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RESEARCH ARTICLE OPEN ACCESS

Causes and Preventions of Road Traffic Accidents in Indore

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ABSTRACT:
Traffic congestion is one of the most widespread and critical global issues, significantly impacting the economy, society, and the environment. Dewas Naka Square, Teen Imli, IT Park Square, and Rajiv Gandhi Square serve as key arterial roads in Indore, featuring a mix of commercial and residential buildings. These roads include intersections with traffic signals and experience severe congestion, particularly during peak hours, due to factors such as shopping centres, schools, and office buildings.
This study aims to analyse traffic volume at these major intersections in Indore, highlighting the challenges posed by increasing congestion. The research focuses on traffic patterns along the city's primary roads, which serve as crucial entry points. The growing population, city-centered development, and an increasing vehicle-to-road capacity ratio contribute to worsening congestion. As traffic volume continues to rise, these roads may soon reach their maximum capacity, classified under Level of Service (LOS) E or F.
In this study, we will analyze the traffic volume of all four intersections—Dewas Naka, Teen Imli, IT Park, and Rajiv Gandhi Square—and identify necessary changes to improve traffic flow. However, the procedural methodology will be demonstrated using Dewas Naka Square and Teen Imli, while the results for all four intersections will be presented in the conclusion.

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I. INTRODUCTION:

India's population is growing rapidly, leading to increased migration from rural areas to cities. As a result, more people are living in urban areas, which has led to higher traffic demand. When traffic volume increases to a point where vehicle movement slows down, congestion occurs.

Dewas Naka Square, Teen Imli IT Park Square, and Rajiv Gandhi Square in Indore are important roads that connect different sectors, markets, and residential areas. Due to their strategic location, these roads experience heavy traffic, especially during peak hours. The congestion is mainly caused by their proximity to key places such as shopping centres, schools, and office buildings.

Traffic congestion is directly linked to population growth. This study focuses on analysing traffic conditions and exploring possible solutions to reduce congestion on these roads. A traffic analysis is conducted to assess the current state of the roads, including their Passenger Car Unit (PCU) and capacity.


Indian Oil

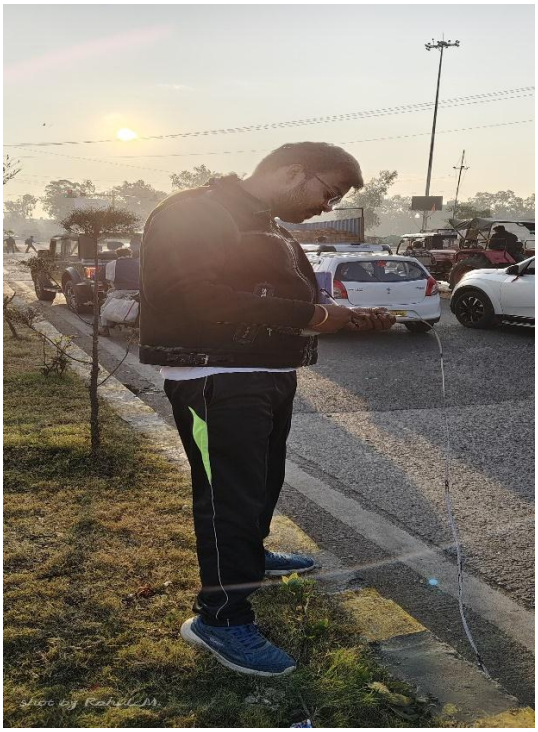

Figure.1:- Survey on Dewas Naka, Teen Imli, IT park and Rajiv Gandhi Squares

II. OBJECTIVES OF THE STUDY:

*1)*Traffic volume:Measure the number of vehicles passing through by points in the study area.
2) To study the traffic composition, vehicle classification (types of vehicles-cars,buses,two-wheelers,etc.)
3) To identify specific locations along Dewas Naka Square, Teen Imli IT Park Square, and Rajiv Gandhi Square,such as intersection, market areas,and narrow sections of the road,where trafficbottlenecks occur and lead to congestion.
4) Traffic speed analysis: To identify traffic average speed and the congestion levels.

