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Comprehensive Review on to Study the Impact of Roadway Condition, Accident and Traffic on Road Safety at Amravati City

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Abstract
Today "Road Safety" is one of the biggest public health issues throughout the country. Lakhs of lives are lost annually because of fatality due to road accidents, and the clock is ticking constantly. Road safety cannot be undermined if we want to achieve goals of sustainable development, prosperity and growth. Road Safety is imperative for a happy, healthy and prosperous life, of an individual as well as that of the nation. The issue concerns to all types of road users – pedestrians, motorcyclists, motorists etc., as well as unauthorized road side vendors and other encroachers. With rising motorization and expanding road network, travel risks and traffic exposure grow at a much faster rate, as the growth of registered vehicles always outnumbers population growth and new roads constructed. Today road traffic injuries are one of the leading causes of deaths, disabilities and hospitalizations with severe socioeconomic costs across the world. As per the 'Road Accidents in India 2021', there were 4,12,432 unfortunate incidences of road accidents during 2021 which claimed 1,53,972 lives and caused injuries to 3,84,448 persons. However, India is committed to bring down fatalities caused by road accidents. As the road accidents are multi-causal which requires multi-pronged measures to mitigate the problems through concerted efforts of all agencies of both Central Government and State Governments. The Ministry, along with various other related organizations as well as stakeholders has formulated a multi-pronged strategy to address the issue of road safety based on Education, Engineering (both of roads and vehicles), Enforcement and Emergency Care.

Keywords: **ROAD SAFTY,ACCIDENT,TRAFFIC TYPE,TRAFFIC VOLUME,DRIVER,VEHICLE**

I. INTRODUCTION

The problem of accident is a very acute in highway transportation due to complex flow pattern of vehicular traffic, presence of mixed traffic along with pedestrians. Traffic accident leads to loss of life and property. Thus the traffic engineers have to undertake a big responsibility of providing safe traffic movements to the road users and ensure their safety. Road accidents cannot be totally prevented but by suitable traffic engineering and management the accident rate can be reduced to a certain

extent. For this reason systematic study of traffic accidents are required to be carried out. Proper investigation of the cause of accident will help to propose preventive measures in terms of design and control.

Fatalities and injuries resulting from road traffic accidents are a major and growing public health problem in India. Every week nearly 2,650 people get killed and 9,000 get injured due to traffic accidents. As per the 'Road Accidents in India 2021', there were 4,12,432 unfortunate incidences of road accidents during 2021 which claimed 1,53,972 lives and caused injuries to 3,84,448 persons. Traffic accidents have now earned India a dubious distinction; with nearly 140,000 deaths annually, the country has overtaken China to top the world in road fatalities. India is the only country in the world which faces more than 15 fatalities and 53 injuries every hour as a consequence of road crashes. While in many developed and developing countries including China, the situation is generally improving, India faces a worsening situation. If the trend continues, the total number of road traffic deaths in India would increase by 100% between 2013 and 2027.

In 2022, there were 1,55,622 deaths due to road accidents were registered in India and 59.7 per cent of fatalities occurred due to over-speeding. In fact, 62 per cent of these accidents were recorded on just 5 per cent stretch of the highways, hinting that preventive measures need to be taken to reduce accidents on these stretches. The authorities need to identify more such stretches across the country and take preventive measures like revising speed limits, fixing blind spots and even out extreme undulations on these roads which are few of the major reasons of road accidents.

With just 1 per cent of the world's vehicles, India accounts for 11 per cent of the global death in road accidents, the highest in the world, according to a report by the World Bank. The country accounts for about 4.5 lakh road crashes per annum, in which 1.5 lakh people die.

"India tops the world in road crash deaths and injuries. It has 1 per cent of the world's vehicles but accounts for 11 per cent of all road crash deaths, witnessing 53 road crashes every hour; killing 1 person every 4 minutes," the report said.In the last decade, 13 lakh people died and another 50 lakh got injured on Indian roads, it said.

"Considering the under reporting phenomenon and using the crash ratios for the Ministry of Road Transport and Highways crash numbers", the report estimates the crash costs at Rs 5.96 lakh crore or 3.14 per cent of gross domestic product (GDP).

