A COMPREHENSIVE STUDY ON IDENTIFYING VARIOUS TRENDS AND PATTERNS OF ROAD ACCIDENTS IN DHAKA CITY

A THESIS SUBMITTED BY

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APPROVAL

Our thesis project titled as “A comprehensive study on identifying various trends and patterns of road accidents in Dhaka city” submitted by Masrhid Monir Khan and Jafrin Rahman Nahin have been acknowledged as the fulfilment of the degree of, Bachelor of Science in Civil and Environmental Technology Engineering.

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DECLARATION

This is stated that this thesis or project report, in whole or in part, has never been submitted for consideration for a degree or diploma from another institution.

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DEDICATION

We wholeheartedly express our gratefulness to our family and teachers for their eternal help and support for us.

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We are incredibly grateful to Almighty Allah for His grace in helping us accomplish our research objectives. We offer our sincere appreciation to Allah, the Most Benevolent and Kind.

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ABSTRACT

This research offers a detailed investigation of traffic accident data, with an emphasis on finding important patterns and trends pertaining to vehicle type, age, gender, and temporal variables. Data from 10,000 accidents between July and December 2023 was analyzed using both manual observation and hypothesis testing techniques. An initial overview of accident patterns can be derived by the manual analysis which includes investigation of data through excel analysis, however for rigorous and more clear analysis require hypothesis testing as manual analysis is often subjected to bias and error. Therefore, deeper insights and significant relationships between variables were analyzed by hypothesis testing, which included chi-square tests and regression analyses. Important conclusions from hypothesis tests are the identification of buses and motorbikes as high-risk vehicles; furthermore, substantial connections were found between vehicle type, age groups, gender distribution, and accident frequency. With the use of the hypothesis tests, these patterns were more statistically validated and supported recommendations for initiatives aimed at improving road safety. This study underscores the need for targeted safety measures on streets, particularly focusing on high-risk demographics and vehicle types, to improve traffic safety in Dhaka.

CHAPTER 1: Background of the study

Road accidents in Bangladesh have emerged as a major threat to public health and safety. Numerous causes, such as increasing urbanization, a rising number of vehicles, poor road infrastructure, and insufficient road safety measures, are some of the key factors in the rise of road accidents.

Bangladesh has a high risk of road traffic crash-related morbidity and death that is steadily increasing (RTCs). In spite of this, comprehensive post-crash treatment is hardly ever available. The rate of RTC mortality in Bangladesh is 15.3% per 100,000 people. When it comes to moderate to severe injuries, cyclists, motorcyclists, and pedestrians are the most susceptible categories to die. 81% of motorbikes victims do not tend to use any safety equipment. 1844 person on average each day experience various levels of damage due to traffic accidents and 29 people acquire irreversible physical disabilities (Bushra Zarin Islam, 2023). These current issues are likely obstructing the achievement of the Sustainable Development Goals by 203.

In spite of numerous appeals, promises, and declarations to reduce traffic fatalities as well as initiatives to improve traffic safety, 6,261 traffic accidents resulted in 7,902 deaths nationwide in 2016. At least 6,749 traffic accidents in 2022 resulted in 9,951 fatalities and 12,356 injuries. Bangladesh's economy is severely impacted by the yearly traffic accidents. It is possible for the expenses associated with traffic accidents to reach 5.1% of GDP. (Report: Bangladesh saw 7,902 road fatalities last year, 2024)

There has been a distressing increase in the number of road accidents in Bangladesh lately. Data from BRTA (Bangladesh Road Transport Authority), indicate that the number of accidents has been steadily rising. The high accident rates are a result of the incompetently maintained traffic system and congested roadways, especially in urban regions like Dhaka and Chittagong. Unpredictable driving behavior, inadequate signs, and bad road conditions make the issue worse. Public buses and motor bikes comprise a large number of traffic incidents. Road safety issue is further exacerbated by the general disregard for safety measures and the lack of enforcement of

traffic laws. At least 5024 lives were lost due to road accidents in 2023. The BRTA report indicated that road accidents in 2023 resulted in over 3,500 deaths and approximately 12,500 injuries.