III. LITERATURE REVIEW:

H.S. Goliya et al. (2020): conducted a study using a structured approach with different data collection methods. The research was divided into two phases: primary and secondary. To gain useful insights, the study area was split into separate sections, the findings showed that road accidents happened more often during the day but were usually more severe at night. Males were the most common victims of accidents, while females were more likely to be involved in fatal cases. Among commercial vehicles, trucks caused the most severe accidents, whereas four-wheelers and two-wheelers had the highest number of accidents. The study also found that widening and improving road alignment helped traffic move more smoothly and doubled road capacity.

Asad Iqbal et al. (2020): conducted a study on road traffic accidents and identified high-risk areas, known as black spots. The research found that the Salt Range area was the most dangerous black spot on the M-2 highway between Lahore and Islamabad, the study used accident data provided by Pakistan's National Highway and Motorway Police (NH & MP). Data analysis was done using MS Excel and Origin Pro software. Based on the findings, the study recommended building underpasses for pedestrians and animals in populated areas and launching public awareness campaigns to improve road safety.

Jeong et al. (2018): conducted a study on classifying motor vehicle crash injuries using traffic accident data from Michigan for the years 2016–2017. The research involved balancing the dataset and using two training methods, including Bootstrap Aggregation, to improve classification accuracy.Many studies use injury severity as the main indicator of accident impact, but this approach may not fully reflect how accidents affect overall traffic flow. Additionally, most studies focus only on mathematical analysis. Since traffic accidents vary by region, conclusions based on city-wide data may not be enough to develop targeted safety measures for specific areas.

Omkar Gholap et al. (2018): stated that road traffic injuries (RTIs) in India have been increasing in recent years. A Road Safety Audit (RSA) is a structured process used to evaluate the safety of existing or planned roads and intersections. This assessment is conducted by an independent review team.Road safety audits can be performed at different stages of a project, including planning, preliminary design, detailed design, and construction. They are applicable to projects of all sizes, from small rural roads to major national highways. RSAs are a proactive and cost-effective method for improving road safety.

Geethabai et al. (2016): studied road accidents in India and emphasized the need for greater public awareness on road safety. They recommended organizing nationwide safety programs, involving NGOs, private organizations,

and the government for a safer India. The government should prioritize improving road infrastructure over ineffective bans. In fatal accidents caused by potholes, compensation should be provided to victims' families, and those responsible for poor roads should be held accountable. The study found that two-wheeler riders, especially in the 21-30 age group, were the most vulnerable. Most accidents occurred in urban areas, with the rainy season contributing to 70% of incidents. A large percentage of victims (95.79%) were not wearing helmets, and fatalities were more common between 8:01 pm and midnight.

S. Sundar and Ghate (2013): supported these research findings, emphasizing that India has the highest number of road traffic-related fatalities in the world. Road accidents are the sixth leading cause of death in India, with nearly 140,000 fatalities recorded in 2012. Despite being a major public health concern, road safety has not received the attention it deserves, particularly as it disproportionately affects the most vulnerable and productive members of society, the government needs to recognize road safety as an important issue related to mobility, health, and equity. There is a need for the government to improve and implement legislation and establish the necessary institutional mechanisms to effectively promote road safety.

Arun S. Bagi et al. (2012) highlighted that a Road Safety Audit is a formal process used to assess the accident risk and safety performance of new road projects, as well as to improve, repair, and maintain existing roads. The role of the auditor is to provide impartial recommendations in writing. The designer or client reviews these recommendations and decides whether to implement the suggested safety improvements, the study focused on Bannerghatta Road (12 km), where accident data was analysed over a period of four years. The analysis included examining the geometric features of the road using V.F. Babkov's method and evaluating pedestrian safety. Accident-prone areas were identified through these detailed analyses.

M. Vaziri (2010): examined road safety in the Asia-Pacific region by analysing trends in road accidents. Data on national road accidents were collected from centralized international databases. Due to gaps and inconsistencies in the data, the study focused on 21 countries in the Asia-Pacific region, which together represent more than half of the world's population, the research used a database covering seven variables from the years 1980 and 1995. Through univariate and multivariate statistical analyses, the study identified significant patterns and relationships among these variables. Accident rates were calculated, assessed, and modelled to represent the risk and severity of road accidents.