The 2022 World Bank report, titled 'Guide for Road Safety Opportunities and Challenges: Low- and Middle-Income Countries Country Profiles', puts the road crash and serious injury cost estimate at 7.5 per cent of India's GDP or Rs 12.9 lakh crore .

A recent study commissioned by the Ministry of Road Transport and Highways (MoRTH) estimates the socio-economic costs of road crashes at Rs 1,47,114 crore in India, which is equivalent to 0.77 per cent of the country's GDP.

"Considering the under reporting phenomenon and using the crash ratios for MoRTH crash numbers, the same study estimates the crash costs at Rs 5.96 lakh crores i.e. equivalent to 3.14 per cent," it said.

II. LITERATURE REVIEW

Many factors may exhibit measurable influence on driving behaviour and traffic safety on two-lane w-lane highways; these include, but are not limited to

(1) Human factors such as improper judgment of road ahead and traffic, driving under the influence of alcohol or drugs, driver education and experience, young driver, age and sex.
(2) Traffic factors like speed, volume, density, capacity, traffic mix and variation.

(3) Vehicle deficiencies, such as defective brake, headlight, tyres, steering and vehicle condition.
(4) Road condition like slippery or skidding road surface, ravels, pot hole, ruts etc.
5) Road design such as inadequate sight distances, shoulder width, no of lanes ,improper curve design, improper lighting and traffic control devices.
(6) Weather condition like fog, heavy rainfall, dust, snow etc
(7) Other causes are such as incorrect sign signals, service station, badly located advertisement, stray animals

A) Driver Characteristics

Hassan and Aty (2012) studied 680 young driver behavior involvements in traffic crash in Florida. The result revealed that aggressive violation, in-vehicle distraction and demographic characteristics were the significant factors affecting young drivers involvement in crashes at the age of 16-17.Invehicle distraction, attitude towards speeding and demographic characteristics were the significant factors effect young drivers crash risk at the age of 18-24.

Constantinou et al.,(2011) found that young novice driver(<25 yrs) are in high risk related to traffic offence. The study was based on gender, sex, age and personality.

Prabhakharn et al.,(2011) analyzed that imparting training among drivers reduces speeding behavior. They used speed as dependent variable and distance as function in ANOVA.

Chandraratna et al,(2006) studied licensed driver involvement in a crash. Using logistic regression it was found very young and old male drivers are responsible due to both speeding and non-speeding.

Sagberg and Bjornskau (2006) conducted a video-based hazard perception test and concluded that male novice driver had relatively longer reaction time and initial risk involved.

Driving speed is an important factor in road safety. Aarts and Schagen (2006) studied relationship between speed and risk of a crash. The conclusion was when speed increases crash increases.

Another study funded by the Swedish National Road Administration reveals that impaired driving is an important road safety problem, and the characteristics of drivers impaired by alcohol or drugs are relevant to targeted interventions. The study considers young driver's

socio demographic attributes: age, sex, class of origin and educational attainment, based on national young Swedish drivers (1988-2000) followed up in police registers for their first motor vehicle crash. Driving under the influence of alcohol or any other sub- stance is forbidden in Sweden. The legal limit for drunken driving is 0.2% concentration in blood, or 0.10 mg per litre in breath. For aggravated drunken driving, the corresponding limits are 1.0% concentration and 0.50 mg/, respectively. The limit for any substance classified as a narcotic is zero. (Vaez and Lafllame, 2005).

Longo et al.,(1999) analyzed blood sample for alcohol, annabinoids(THC),benzodiazepines from 2500 injured Australian drivers. He found drivers tested positive for alcohol only,benzodiazepine only. The combination of alcohol and cannabinoids and Combination of alcohol and benzodiazepines were more culpable for the crash than drug-free group. Analysis of Results for crashes are shown in Table 2.1

B) Vehicular Characterstics

Vehicle plays an important role in a crash. This may be due to defective wheel alignment, brake failure, overloading, one or two head light defect, back light defect,
indicator defect, steering defect.

Tyre defect may be due to under or over inflation overloading, ageing behavior, external
impact due to pothole, debris, nail etc. Tires up to Six years from the date of manufacturer should be changed including spare tires (Osueke and Okorie,2012).

