methods are further divided into two sub-

categories such as model-based and non-model-based. For the identification of black spots, the non-model-based methods use crash number, crash frequency, and crash rate, whereas the model-based methods use category analysis, traditional approach, and modern approach. The best model-based methods are the Empirical Bayes method, Poisson or Negative Binomial distribution method, and category analysis method. Several researchers have used the Empirical Bayes method to estimate the expected number of crashes at any black spot location (Hauer 1992).

ASSESSING THE BLACK SPOTS FOCUSED POLICIES

Another work by Geurts et al. (2005) Proposed that the black spot can also be identified based on the level of risk and the likelihood of a crash occurring at each location. The level of risk at a certain location can be higher than the normal level of risk in the neighboring location. This level of risk and the likelihood of a crash occurring method was particularly used during the Australian black spot program from the year 1996 to 2002. It was evident from the literature that in European countries black spots were identified by the sliding window method which is statistically as well as empirically ineffective. In Germany, accident maps are used for the process of black spot identification which is somewhat similar to the sliding window method.

Geurts et al. (2003) defined a black spot as a location on the road where the concentration of crashes has exceeded the specified value of the crashes in a certain duration of time. For example, a black spot is a location at which at least 4 injury crashes have been recorded during the last 5 years. Furthermore, the locations of high risk where crashes tend to concentrate over time are known as hazardous locations, hot spots, or black spots. However, there is no specific and unique definition of road accidents in black spots around the world. The definitions vary from country to country based on their criteria for identification of black spot locations. Traditionally, the black spots are defined based on the number of accidents or the rate of accidents. In today's modern era road and transport have become a central part of every human being. Everybody is a road user in one way or the other. The present transport system has reduced the distances but it has, on the other hand, increased the life risk of road accidents. Every year road accidents lead to the loss of lakhs of lives and serious injuries to crores of people.

III. METHODOLOGY

To study literature review we have to go through various books, scholarly articles, literature reviews and another sources relevant to traffic accident analysis, and so by doing, provides a description and summary required for the project work. To collect accidental data, the information is available in First information reports logged in police stations. Vehicles those involved in accidents and reported in F.I.R with the details of accident. After collection of the data from police stations. The traffic accident analysis would be done for span from 1 September 2022 to 1 January 2024. The data will be analyzed to study accidental rates annually, monthly, hourly by using different methods. For measuring section length, we selected Global Positioning System Technology which is introduced in every smartphone. Google maps were used to locate distance between two points. Hence with the use of advanced technology we, very easily measured the distance.

Vehicle accident rate is derived by dividing number of accident on stretch by the considered road length.

$$\text{Accident rate} = \frac{M}{L}$$

Where,

M= Total number of accidents on stretch.

L= Road length.

To express all information, we are using Word software. In this software all particular data are filled which is required for experiment.

Methodology chart – The overall process of accidents analysis is shown in the form of the following chart

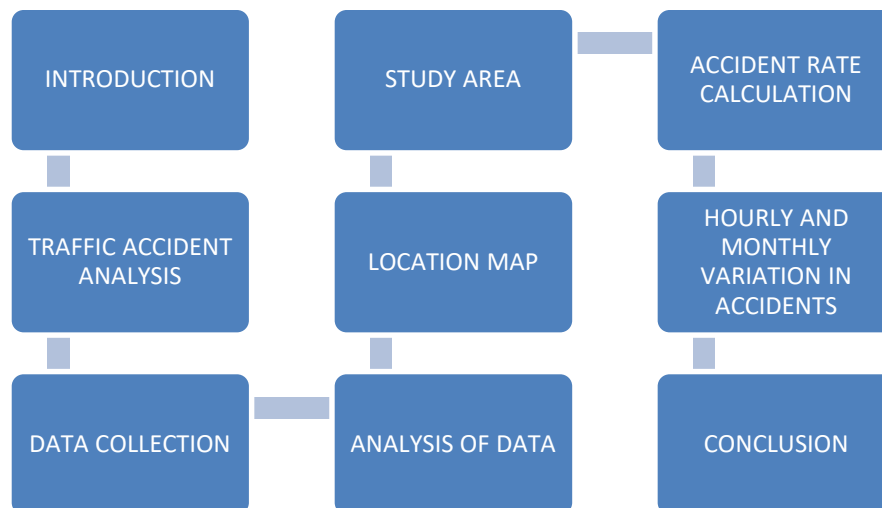


FIG: METHODOLOGY CHART

3.1 Site Selection Study Area

THE YAVATMAL DISTRICT OF MAHARASHTRA STATE HAS BEEN SELECTED AS AN AREA OF THE RESEARCH TOPIC.

Two-lane road of about 5 Km from Sharda chowk to Lohara Square was chosen for this study. The road was divided into five stretches of 1 Km each. The following stretches were selected for data collection.

