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Statistical Analysis of Road Traffic Accident Under Kirumampakkam Traffic Police Station

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ABSTRACT

Road traffic accidents are regarded as the biggest general health concern because they cause so many injuries and fatalities globally. One of the developing countries with the highest rate of such incidents is India. As a result, the public and traffic agencies focus on measures to lessen the severity of such accidents thereby reducing the fatality rate [2]. This dissertation examines various elements and data regarding the number of traffic accidents that occurred in various studies and nations, as well as various safety recommendations [1].Although little progress was made in the prediction of road injury, researchers studying road safety have seen success in the analysis of traffic accidents caused by the use of data analytic techniques [2]. In order to forecast injury severity levels, this paper applies advanced data analytics methods and assesses their effectiveness. This study makes use of publicly accessible data, which spans between the years 2019to 2022. Data is collected from the traffic police station and the data is analysed by the statistical analysis to get the result of accidents and severity of injuries.

Keywords: road accidents, rate of injuries, data analytic technique.

1. INTRODUCTION

The word accident is derived from the Latin verb accidere, signifying occurance, happening, falls upon, or by chance. A road traffic accident (RTA) is an unanticipated incident that happens on the road and involves a vehicle and/or other road users and results in casualties or property loss [1]. A road accident used to be sensational affairs two or three decades ago, whereas now-a-days; it has become something that occupies the headlines of our newspaper almost every day [2]. Though additional traffic regulation, such as speed limits, and other restrictions have been imposed to reduce the number of accidents, yet the number is increasing.Only 48% of the world's registered vehicles are in low and middle-income countries, where more than 90% of road fatalities occur [3]. More money was lost financiallyabout $518 billionthan was given to these nations in development aid. Developing countries continue to lose 1-3% of their gross national product (GNP) due to the epidemic of traffic fatalities[5].Road crashes could become the fifth leading cause of death worldwide, according to the World Health Organization (WHO)leading cause of death by 2030,resulting in an estimated 2.4 million fatalities per year.The 21st century has seen a swift increase inroad motorization as a result of massive population growthRisks of road traffic fatality (RTF) may rise due to urbanization and increased mobility of today's society [6]. Many accidents result in vehicle damage or injuries to the occupants or even other innocents at times, insurance claims related to which often have to be settled in court [9]. The investigation is conducted by police. This studyoutlines a framework for predicting accident severityfor accidents on the road [9].The primary objective of this Endeavor is to gather essential statistics and factual information about the

severity of traffic accidents. By effectively connecting the frequency of accidents and the severity of the causal variables.

2. AIM and OBJECTIVES

AIM:

To study and analyse the injuries caused by road traffic accident and estimate rate of injuries Occurred around Kirumampakkam sub division of Puducherry.

OBJECTIVE:

- To determine the rate of accidents in two wheelers, four wheelers and heavy vehicles.
- To assess the injury caused in each type of vehicular accidents.
- To analyse the data acquired and conclude the based on the rate of accident and severity of the injuries.

3. REVIEW OF LITERATURE

[1] Ahmad Hasan Nury, Jahir Bin Alam, Syedazehanfarzana, Md. Abu Zafor,(2012). Study on Frequency Analysis of Sylhet City's Road Accident. Int. J. of Engg. and Tech.2(4): 608615.

- A road traffic injury is defined as a fatal or non-fatal injury that arises from an accident or incident involving a minimum of one motor vehicle in motion on a public or private road that is accessible to the general public and leaves at least one person injured or killed.
- These mishaps are viewed socially as normal parts of life that happen at random. However, in actuality, they are the outcomes of a complicated web of interactions between the general populace, their cars, the general environmental conditions, and the current legislative provisions.
- Road traffic incidents can frequently be avoided.Worldwide, more than a million people lose their lives in traffic accidents each year. It is one of the major causes of death, according to the World Health Organization (WHO).
- India, a nation that is fast developing and experiencing economic growth, has its own problems with traffic accidents because of the quick spread of motorization.

[2] Atubi Augustus O,(2010). Road Traffic Accident Variations in Lagos State, Nigeria: A Synopsis of Variance Spectra. Afr. Res. Rev. 4(2):197- 218.