Aside from the significant impact on people's lives and the country's healthcare system, road accidents have a significant impact on various aspects of the economy. The costs associated with property damage, including vehicle repairs and damage to public infrastructure, further contribute to the economic impact. Traffic accidents cost 1.5% of Bangladesh's GDP per year. This covers both direct and indirect costs, such as lost revenue and productivity as well as medical bills and property damage (Bank). Furthermore, a consequential loss of productivity in the labor force is also a crisis that is induced from accidents and casualties. Because of the deaths and serious injuries caused by traffic accidents, there is a huge loss of production. The long-term disabilities that survivors frequently experience limit their capacity to work, which lowers their income and lowers economic production.

1.1 Problem statement

The growing number of traffic accidents in Bangladesh highlights the urgent need for methodical research to improve road safety. Because data is scattered and insufficient, there is now a considerable gap in understanding accident trends. This makes it more difficult to create focused initiatives that effectively lower accident rates. Bangladesh faces significant challenges in maintaining a comprehensive road accident database, which hampers effective road safety measures. Since data collection depends on sporadic police reports and fragmented data types, BRTA's data collection is frequently insufficient and lacks thorough categorization. Thus, it is evident that there is a study gap in identifying the causes and triggers of traffic accidents. The lack of an extensive database also restricts research and evidence-based solutions, as is mentioned. These problems highlight the critical requirement for a strong, centralized accident database in order to improve data quality and facilitate efficient traffic safety initiatives.

1.2 Objective

This research is primarily driven by two key objectives.

Identifying accident trends and influencing factor:

Even while the number of traffic incidents is rising, there is still a big gap in our understanding of the underlying patterns and causes. It is challenging to identify trends such as common accident types, common accident hotspots, and common contributing factors since there is a dearth of information and analytical tools. As a result, stablishing targeted inventions and preventive measures that could successfully reduce the frequency of accidents becomes more challenging. This study attempts to identify these trends by examining accident data, which includes chronological, geographical, and situational elements. This will make it possible to develop evidence-based plans and regulations to improve traffic safety and lower accident rates. Comprehending and recognizing these trends is essential for putting particular policies into action, such as better road construction, better traffic control, and focused public education campaigns.

Creating a comprehensive accident database:

Attempts to systematically track and assess accident-inducing elements, such as vehicle types, gender, age, road conditions, and environmental conditions, are hindered by the lack of a comprehensive accident database. The absence of a structured data repository makes it more difficult to carry out in-depth analysis and produce useful insights. In order to solve this issue, the thesis creates an extensive accident database that includes a variety of pertinent variables.

1.3 Scope of study

This study's focus is on finding patterns and contributing variables for traffic accidents in Dhaka, a megacity that is expanding quickly. It would examine information gathered from a renowned orthopedic hospital located at the center of Dhaka city. The data we have collected are registered between July 2023 and December 2023, with a particular emphasis on about 10,000 accident cases. Examining accident trends, causative variables, and their effects on traffic safety are the goals of

the study. The study's geographic scope is restricted to Dhaka and its environs, with a particular focus on hospital data to provide insight into the effects on emergency services and healthcare systems. The results will guide the development of strategies to improve urban road safety.

CHAPTER 2: Methodology

The methodology for identifying accident patterns and trends from accident data involves a comprehensive and multi-faceted method. This method includes fieldwork, data collecting, statistical analysis, testing of hypotheses, and literature evaluation. Every element is intended to methodically address the study goals and advance our comprehension of accident trends. A thorough explanation of the process is provided below:

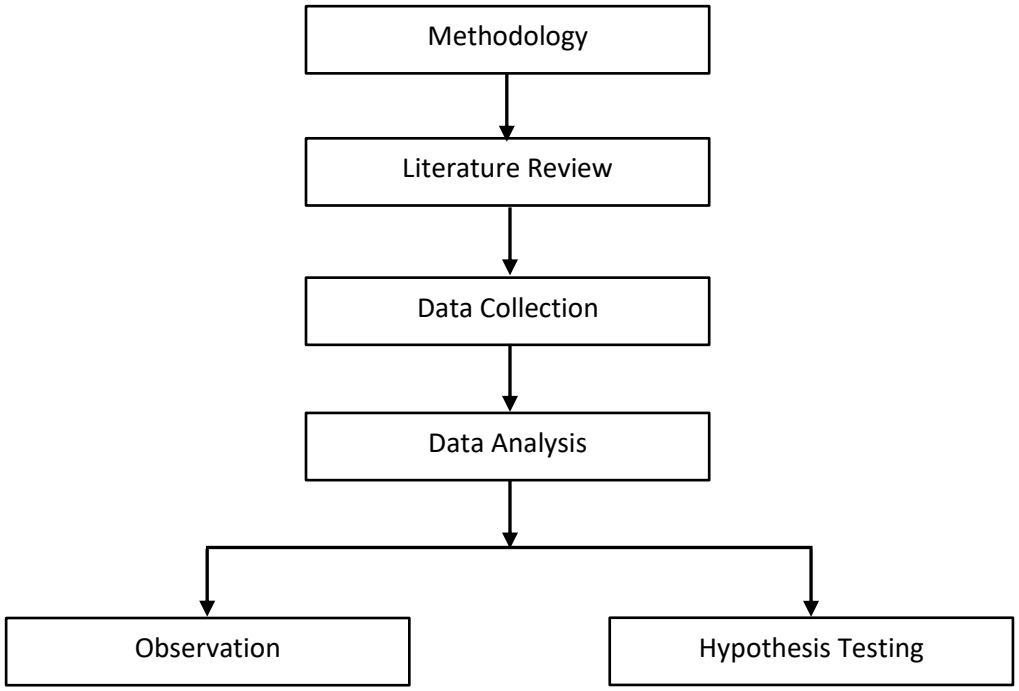

Figure 1: Methodology chart

- Literature review:

This includes reviewing the body of research on accident trends, patterns, and data analysis methods in great detail. This also includes scholarly publications, books, and pertinent articles to comprehend theoretical frameworks, find gaps in the field's existing knowledge, and lay the groundwork for the investigation.

- Data collection:

Hospital Visits: Arranging and carrying out visits to several hospitals in order to obtain knowledge about data management and emergency care procedures was a key part of this methodology. This further includes talking to medical experts to learn how accident information is logged and handled.

Gathering Primary Data from Hospital Emergency Wards: Data collection process primarily included gathering accident records from hospital emergency rooms. This entails acquiring anonymised accident-related patient records, which provide details on the nature, extent, and treatment results of the accidents.

- Data analysis:

This included systematically organizing the collected data for analysis, ensuring accuracy and consistency. This further involves coding, cleaning, and preparing the data for statistical analysis.

Hypothesis testing:

Several hypothesis tests were used to thoroughly assess accident patterns and trends. As an example, p-test was conducted to know the significance of variations in accident-related variables between groups or conditions. Independent t-test was conducted for making a comparison between groups, and paired samples t-test was conducted to observe the mean changes over time within same sets of variables. Chi-square test can be used to look into correlations between categorical variables. For example, we'll see if accident kinds have a relationship with particular demographic

traits. To compare means across several groups, such as assessing differences in accident severity by location or time of day, ANOVA (Analysis of Variance) will be utilized.

CHAPTER 3: Literature review

Our literature review synthesizes current research on road accident patterns in Dhaka, focusing on accident prevalence, contributing factors, and the effectiveness of existing interventions.

Between 2016 and 2020, the majority of road accidents in Dhaka were classified as fatal, comprising 70.21% of the total accidents, followed by grievous accidents at 22.57%, simple accidents at 3.91%, and collisions at 3.32%. This data highlights a notably high fatality rate in the city. Analysis of accident data revealed that Tuesday recorded the highest number of incidents, with a total of 208 accidents occurring on this day. Additionally, a significant proportion of accidents, totaling 50.07% (679), occurred at non-junction areas, indicating that reckless driving on roadways away from intersections is a major contributing factor to the high accident rates. (Md Sifat Bin Siraj, 2021)

The number of accidents in Dhaka has been decreasing by more than 10% annually. Analysis of accident data reveals that 63% of these incidents occurred in areas without traffic control measures. Furthermore, 73% of the accidents took place on divided roadways or in locations where only one-way traffic movement was permitted. Additionally, a significant majority, 97%, of the accidents occurred on straight road sections. This data highlights key areas for potential intervention, including the need for improved traffic control and enhanced road design to mitigate accidents. (I Ahmed, 2014)