Shami (2005): reported that over seven million Indians are affected by traffic accidents each year, ranging from minor injuries to severe accidents and fatalities. The most vulnerable road users, such as pedestrians and cyclists, are the most affected. However, traffic safety campaigns have mostly focused on ensuring smooth traffic flow and prioritizing the needs of drivers of four-wheel vehicles, the annual economic cost of traffic accidents in India is nearly 2% of the GDP, which is an unacceptably high burden. A well-informed, multi-sector approach, supported by a strong commitment to reducing traffic accidents, could lead to significant improvements in road safety.

STUDY AREA DETAILS

In this study, we will conduct a traffic flow count at Rajiv Gandhi Square, Teen Imli Square, IT Park Square, and Dewas Naka Square to analyze the traffic-related issues and propose solutions for their mitigation. These four squares were selected because they serve as key entry points to Indore, where traffic congestion is frequently observed. Initially, we had selected a total of nine major squares in the city's entry zones, but we excluded five of them as they did not show significant traffic-related issues, and some already had flyovers in place.The procedural methodology will be demonstrated using Dewas Naka Square and Teen Imli, while the results for all four intersections will be presented in the conclusion.

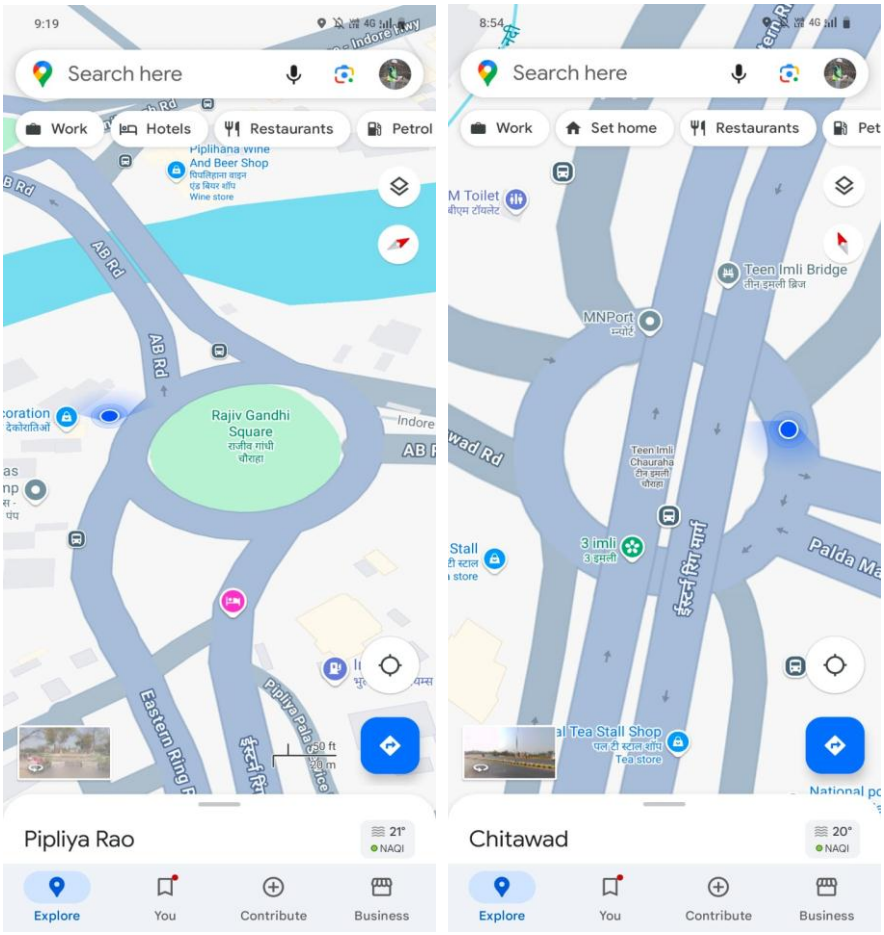

figure.2:- Location of study area.