Accident imposes high intangible cost (pain, grief and suffering). Vehicle accident can be fatal and constitute a high economic burden. Oduro (2012) surveyed a no of accident and found that 83% break failure result in accident. Brake ineffectiveness is due

to vehicle overloading, uneven tyre pressure, incorrect brake adjustment, air in breaking system,automatic brake adjuster not working, brake fluid on lining . Brake failure is due to broken pipe, low brake fluid level, cracked brake drum, brakes overheating.

Overloading truck reduces braking ability of truck, stability of truck, unexpected defect of road and damage of vehicle. Fatal crashes involving overloaded large truck increases by 52% (Chan, 2008).

C) Environment Characteristics

Roadway design is one of the most significant factors that affect driving behavior and perceived safety. Bassat and Shinar (2011) studied combined effect of roadway design element such as shoulder width, guardrail and roadway geometry (curvature) by taking objective driving measures (Speed and lane position) and subjective measure(perceived safe driving speed and estimated road safety) into account. They found the shoulder width had a significant effect on actual speed and lane position but when a guard rail had a significant effect on perceived safe driving.

Mohmed et al, (2011) studied on crash related to visibility obstruction due to fog and smoke in Florida. It was found that fog smoke related crashes are more likely to occur at night without street lighting leading to more severe injuries. Head-on and Rear-end are common crashes in terms of crash risk and severity. These crashes are more prevalent road, undivided roads, roads with no sidewalks and two lane rural roads.

Hiselius(2004) studied the accident frequency and homogeneous flow of vehicle. It was found that the accident rate decreases when the traffic flow is homogenous in nature. For Lories there was an decrease in no of accident and for car the accident rate was constant.

Golob et al.,(2004) made a relation between traffic flow and traffic accident. It was from the study that means volume and median speed affect safety. Lane- change crashes tend to occur when there is the highest variability in speed. While rear end crashes tend to cluster where there is a lower variation in speed. There suggestion was to improve traffic engineering and implementation of ITS (Intelligent Transportation System) and enhance driver education.

Kurlaftis and Golias (2002) studied between road geometric characteristics and accident rate. They found AADT, lane width, Serviceability index, friction, pavement type, access control are the main factor contributing to accidents. Relative importance was 100% for AADT, 72% for lane width, 59% for serviceability, 32% for friction, 30% for pavement type and 14% for rural two-lane road.

Caliendo et al., (2006) fitted a Poisson and negative binomial model using accident as dependent variable and length, curvature, sight distance, side friction coefficient, longitudinal slope, presence of junction as independent variable.

III.CONCLUSION

II. Following Outcome are expected:
III.
IV. (1) Determination of accident rate and frequency of accident
V. (2)Annual variation in accidents.
VI. (3) Monthly Variation in Accidents
VII. (4) Hourly variation in accidents
VIII. (5) Number, Category Of Vehicle Involve In Fatalities.
IX. (6) To establish Relation between the traffic volume and accident.
X. (7) Identification of road surface conditions along the black spot.
XI. (8) To compare trend of accident, injuries and fatalities. Identification of road side feature involve in accident .

IV.PROPOSED METHODOLOGY

Two-lane road of Amravati city was chosen for, this study The road was divided into four Stretches .

following stretches were selected for data collection.

(i) Stretch 1- Welcome point to Irwin Square.
(ii)Stretch 2 - Biyani Square to Irwin Square.
(iii)Stretch3- Camp point Restaurant to MIDC.
(iv)Stretch4- Bus stand to Rajkamal square.