Every year, there are 11% fewer traffic incidents in Dhaka overall. Accidents resulting in injuries have increased while fatal accidents and auto collisions have decreased. With 69% of road accidents resulting in fatalities and 60% involving pedestrians, the majority of these incidents are marked by high mortality rates. Moreover, 54% of these mishaps take place during the day. This pattern indicates a change in the dynamics of accidents and emphasizes the necessity for focused

interventions to deal with the rise in events involving injuries and pedestrian involvement (I Ahmed, 2014)

CHAPTER 4: Scope of study

In order to better understand the trends and contributing factors of traffic accidents in Dhaka City, this study will specifically look at the demographics, risk factors, and important trends that are linked to these incidents. We will be examining data from July 2023 to December 2023, which includes about 10,000 accident cases from a top orthopedic hospital in Dhaka. The research is restricted to Dhaka City geographically and focuses on data collected from emergency ward. The findings will assist in formulating plans of action and regulations targeted at lowering accident rates.

CHAPTER 5: Data Collection

We collected data from the emergency ward of NITOR. The timeline of gathering data was July 2023 to December 2023.

DAY	TOTAL ROAD ACCIDENT	DAY	TOTAL ROAD ACCIDENT	DAY	TOTAL ROAD ACCIDENT	DAY	TOTAL ROAD ACCIDENT	DAY	TOTAL ROAD ACCIDENT	DAY	TOTAL ROAD ACCIDENT
1-Jul	38	1-Aug	48	1-Sep	40	1-Oct	50	1-Nov	15	1-Dec	48
2-Jul	47	2-Aug	24	2-Sep	37	2-Oct	34	2-Nov	21	2-Dec	49
3-Jul	55	3-Aug	29	3-Sep	38	3-Oct	29	3-Nov	43	3-Dec	26
4-Jul	47	4-Aug	48	4-Sep	35	4-Oct	30	4-Nov	35	4-Dec	49
5-Jul	54	5-Aug	41	5-Sep	40	5-Oct	30	5-Nov	38	5-Dec	40
6-Jul	37	6-Aug	41	6-Sep	42	6-Oct	32	6-Nov	18	6-Dec	28
7-Jul	28	7-Aug	28	7-Sep	35	7-Oct	37	7-Nov	47	7-Dec	30
8-Jul	45	8-Aug	32	8-Sep	39	8-Oct	32	8-Nov	45	8-Dec	33
9-Jul	28	9-Aug	34	9-Sep	38	9-Oct	35	9-Nov	40	9-Dec	40
10-Jul	43	10-Aug	27	10-Sep	40	10-Oct	40	10-Nov	44	10-Dec	88
11-Jul	41	11-Aug	38	11-Sep	34	11-Oct	42	11-Nov	30	11-Dec	35
12-Jul	35	12-Aug	33	12-Sep	30	12-Oct	42	12-Nov	45	12-Dec	36
13-Jul	45	13-Aug	30	13-Sep	38	13-Oct	40	13-Nov	37	13-Dec	43
14-Jul	40	14-Aug	40	14-Sep	43	14-Oct	41	14-Nov	41	14-Dec	43
15-Jul	40	15-Aug	31	15-Sep	56	15-Oct	28	15-Nov	20	15-Dec	53
16-Jul	44	16-Aug	40	16-Sep	36	16-Oct	41	16-Nov	26	16-Dec	52
17-Jul	47	17-Aug	38	17-Sep	58	17-Oct	27	17-Nov	28	17-Dec	53
18-Jul	38	18-Aug	51	18-Sep	57	18-Oct	35	18-Nov	44	18-Dec	42
19-Jul	33	19-Aug	32	19-Sep	40	19-Oct	50	19-Nov	47	19-Dec	48
20-Jul	44	20-Aug	33	20-Sep	34	20-Oct	50	20-Nov	30	20-Dec	30
21-Jul	35	21-Aug	40	21-Sep	32	21-Oct	33	21-Nov	28	21-Dec	47
22-Jul	42	22-Aug	32	22-Sep	41	22-Oct	54	22-Nov	26	22-Dec	42
23-Jul	45	23-Aug	39	23-Sep	34	23-Oct	38	23-Nov	45	23-Dec	39
24-Jul	48	24-Aug	38	24-Sep	33	24-Oct	46	24-Nov	44	24-Dec	46
25-Jul	32	25-Aug	35	25-Sep	33	25-Oct	50	25-Nov	37	25-Dec	46
26-Jul	37	26-Aug	23	26-Sep	40	26-Oct	32	26-Nov	35	26-Dec	40
27-Jul	38	27-Aug	38	27-Sep	34	27-Oct	47	27-Nov	33	27-Dec	34
28-Jul	44	28-Aug	30	28-Sep	43	28-Oct	24	28-Nov	33	28-Dec	32
29-Jul	37	29-Aug	28	29-Sep	31	29-Oct	26	29-Nov	29	29-Dec	47
30-Jul	41	30-Aug	39	30-Sep	35	30-Oct	54	30-Nov	50	30-Dec	37
31-Jul	40	31-Aug	55			31-Oct	45			31-Dec	38