IV. METHODOLOGY

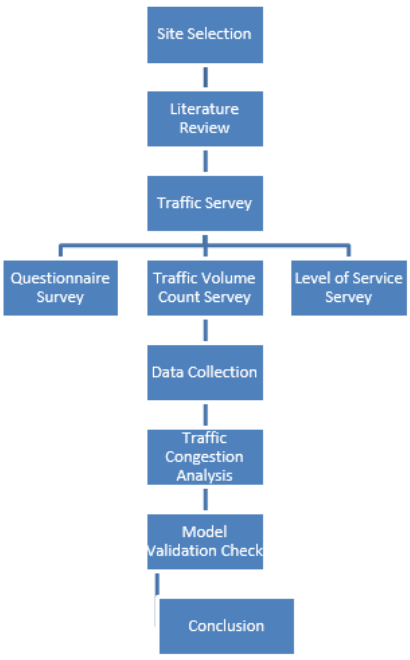

Figure3:- Flow Chart with Study Methodology

V. DATA COLLECTION AND ANALYSIS

A. Data Collection

A real-time traffic dataset was utilized to conduct both daily and weekly congestion analyses for a specific road segment. The daily analysis revealed a recurring peak congestion period. The objective of this survey is to gain insights into traffic dynamics, including average daily traffic, traffic composition, peak hour traffic, and directional distribution at designated survey points.

Based on the data analysis, peak hour timings were identified for the observed road stretch. Due to certain limitations, data collection was carried out specifically during peak hours (9:00 AM to 11:00 AM and 6:00 PM to 8:00 PM).

Traffic vehicles were categorized into seven groups based on their dimensions: car/van/jeep, two-wheeler, three-wheeler, bus, light commercial vehicle (LCV), truck, and bicycle. Figure 4 presents the traffic volume at Dewas Naka during both morning and evening peak hours, while Figure 5 illustrates the traffic at Teen Imli during the same time periods. These figures help in understanding which category of vehicles was most prevalent and how the traffic was distributed.

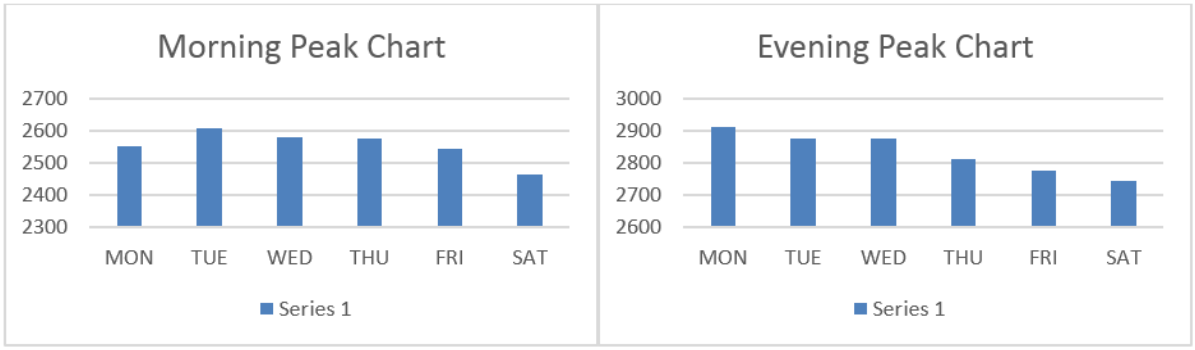

Fig 4: -Morning/Evening peak hour at Dewas Naka square

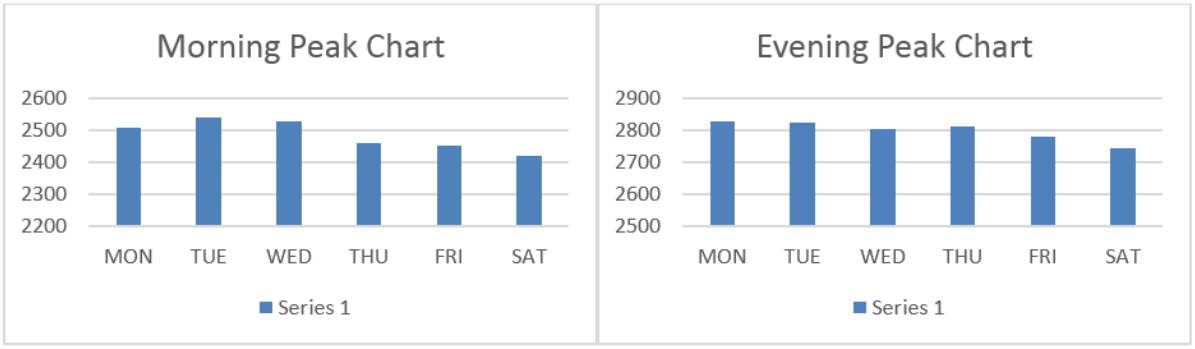

Fig 5: -Morning/Evening peak hour at Teen Imli square

B. Data Analysis

1) Vehicle Composition Vehicle classification is performed to understand the composition of traffic, using PCU (passenger car unit) values from guidelines like IRC 106: 1990.This allows for conversion of various vehicle types into equivalent passenger cars to better understand their impact on the road.