A] Data collection

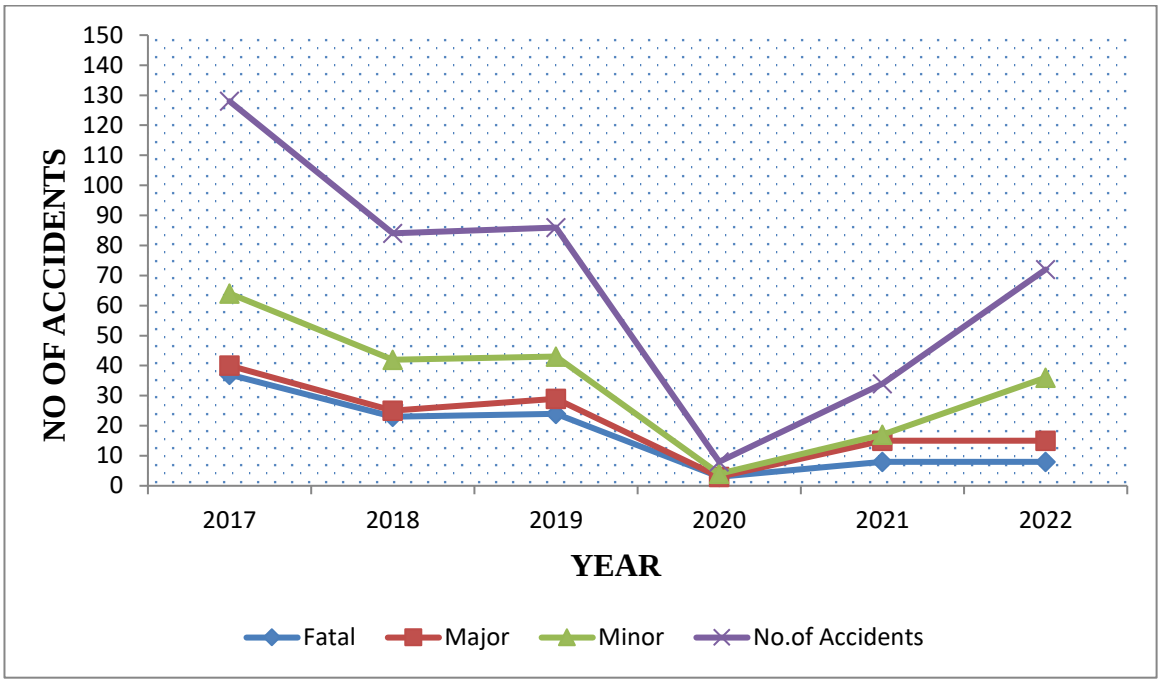
The information available for accident studies is the FIR (First Information Report) lodged in the police stations.
The data from these records of last eleven years (2007-.2017) were extracted from the FIR record filed under IPCno.279/337338/304
(A). Vehicles those involved in accidents and reported 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, minibus, motor cycle, tanker, truck and bus.

Police Station	Road section covered under the police station
Gadgenagar/ City Kotwali	Welcome point to Irwin Square.
Fezarpura/ Gadgenagar	Biyani Square to Irwin Square.
Fezarpura/ Rajapeth	Camp point Restaurant to MIDC.
Fezarpura/City Kotwali	Bus stand to Rajkamal square.