Table 1: RTA report from July to December 2023

The accidents were categorized according to vehicle type. This categorization can help to rigorous analysis of research that can help us to identify accident pattern.

		MOTOR BIKE			RICKSHAW			CNG			CAR			BUS					
DATE	DAY	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	TOTAL MALE	TOTAL FEMALE	TOTAL
1-Nov	WEDNESDAY	11	0	11	0	0	0	0	0	0	1	2	3	1	0	1	13	2	15
2-Nov	THURSDAY	6	0	6	0	0	0	1	0	1	1	0	1	2	0	2	10	0	10
3-Nov	FRIDAY	14	0	14	3	1	4	3	2	5	1	0	1	1	1	2	22	4	26
4-Nov	SATURDAY	13	0	13	2	0	2	3	0	3	1	1	2	11	1	12	30	2	32
5-Nov	SUNDAY	3	0	3	0	0	0	1	1	2	0	0	0	0	0	0	4	1	5
6-Nov	MONDAY	4	0	4	1	0	1	0	2	2	2	0	2	0	0	0	7	2	9
7-Nov	TUESDAY	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0	1	1	2
8-Nov	WEDNESDAY	10	0	10	4	3	7	5	5	10	0	2	2	0	0	0	19	10	29
9-Nov	THURSDAY	11	1	12	3	2	5	9	0	9	5	0	5	4	1	5	32	4	36
10-Nov	FRIDAY	20	2	22	3	1	4	9	1	10	4	0	4	7	4	11	43	8	51
11-Nov	SATURDAY	20	4	24	3	1	4	5	1	6	2	1	3	8	2	10	38	9	47
12-Nov	SUNDAY	9	1	10	3	1	4	3	1	4	0	0	0	1	0	1	16	3	19
13-Nov	MONDAY	24	0	24	3	3	6	2	0	2	2	0	2	3	2	5	34	5	39
14-Nov	TUESDAY	6	0	6	2	1	3	2	0	2	0	1	1	10	1	11	20	3	23
15-Nov	WEDNESDAY	10	1	11	0	0	0	1	2	3	1	1	2	3	1	4	15	5	20
16-Nov	THURSDAY	16	0	16	1	0	1	3	0	3	1	0	1	1	0	1	22	0	22
17-Nov	FRIDAY	13	1	14	0	0	0	2	2	4	0	1	1	0	0	0	15	4	19
18-Nov	SATURDAY	7	0	7	2	0	2	5	1	6	1	0	1	6	2	8	21	3	24
19-Nov	SUNDAY	6	1	7	1	0	1	2	0	2	0	0	0	6	3	9	15	4	19
20-Nov	MONDAY	15	1	16	3	1	4	5	0	5	1	0	1	4	1	5	28	3	31
21-Nov	TUESDAY	4	1	5	0	0	0	0	0	0	0	0	0	5	0	5	9	1	10
22-Nov	WEDNESDAY	18	2	20	3	0	3	1	0	1	1	0	1	2	2	4	25	4	29
23-Nov	THURSDAY	6	1	7	1	0	1	0	1	1	0	0	0	3	1	4	10	3	13
24-Nov	FRIDAY	3	1	4	0	2	2	5	3	8	0	0	0	0	0	0	8	6	14
25-Nov	SATURDAY	13	0	13	0	0	0	3	0	3	1	0	1	2	0	2	19	0	19
26-Nov	SUNDAY	15	0	15	0	1	1	1	2	3	1	1	2	0	1	1	17	5	22
27-Nov	MONDAY	7	0	7	1	0	1	0	0	0	4	0	4	1	0	1	13	0	13
28-Nov	TUESDAY	2	0	2	0	1	1	1	0	1	1	0	1	1	0	1	5	1	6
29-Nov	WEDNESDAY	3	0	3	0	0	0	1	0	1	3	1	4	2	0	2	9	1	10
30-Nov	THURSDAY	11	0	11	5	0	5	1	0	1	0	0	0	5	3	8	22	3	25