- Accidents causing a great deal of sickness and mortality, traffic accidents have a significant negative impact on the nation's economy.
- An interaction between various components, such as the environment, the vehicle, and the human being, results in a traffic accident.
- Conventionally, traffic accidents are thought to be unpredictably occurring, unavoidable, and unpreventable.However, the majority of traffic incidents are predictable and avoidable.
- This necessitates an understanding of the variables causing and contributing to traffic accidents.Every year, traffic accidents result in the deaths of approximately 1.3 million people and injure 20-50 million more.
- The World Health Organization (WHO) reports that it is the main cause of death for individuals between the ages of 15 and 29.

[3] Banik, B. K., Chowdhary, M. A. I., Hossain, E., and Moumdar, B. (2011).Road accident and safety study in Sylhet Region of Bangladesh. J. of Engg. Sci. and Tech. 6(4):493-505.

- By 2030, it is anticipated that traffic accidents would rank among the top five major causes of death. Approximately 3% of the GDP of undeveloped and emerging nations, who make up 82% of the global population, is lost to road traffic accidents (RTAs).
- 90% of traffic accidents happen in the same nations where 54% of all registered vehicles worldwide are motorized.
- India, a nation that is growing economically and developing quickly, has one of the greatest rates of motorization growth, which is matched by a rapid expansion of road networks and urbanization. As a result, the nation faces a number of problems related to RTA and road safety standards.
- The overall number of RTAs in 2023 was 5,01,423, up 2.5% from the previous year. 1,46,133 people lost their lives as a result of these accidents in 2023.
- According to the available data, there were 29.9% fatalities for every 100 incidents in India in 2023.
- Additionally, approximately 1374 accidents and 400 fatalities occur daily on Indian roads, translating to an average of 57 accidents and 17 fatalities each hour in our nation.
- There were 2,10,023,000 registered motor vehicles as of 2023. The length of the road was 54, 72, and 144 kilometres in the same year.
- The network of roadways includes district roads, state highways, national highways, and rural and village roads.
- Concurrently, the percentage of registered vehicles was 73.5 percent for two-wheelers, followed by automobiles, jeeps, and taxis (13.6%), cargo trucks (4.4%), buses (1%) and other vehicles (7.5%).
- This led to a dramatic increase in the number of vehicles per thousand people,3.7% of the nation's GDP is lost economically as a result of traffic accidents.

[4] Baojin Wang (2002). Safety in the Road Environment: A Driver Behavioural Response Perspective. Trans.29: 253- 255.

- The idea that traffic accidents and injuries are random occurrences is a major contributing factor to the neglect of traffic accident data in public health.
- Such occurrences are thought to be the inevitable result.
- They are seen as likely accidental, unforeseen, and unpredictable events that are unavoidable. In India, driver error accounts for 77.1% of the primary causes of traffic accidents.

5. ESHAH, T., HILL,S.(2010). Mining Road Traffic Accident Data to Improve Safety: Role of Road-Related Factors on Accident Severity in Ethiopia. Proceedings of AAAI Artificial Intelligence for Development, 22-24

- Additional factors include bad road conditions, dirty cars, and weather conditions. Among the things that lead to traffic accidents include drunk driving, excessive speeding, disregard for traffic laws, and careless driving.
- Commercial vehicle drivers in India are known to drive while intoxicated. Young people and private vehicle owners are also significant participants in the game.
- Operator The following are other contributing factors to rear-end collisions: fever, tiredness, younger age (15–29 years), male sex, improper use of safety belts and helmets, medical conditions (sudden illness, myocardial infarction, impaired vision), psychological factors(risk-taking, impulsiveness),

poor judgment, delayed decision-making, aggression, poor perceptions, family dysfunction, and distracted driving (using a phone while driving).

[6] Dell'Acqua, G.; Russo, F. (2010). Speed Factors on Low-Volume Roads for Horizontal Curves and Tangents. The Baltic J. of Road and Bridge Engg. 5(2): 89-97

- There is a significant way that drivers can help lower the number of accidents. Issuing driving licenses must to be only predicated on the minimal proficiency attained by students attending approved driving schools.
- Every driver needs to have a current driver's license and receive the appropriate training. It is necessary to educate drivers and the general public on traffic laws.
- Drivers should have routine medical examinations, particularly for vision and hearing issues. Honking without purpose should be avoided.
- It is necessary to strengthen the penalties or laws (MVA amendment) for those who violate traffic rules. Strict oversight is needed to prevent overloading. RTA can be decreased by making the registration of criminal charges in overloading mandatory.
- It can be beneficial to make sure that safety equipment (helmets, belts, etc.) is used. Permit cancellation for overcrowded passenger vehicles is the appropriate course of action.