Vehicles Compositions							
Dewas Naka Square							
In/Out							
Car/Jeep/Van	Auto	Two-Wheeler	HCV	Bus	LCV	Cycles	Others
27%	5.63%	57.19%	4.93%	3.25%	1.00%	1.00%	0%

Vehicles Compositions							
Teen Imli Square							
In/Out							
Car/Jeep/Van	Auto	Two-Wheeler	HCV	Bus	LCV	Cycles	Others
23.42%	2.5%	61.70%	2.78%	5.3%	2.3%	1.00%	1%

2) Hourly vehicle traffic

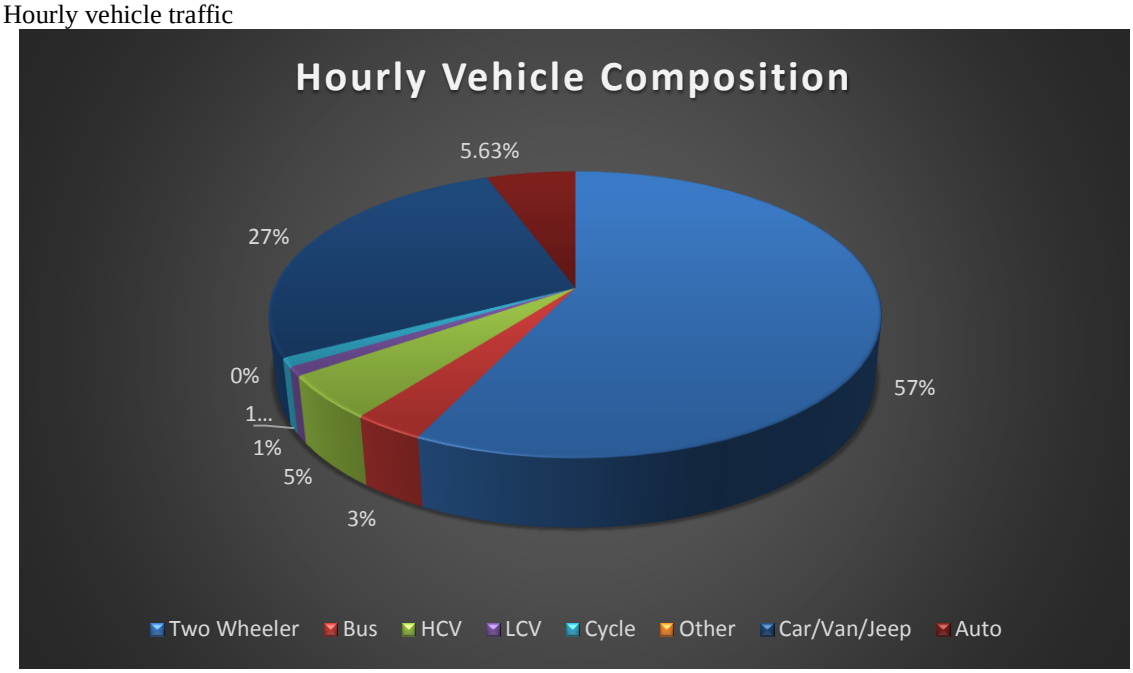

Figure6: - Hourly vehicle traffic at Dewas Naka Square

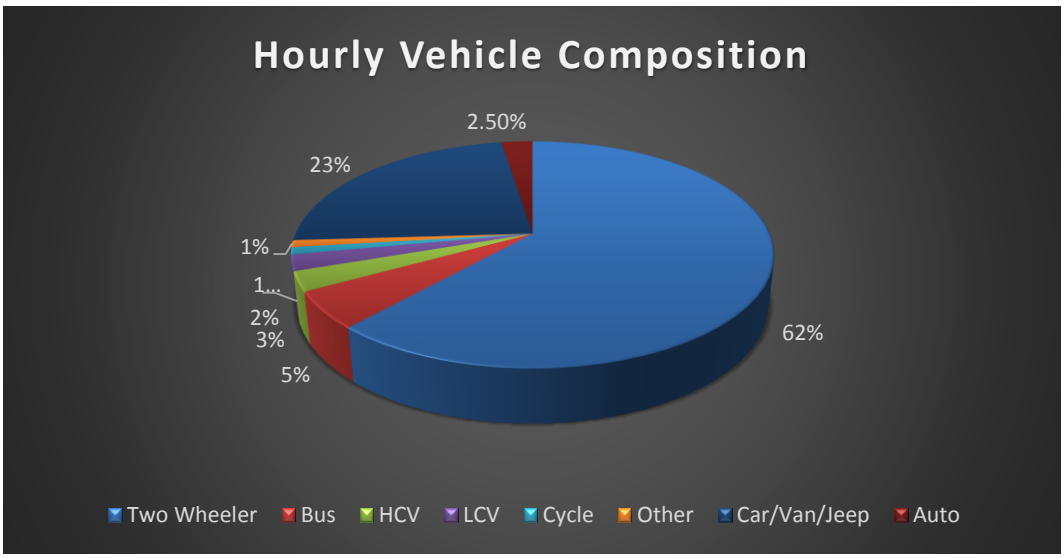

Figure7: - Hourly vehicle traffic at Teen Imli Square

3) Volume variation of vehicles

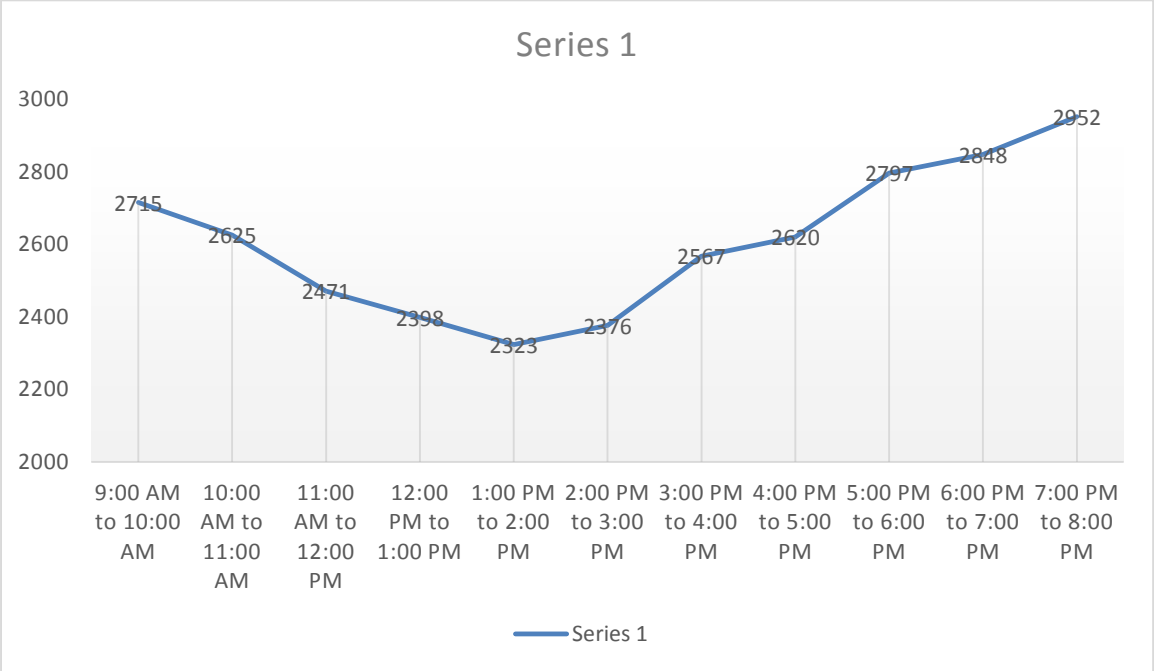

Figure: -8 Volume variation of vehicle in Dewas Naka Square