Table 2: RTA data categorization according to vehicle type

CHAPTER 6: Data Analysis

6.1 Observations

6.1.1 Accident data in relation to vehicle type

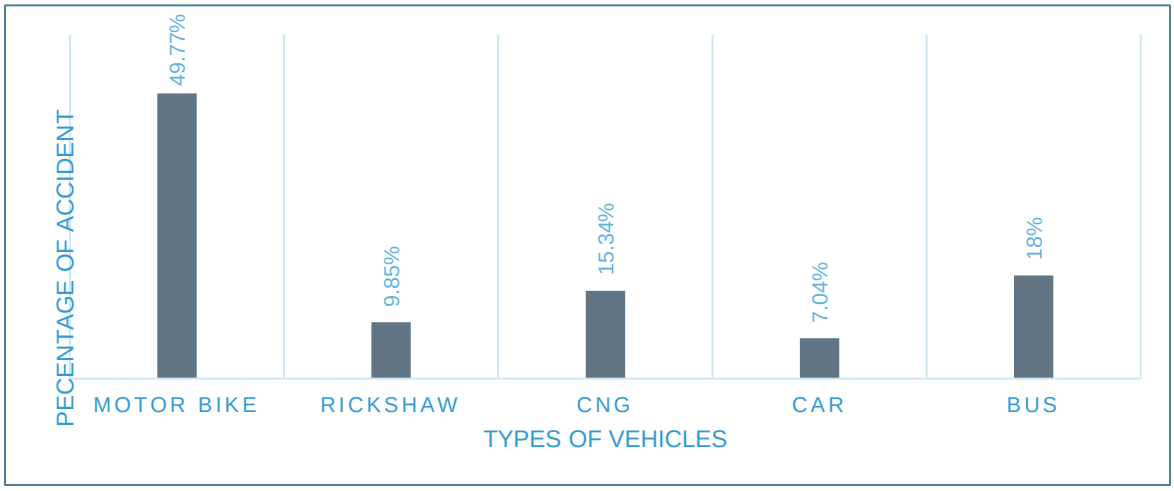

Figure 2: Accident relation according to vehicle type

Findings: The graph on this slide highlights accidents based on the type of vehicle involved. According to this, motorbikes is the dominant vehicle type, contributing to almost half of the accidents (49.77%). This is followed by buses (18%), CNG vehicles (15.34%), and rickshaws (9.85%), with cars being the least involved (7.04%).

Interpretation: Due to issues including low visibility, lack of safety, and possibly reckless driving, two-wheelers are particularly susceptible on the highways, as suggested by the high proportion of motorbike accidents. Due to their widespread use in public transportation and the difficulties of navigating big vehicles in crowded urban locations, buses are also responsible for a sizable percentage of accidents. Cars and rickshaws have lower accident rates than motorbikes or buses, maybe because they are less common.