[7] Dinesh Mohan,(2011). Analysis of Road Traffic Fatality Data for Asia. J. of the Eastern Asia Society for Trans. Studies. 9: 1786 – 1795.

- A National Accident Relief Policy is required to guarantee things like immediate assistance, free trauma care, and training for law enforcement, educators, and paramedics.
- It is necessary to implement regulations requiring two-wheelers to wear helmets and four-wheelers to wear seat belts.
- The relevant authorities must firmly enforce traffic regulations. Smooth traffic flow can be achieved by eliminating stray animals such as cattle and encroaching on sidewalk and road edges.
- Preventing random car parking on congested roads and intersections will guarantee unobstructed traffic flow.
- To a certain extent, we might think of road traffic operation risk as the likelihood that traffic accidents will occur.

[8] G A Hindle, T Hindle,(2011). Safety Cameras and Road Accidents: Effectiveness in Local Authority Areas in England. J. of the Op. Res. Soc. 62: 1181-1188.

- An in-depth analysis of the hidden safety concerns present in each link in the road traffic system holds the key to solving the problem of road traffic safety.
- Additionally, this issue can be resolved by investigating the macro- and micro-level driving risks and implementing the necessary preventative and control measures to lower the likelihood of all types of traffic incidents.

[9] Haigney, D. E., Westerman, S. J. (2001). Mobile (cell) phone use and driving: A critical review of research methodology. Ergonomics, 44:132– 143.

- It is necessary to research the reasons and modes of risk transmission. The research topic of vehicle factor risks includes studies on driver assistance systems, vehicle collision risk prediction and evaluation, vehiclelanechanging safety, and risk prevention and control of hazardous material transportation vehicles.

- The design theory of driving assistance systems, autonomous vehicle accident-avoidance algorithms and models, risk assessment of cars changing lanes, and decision-making technologies are among the notable accomplishments of pertinent research.
- Which together have built the groundwork for enhancing the security and intelligence of automobiles?
- Additionally, they support the development of intelligent transportation systems (ITS).

4. MATERIALS AND METHODOLOGY

MATERIALS REQUIRED

Database of road accidentwas collected from the Traffic police station Kirumampakkam Puducherry.

METHODOLOGY

Type of study: A cross sectional study was done to find out the relationship between the vehicle type and severity caused due to the accident.

Period of study: July 2023 to December 2023.

Research approach: Quantitative research.

The study proposal was made and presented to the Institutional review committee for review. The study was accepted by the Institutional review board on .The study was focused on the accidents occurred in Kirumampakkam, Pillayarkuppam, Pannithittu, Narambai, Kattukuppam, Manapet, Mathikirshnapura and Pudukuppam villages located in Puducherry, India between the year 2019 to 2022. The data was collected from the Kirumampakkam traffic police station Puducherry after obtaining permission from Superintendent of Police AriyankuppamPuducherry. The data was collected by reviewing each accident case report and scrutinizing the information. The collected information is compiled based on the vehicle involved in the accident and scale of injuries and or mortality caused due to the accident. The vehicle types were classified as two wheelers, four wheelers and heavy vehicles. The injury type was assessed and staged as simple, grievous and fatal incidents. The data was analysed and separated based on the vehicle type and severity of the injury obtained in each type of vehicles. Based on the data obtained statistical analysis was done to find out the significance between the type of vehicle and severity of the injury.