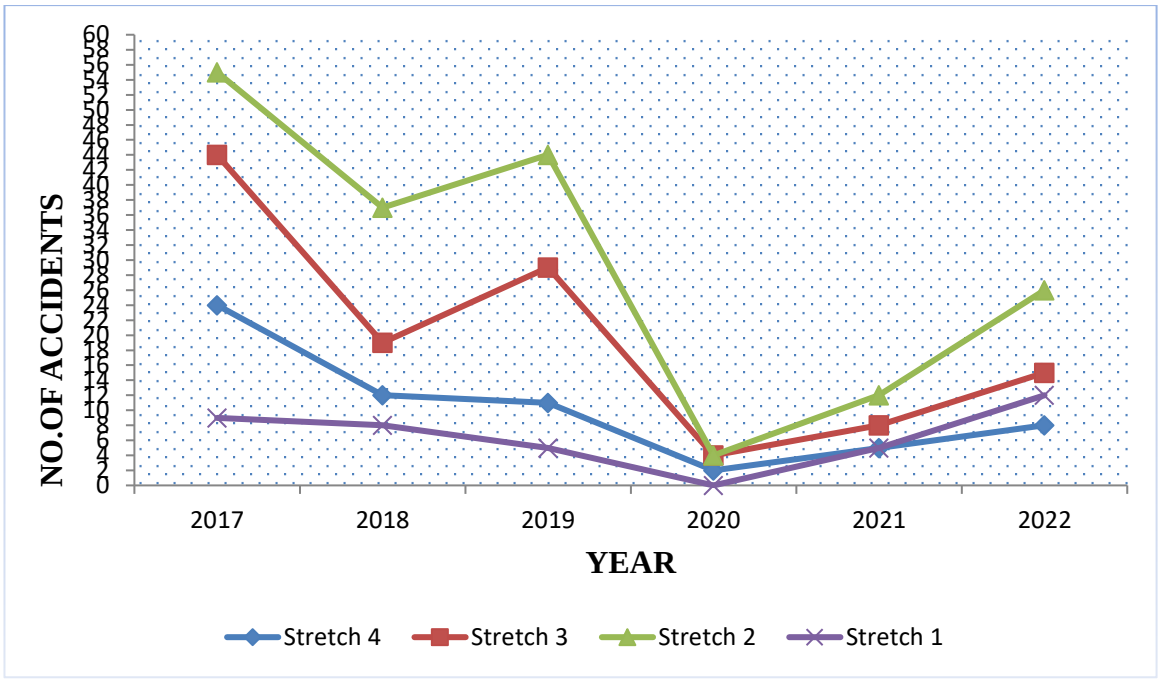
Table : Frequency of accident

Distance of origin	No. of accidents (2017-2022)	Frequency	Total frequency
2.8	39	8	8.0
2.2	51	10.5	18.5
6.6	57	11.74	30.24
3.8	59	12.15	42.39
Total	206	42.39	

From the Table 4.1 and 4.2 it is observed that frequency and rate of accidents is more for stretch 4 followed by stretch 2, 1, 3 respectively.