- i. Stretch 1 – Sharda chowk to Tehsil chowk.
- ii. Stretch 2 – Tehsil chowk to Sanvidhan chowk.
- iii. Stretch 3 – Sanwidhan chowk to Darda nagar.
- iv. Stretch 4 – Darda nagar to Ekvira square.
- v. Stretch 5 – Ekvira square to Lohara square.

LOCATION MAP

The study area is taken from stretch Sharda chowk to stretch Lohara square of 5 km span and the below map is taken from google map in satellite view to easily understand the location map.



Fig : Location map

3.2 ACCIDENT DATA COLLECTION

The information used for studies regarding accident is the (First Information Report) i.e. FIR which is lodged in the police stations. The data from these records from 1 September 2022 to 1 January 2024 were extracted from the FIR record filed under IPC no.279/337/338/304 (A). Accident vehicles which are reported in the F.I.R with the details of accident. The categories of vehicles include tempo, auto, and different types of two-wheelers, cars, mini-truck, minibuss, motor cycle, tanker, truck and bus.

Table 4.1 Accident Data of Selected Stretch

Year	Month	Number Of Accidents	Fatal
2022	September	3	0
2022	October	4	1
2022	November	3	0
2022	December	2	0
2023	January	2	0
2023	February	3	0
2023	March	2	0
2023	April	1	0
2023	May	1	0
2023	June	3	0
2023	July	2	1
2023	August	6	1
2023	September	4	0
2023	October	3	0
2023	November	2	1
2023	December	4	0
2024	January	1	0

3.3 Accident Rate Calculation

$$\text{Accident Rate} = M / L$$

Where,

L = Road Length

M = Total number of Accidents of on a road stretch

Table 4.2 Accident Rate of 2 Year

Sr. No.	Name Of Stretch	Length	Number Of Accident In Two Years	
			Sum Of 2 Years	Accident rate
1.	Sharda chowk to Tehsil chowk	1000 m	11	0.011
2.	Tehsil chowk to Sanvidhan chowk	1000 m	13	0.013
3.	Sanvidhan chowk to Darda square	1000 m	15	0.015
4.	Darda square to Ekvira square	1000 m	14	0.014
5.	Ekvira square to Lohara square	1000 m	16	0.016

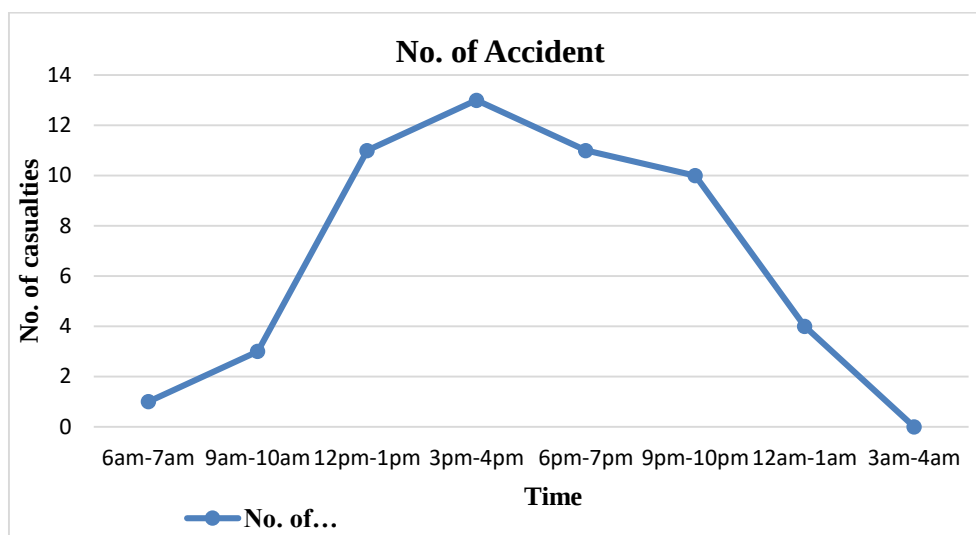


Fig.Accident time wise (2022-2024)

CONCLUSION

- i. Traffic accidents are a main public safety issue, with much research devoted to the analysis and prediction of these rare events.
- ii. It is estimated that accident caused by bikes is (45%), cars (30%), trucks (15%) and, others (10%). Road safety awareness should be raised among road users to reduce accident rates.
- iii. Stretch 5 has the highest number of accidents which accounts for 45% of total accidents.
- iv. Stretch 3 has the second highest number of accidents which accounts for 30% of total accidents.
- v. Accidents can be minimized by clearing-off shoulders, reducing speed limit, junction improvement, providing the medians and improving road.

The main concern with road accident data analysis is to identified the most influential factors affecting road accident frequency and accident severity. Traffic Accident Analysis study helped us to derive factors that are responsible for accidents. From this dataset, a variety of insights concerning the location, time, weather and point of intersect of an accident can be found. The analysis helps us to understand the best month, day and hour of the day to travel. Also it can help us to predict what are the accident prone areas in each city.

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