DATA MANAGEMENT

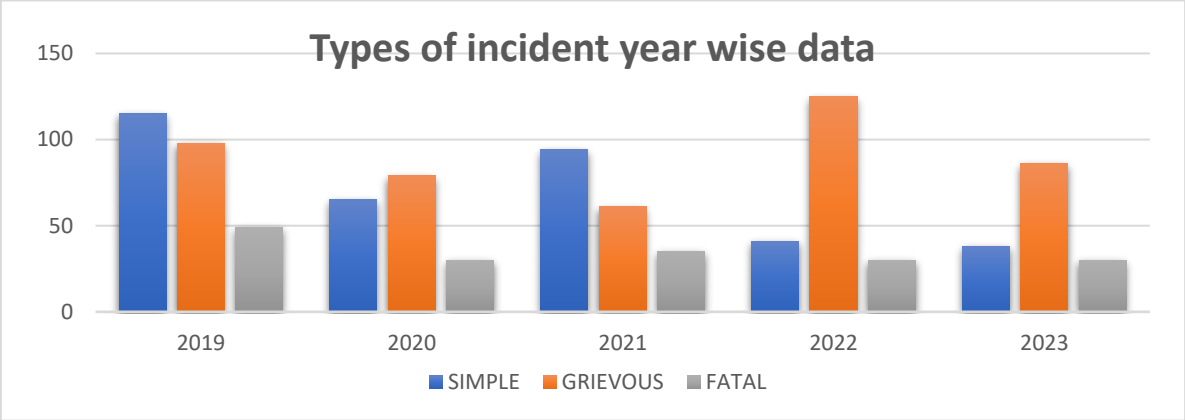
Data collection and Processing;

The data comprises from Kirumampakkam traffic police station Puducherry which spans the time period of 2019 to 2022. The data contain details about the accidents involving injuries that happened on public roadways and were reported to the police. The data is analysed and given to the authorities after being gathered by the authorities at the scene of an accident or, in some situations, after being reported by a member of the public at a police station.Data for this project is kept in a relational database. However, in further work, the relational data will be converted intoHadoop key-value records after first being denormalized. In this work, we divided the accidental injuries into three categories and they are simple, grievous and fatal. The databaseis collected in the above manner, which means the injuries caused in two wheelers accident, four wheelers and heavy vehicles. A key stage in the data analytic is the selection of data. Data needs to be of good quality and clean. Data quality considerations include accuracy, completeness and consistency. In addition, data volume is important as well. Data should be large enough to be of value in predictive modelling. It must be split into training, test and validation subset in order to evaluate the model.A challenge in developing analytical models for collision severity is data

imbalances between fatalities, which are uncommon occurrences, and accidents with no or few injuries. Since fatal accidents are uncommon in the dataset, most algorithms will perform badly and provide poor predictive models due to the high imbalance of accident data. In unbalanced data sets, such those pertaining to traffic accidents.

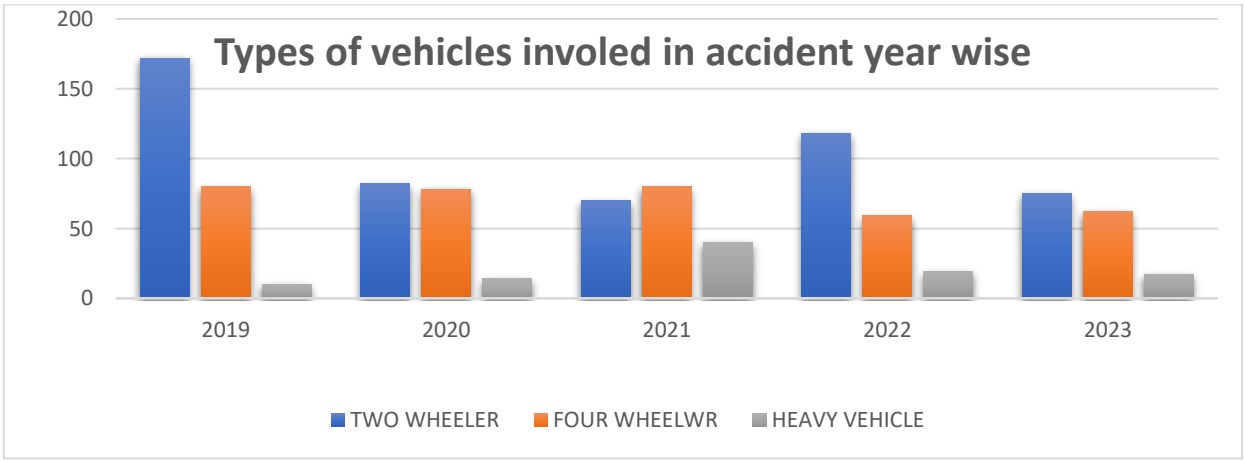
5. RESULTS & DISCUSSION.