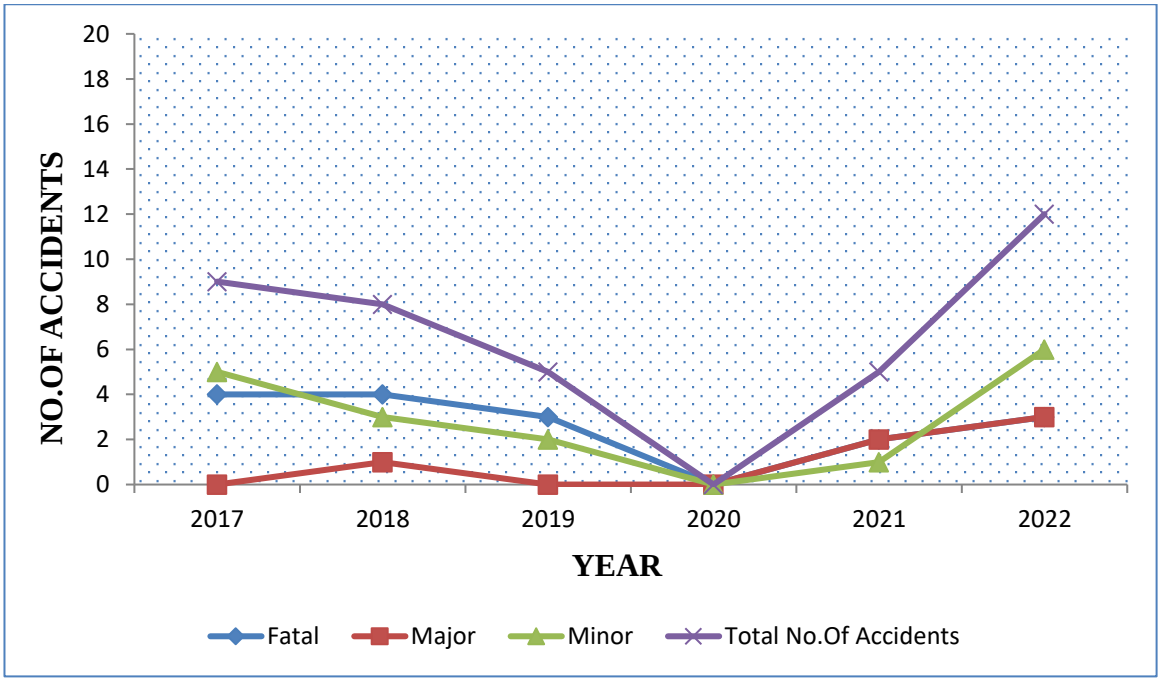


Graph :Annual variations in accidents of total stretch



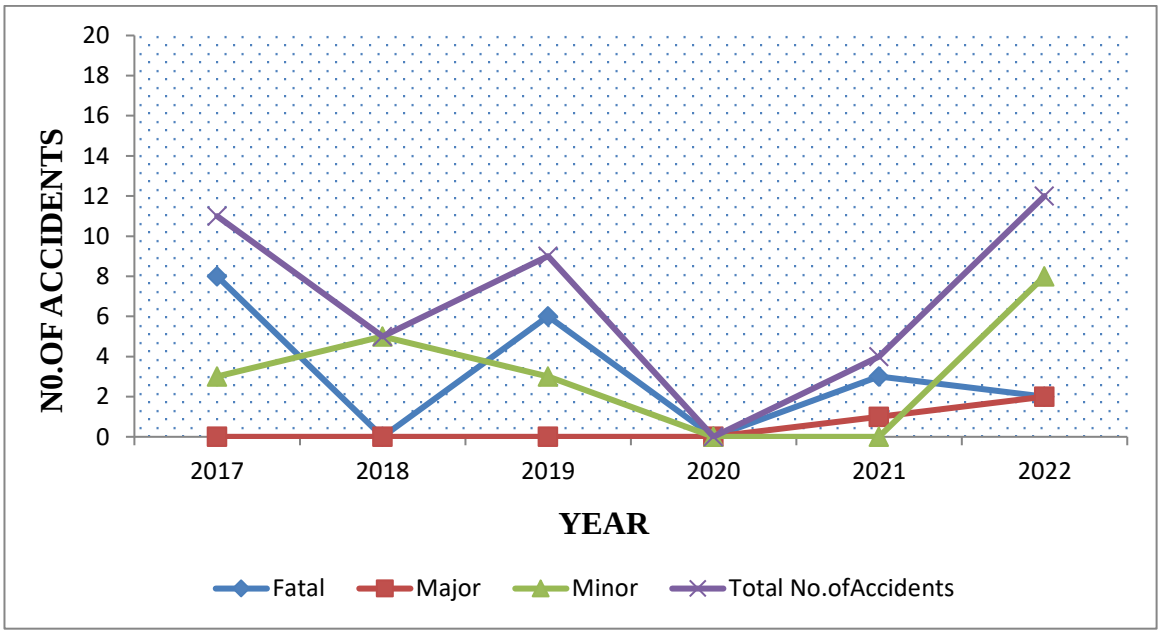
Graph : Annual variations in accidents of four stretches

STRETCH 1



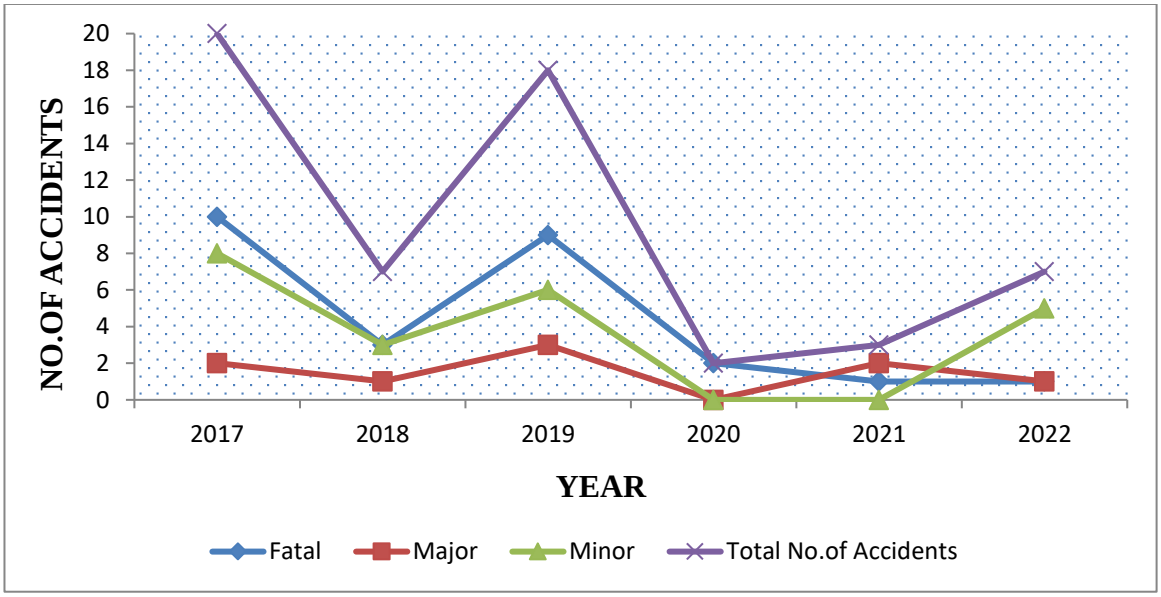
Graph : Annual variations in accidents of stretch 1