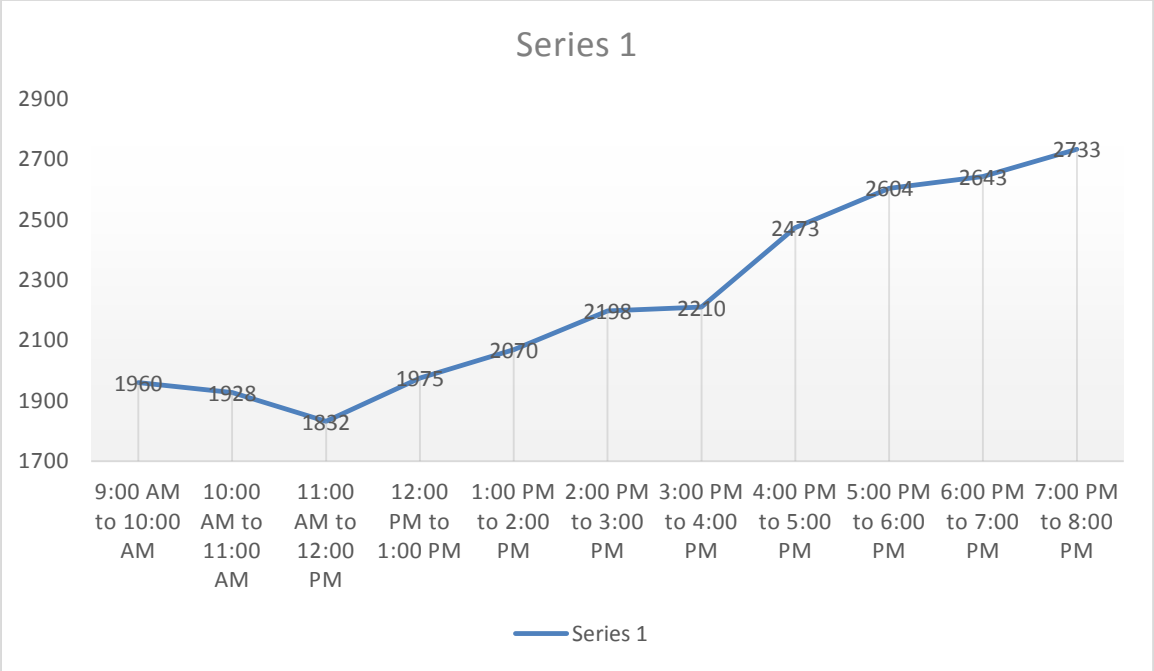

Figure: -9 Volume variation of vehicle in Teen Imli Square

4) Capacity and the level of service of each road section

Location	Direction	Time	PCU/Hr.	Width of Road as per IRC	Design Service Volume @PCU/Hr	V/C	LOS
Dewas Naka	Satya Sai Square, Niranjanpur,	Morning Peak Hr. 9:00 AM to 10:00 AM	2770	3.5m	2400	1.11	F

		Evening Peak Hr. 6:00PM to 8:00PM	2933	3.5m	2400	1.20	F

Location	Direction	Time	PCU/Hr.	Width of Road as per IRC	Design Service Volume @PCU/Hr	V/C	LOS
Teen Imli	Navlakha Square, Musakhedi Square, IT Park Square	Morning Peak Hr. 9:00 AM to 10:00 AM	1944	3.5m	2400	0.81	E
		Evening Peak Hr. 6:30 AM to 7:30 AM	2688	3.5m	2400	1.12	F

VII. CONCLUSION

1)Vehicle composition

From the survey we can see that at Dewas Naka, the primary cause of heavy traffic is the influx of buses coming from the Dewas side, along with the presence of unnecessary small and large trucks. Despite having a flyover at Teen Imli, traffic congestion occurs due to government and private buses, as well as auto-rickshaws being parked along the roadside, which narrows the road. Additionally, the absence of a traffic signal further contributes to the issue. At IT Park, traffic congestion is mainly caused by a high volume of cars and buses. Similarly, at Rajiv Gandhi Square, the lack of a traffic signal, street vendors, roadside stalls, and buses being parked on the road are the key reasons for traffic problems.