Analysis and Result;



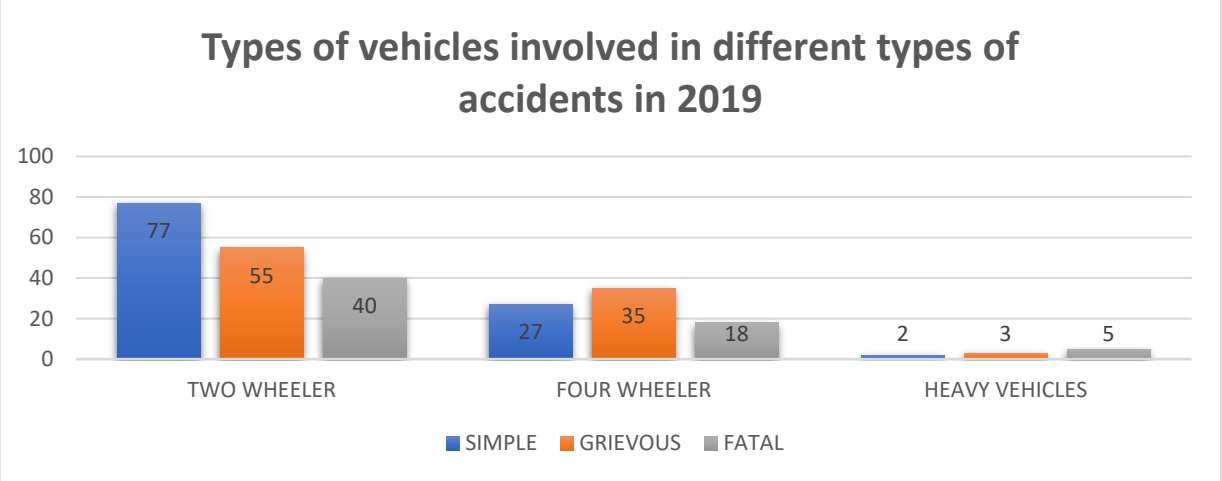
YEAR	SIMPLE	GRIEVOUS	FATAL
2019	115	98	49
2020	65	79	30
2021	94	61	35
2022	41	125	30
2023	38	86	30

- In this graph, the bars are representing the accidental injuries like simple, grievous and fatal of past five years (2019 – 2022).
- In 2019 simple injuries are the major one which occurred in higher frequency. In 2020 grievous injuries were recorded in peak.
- In 2021 simple injuries are higher than other type of accidents. Comparing to other years grievous injuries has been reported higher in 2022.



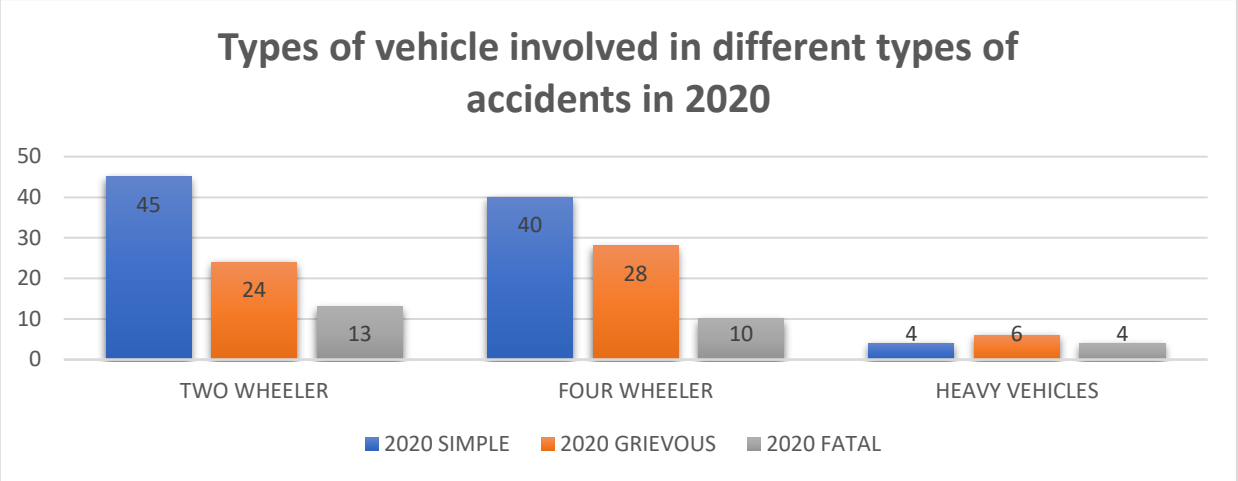
YEAR	TWO WHEELER	FOUR WHEELER	HEAVY VEHICLE
2019	172	80	10
2020	82	78	14
2021	70	80	40
2022	118	59	19
2023	75	62	17