STRETCH 2



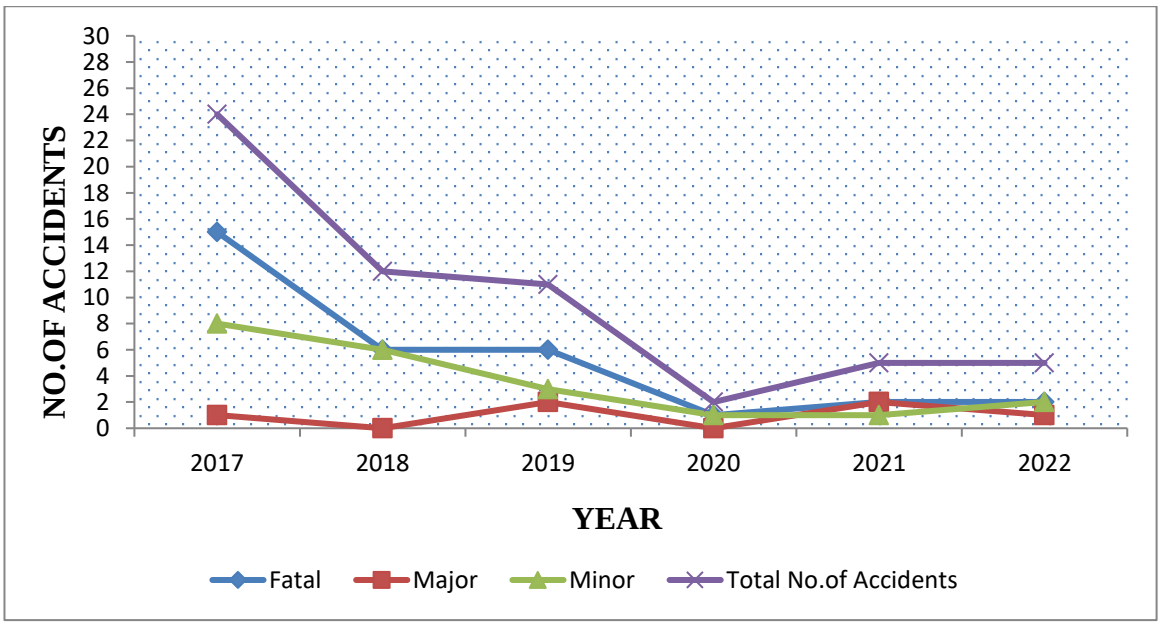
Graph : Annual variations in accidents of stretch 2