2)Survey data of traffic

In this section shows levels of traffic throughout the day, with peaks during the 7:00AM to 8:00 PM time slot at all square Dewas Naka, TeenImli, IT- Park and Rajiv Gandhi Square

- The total PCU of vehicles recorded at **Dewas Naka Square** during the daytime was 2,670, while at night, it was 2,900. The Volume-to-Capacity (V/C) ratio for the daytime was calculated as 1.15, resulting in a Level of Service (LOS) of F. Similarly, the V/C ratio for the nighttime was 1.22, also corresponding to a Level of Service (LOS) of F.
- The total PCU of vehicles recorded at **Teen Imli Square** during the daytime was 1,944, while at night, it was 2,688. The Volume-to-Capacity (V/C) ratio for the daytime was calculated as 0.81, resulting in a Level of Service (LOS) of E. Similarly, the V/C ratio for the nighttime was 1.12, also corresponding to a Level of Service (LOS) of F.
- The total PCU of vehicles recorded at **IT Park Square** during the daytime was 2,340, while at night, it was 2,472. The Volume-to-Capacity (V/C) ratio for the daytime was calculated as 0.97, resulting in a Level of Service (LOS) of E. Similarly, the V/C ratio for the nighttime was 1.03, also corresponding to a Level of Service (LOS) of F.
- The total PCU of vehicles recorded at **Rajiv Gandhi Square** during the daytime was 2,542, while at night, it was 2,830. The Volume-to-Capacity (V/C) ratio for the daytime was calculated as 1.05, resulting in a Level of Service (LOS) of F. Similarly, the V/C ratio for the nighttime was 1.17, also corresponding to a Level of Service (LOS) of F.

3) Hourly share of vehicles

The survey indicates that the data is gathered between 9AM and8PM with the 6 PM to 7 PM time slot seeing the most vehicles closely followed by the 7 to 8PM time slot. Thorough the day, two-wheeler predominate in traffic, with evening rush hours seeing the highest concentration of these vehicles.

Recommendations

a) Flyovers or underpasses: Construct flyovers or underpasses at Rajiv Gandhi Square, Dewas Naka, and IT Park. Additionally, build another flyover or underpass at Teen Imli, connecting the RTO Road direction to the Navlakha Road direction.

b) Public Transportation: Expand the BRTS and metro networks to cover all squares, encouraging people to use public transportation instead of relying on cars and bikes.

c) Rope way systems: Explore elevated rope way solutions for specific high-traffic zones where road expansion isn't suitable.

d) Dedicated Parking Zones: Develop structured parking areas to reduce on street parking.

e) Pedestrian Facilities: Build footpaths and dedicated pedestrian crossing to separate pedestrian traffic from vehicular flow.

f) The size of the center island in the IT park should be reduced.
g) The left turns at Dewas Naka should be widened so that the congested traffic can flow more smoothly.

References

[1]. Gupta, A., & Goliya, H. S. (2020). Road accident analysis on state highway–18 "A case study from Dewas to Bhopal". International Journal of Scientific & Engineering Research, 11(3), 26-37.
[2]. Iqbal, A., Rehman, Z. U., Ali, S., Ullah, K., & Ghani, U. (2020). Road traffic accident analysis and identification of black spot locations on highway. Civil Engineering Journal, 6(12), 2448-2456.
[3]. Jeong, H., Jang, Y., Bowman, P. J., & Masoud, N. (2018). Classification of motor vehicle crash injury severity: A hybrid approach data. Accident Prevention, 120, for imbalanced Analysis & 250-261.
[4]. Omkar, G., Nikita, S., Vaishnavi, S., Navnath, N., Kuldeepak, D., & Ashutosh, K. (2018). Road Safety Audit. International Journal of Engineering Research & Technology, 7.
[5]. Pai, S. (2016). A literature study on road accidents statistics and reasoning. International Innovative Journal Technology Research, 4(6), of and 4979-4984.
[6]. Malik, F., & Jabbar, S. F. S. F. F. R. M. (2017). Road accidents and prevention. International Journal of Engineering Development Research, 5(2), and 40-46.
[7]. Sundar, S., & Ghate, A. T. (2013). Accidents and road safety: Not high on the government's agenda. Economic and Political Weekly, 77-83.
[8]. Bagi, A. S., & Kumar, D. N. (2012). Road safety audit. IOSR Journal of Mechanical and Civil Engineering, 1(6), 1-8.
[9]. Shad, R., & Rahimi, S. (2017). Identification of road crash black-sites using geographical system. International Traffic and information Journal for Transport Engineering, 7(3), 368-380.
[10]. Shami, S. (2005). Road traffic safety: Cost of government neglect. Economic and Political Weekly, 1598-1602. https://www.jstor.org/stable/4416498