- The graph shows the types of vehicles involved in accident from the year 2019 – 2022.
- In 2019 the number of two wheelers involved in accident is comparatively higher than next three years.
- By 2020 the rate of accidents in both two wheelers and four wheelers are slightly equal.
- In 2021 the higher number of accidents are occurred by four wheelers when compared with the other four years.
- During the year 2022 greater number of accidents are caused by two wheelers.



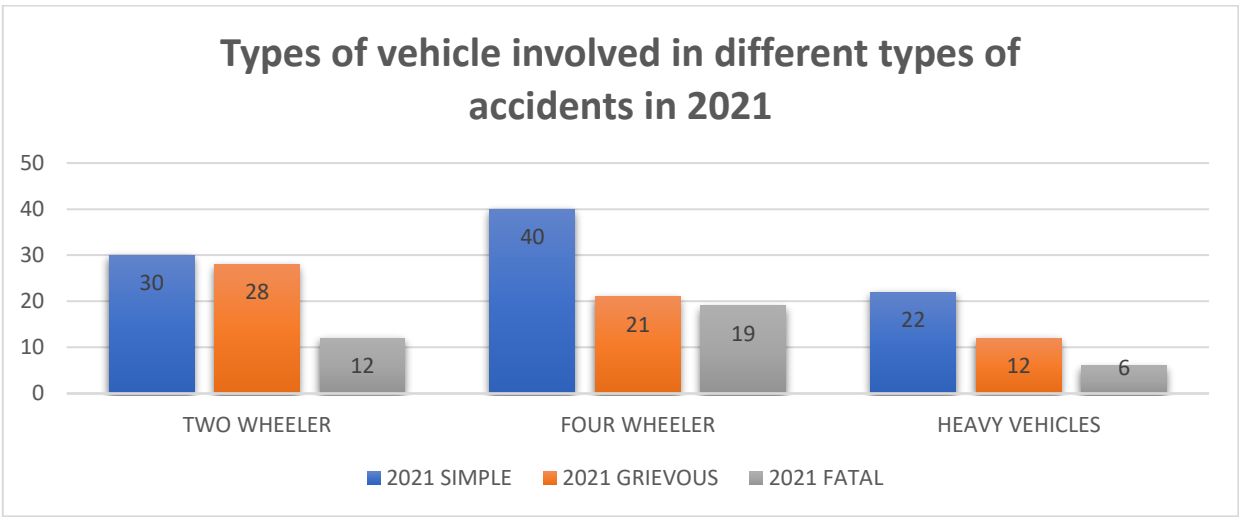
	2019		
	SIMPLE	GRIEVOUS	FATAL
TWO WHEELER	77	55	40
FOUR WHEELER	27	35	18
HEAVY VEHICLES	2	3	5

- By statistical data analysis, the simple injuries are greater in two wheeled vehicles while the four wheelers have the higher rate of grievous injuries,fatal injuries are higher in heavy vehicles compared to other.