STRETCH 3



Graph : Annual variations in accidents of stretch 3

STRETCH 4



Graph : Annual variations in accidents of stretch 4

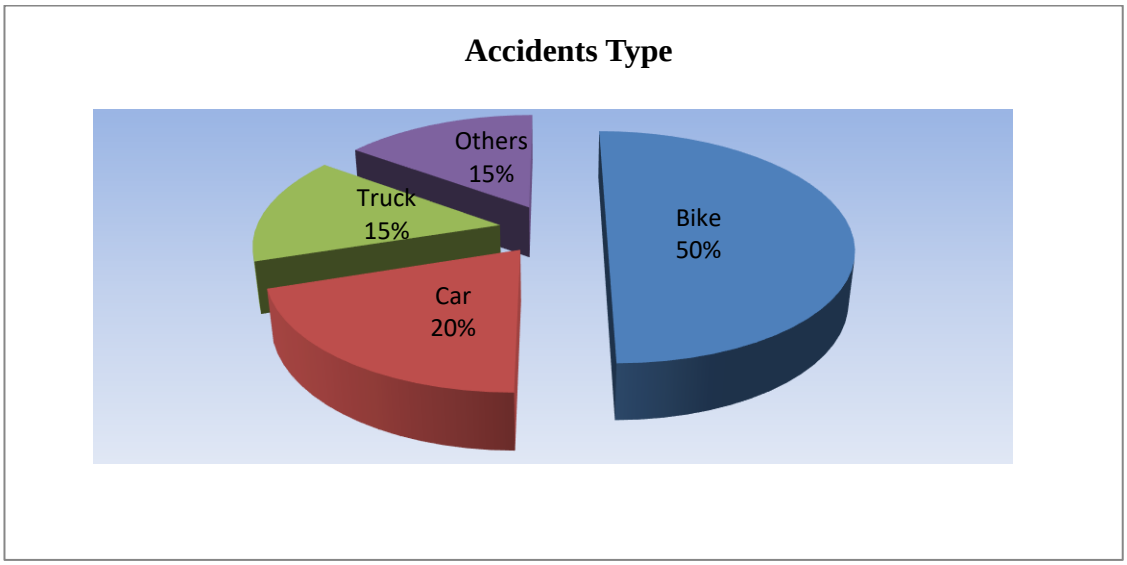


Fig.: Vehicles involved in accidents during 2017-2022

Source:-Ministry of Road Transport and Highway

Fig.: Month-wise road accidents, persons killed

4.2 Month-wise road accidents

The time period between 12 am and 6 am, however, is the safest with less than 10% of the accidents, official data analyzed by News18 shows. The month-wise data on road accidents revealed that January 2021 reported most road accidents The 3 pm to 9 pm period has proven to be quite risky and fatal on Indian roads as the government data shows nearly 40% of the total road accidents registered in 2021 took place during that time. The time period between 12 am and 6 am, however, is the safest with less than 10% of the

accidents, official data analyzed by News18 shows. According to the annual report 'Road Accidents in India — 2021', released by the Ministry of Road Transport and Highways, of the total 4.12 lakh accidents registered during 2021, over 1.58 lakh were reported between 3 pm and 9 pm.7 Further diving into the data shows that in 2021, the interval between 6 pm and 9 pm recorded maximum number of road accidents – accounting for about 21% of the total accidents in the country and this is in line with the pattern seen over the past five years. The time between 3 pm and 6 pm reported the second highest accidents – about 18%. During 2021, the time for 4,996 accidents was not known, the report shows.

4.3 Annual variations in accidents

Graph 4.1 shows the annual variation in accidents of total stretches during year 2017- 2022. It is observed that percentage accidents are increasing in most of the year. In the year 2017 accident rate was high and low in the year 2022.It may be due to increase in number in no. of vehicles, increase in population, bad traffic environment.

Graph 4.2 shows annual variation in accidents of the four stretches. It is observed that no. of accidents are more for stretch-4 and are more higher than stretch 2 and 3.

This is because of high traffic volume on stretch 4.Traffic volume decreases on stretch1 .Stretch-4 has high population density. Accident rate is more due to more number of noncommercial and commercial vehicles on the road, bad traffic environment.

4.4 Monthly variations in accidents

Fig 4.3 shows the monthly variation in accidents. Maximum number of accidents occurs in summer season i.e. in the month of March, April and May. This is due to distraction related to environment. Problem in these months are fatigue, glare, inconvenient heat.

4.5 Hourly variations in accidents

Fig 4.2 shows hourly variation accidents. **One can observe more accidents occurs between 7PM to 9PM**. During this hour line truck (Truck Series) start their long journey. Most of the driver do not use speedometer as they drive by approximate speed, then speed crosses limiting speed as a result accident occur. Also drivers drink and drive the evening hour. Accident also occurs due to overloading of vehicles. In India load capacity 10 ton or 16.2 ton for goods carriage but they carry more load that results uncontrol and leads to accidents.

4.6 Vehicles involved in fatalities.

Vehicle users related to fatalities during 2017-2022 are shown pie chart percent. The results indicate that 50 percent of fatalities are due motor cycle followed by 20 percent car, 15 percent truck unknown respectively as shown fig4.1 drivers consume alcohol during driving, as a result reaction time increases and loss of control occurs during speed driving leads to fatalities.

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