	2020		
	SIMPLE	GRIEVOUS	FATAL
TWO WHEELER	45	24	13
FOUR WHEELER	40	28	10
HEAVY VEHICLES	4	6	4

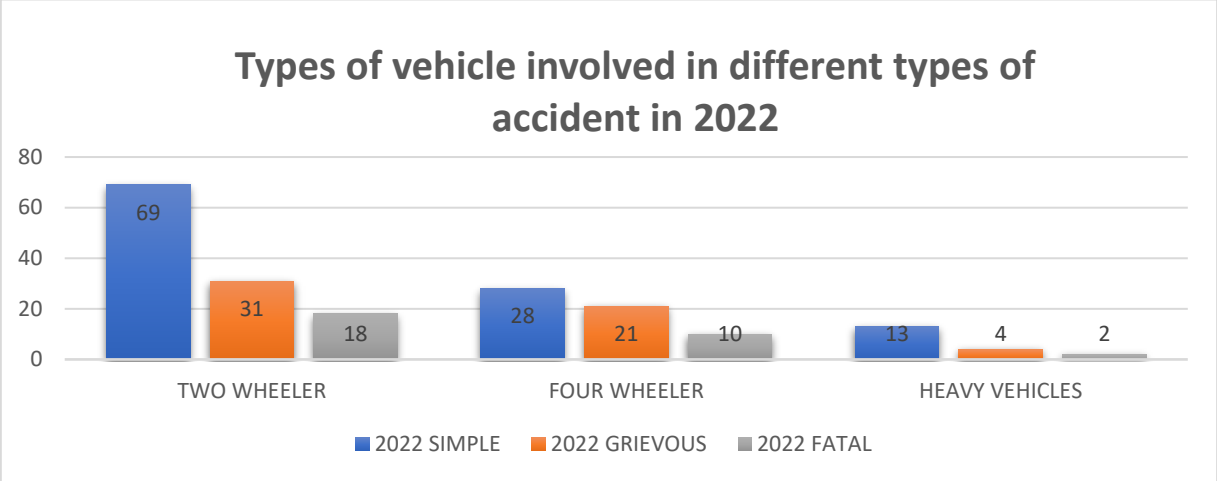
- In the year 2020, simple injuries seem to be higher in two wheelers, grievous injuries in both four wheelers and heavy vehicles.



	2021		
	SIMPLE	GRIEVOUS	FATAL
TWO WHEELER	30	28	12
FOUR	40	21	19

WHEELER			
HEAVY VEHICLES	22	17	6

- By the year 2021, four wheelers and heavy vehicles have higher the higher number of simple injuries and the rate of simple and grievous injuries in two wheelers are comparatively equal.



	2022		
	SIMPLE	GRIEVOUS	FATAL
TWO WHEELER	69	31	18
FOUR WHEELER	28	21	10
HEAVY VEHICLES	13	4	2

- In the year 2022, two wheelers have the greater number of simple and grievous injuries and the fatal rate in the year is higher than the other years.

DISSCUSSION

- The present study is toanalyse the injuries caused by road traffic accident and estimate rate of injuries occurred around Kirumampakkam sub division of Puducherry.
- Based on statistical data research, two-wheeled vehicles have a higher rate of simple injuries, whereas four-wheelers have a larger risk of serious injuries. Heavy vehicles have a higher rate of fatal injuries than other vehicle types.
- 2020 seems to be the year of greater simple injuries in two-wheelers and severe injuries in four-wheelers and large vehicles.
- By 2021, the rate of simple and severe injuries in two-wheelers is roughly equivalent to that of four-wheelers and heavy vehicles, which have higher rates of simple injuries.
- Two-wheelers sustain more minor and serious injuries in 2022 than in any previous year, and the

year's fatality rate is also higher than average.

GIS. Geographic information system offers an effective communication and routing mechanism to help identify the accidents as soon as possible. The suggested accidents detection system employs a fusion method to determine the accidents severity score from a variety of factors from rider-dependent and independent models as well as vehicle-dependent models. Based on the characteristics of the vehicle and rider independent model, the support vector machine technique is utilized to identify accidents. To reduce false negatives and boost accident detection accuracy, the output from the accident detection system and support vector machine (SVM) is integrated. The suggested solution notifies the centralized control system of the accident's location as soon as it is detected.The suggested approach uses a GIS to assess the amount of traffic on the road and uses that information to determine the fastest route to the hospital. In order to improve vehicle design and the accident management system, the system then conducts data analysis to identify several valuable patterns based on the characteristics observed.

CONCLUSION

From the statistical analysis of the database, it was observed as the two wheelers has high rate of accidents and high in simple injuries. Comparing to other vehicles two wheelers has the higher rate of grievous and fatal injuries. The least count of accidents is done in heavy vehicles. In heavy vehicles simple injuries are the major one. Four wheelers accident has caused more simple injuries.

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