6.1.2 Accident data in relation to gender type (FEMALE)

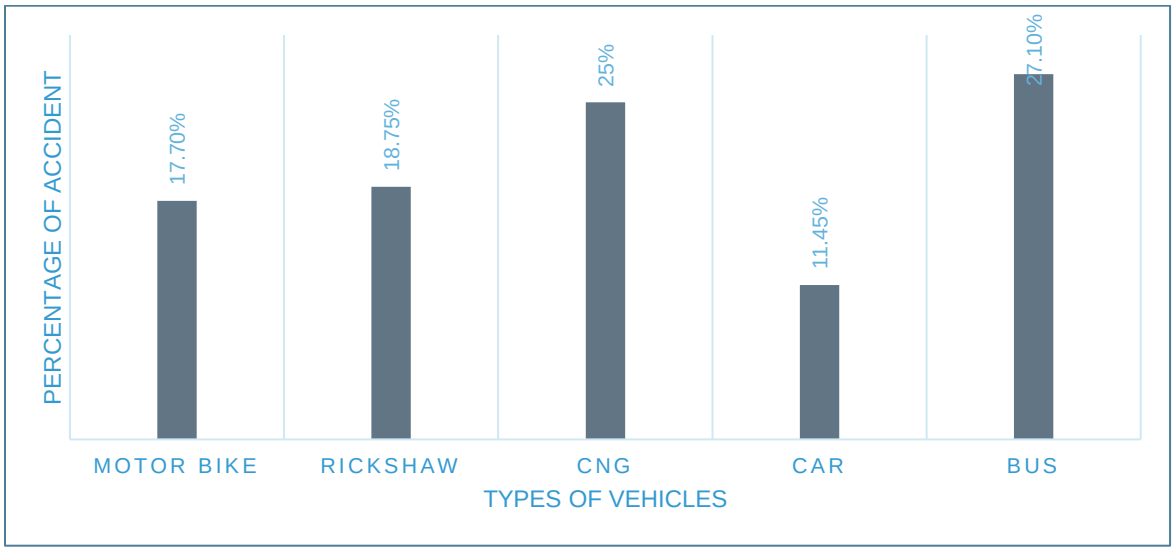

Figure 3: Accident relation according to gender (Female)

Key Findings: This slide shows that the bulk of accidents involving female casualties (27.10%) occur on public buses. Next in order of popularity are CNG vehicles (25%), motorbikes (17.70%), cars (11.45%), and rickshaws (18.75%).

Interpretation: The prevalence of female-related bus accidents implies that women are more likely to suffer injuries when riding public transportation. The high number of CNG-related accidents and rickshaw-related accidents may be related to the fact that both vehicles are frequently used for short-distance trips, particularly in cities. This information emphasizes how crucial it is to strengthen security protocols for public transportation, especially for female riders.

6.1.3 Accident data in relation to gender (MALE)

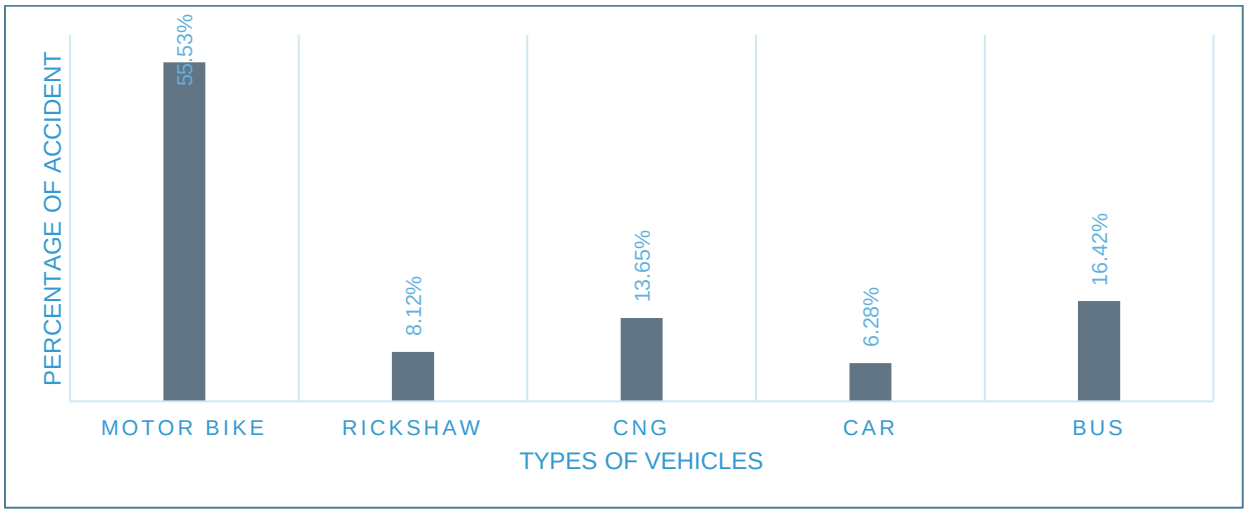

Figure 4: Accident relation according to gender (Male)

Key Findings: Males are predominantly involved in motorbike accidents (55.53%), followed by buses (16.42%), CNG vehicles (13.65%), rickshaws (8.12%), and cars (6.28%).

Interpretation: The stark difference in male accident patterns compared to females underscores the risk associated with motorbike use. Males, more frequently the drivers of two-wheelers, face greater danger on the roads. The percentage of male involvement in bus accidents is also notable, indicating that public transport poses a risk across genders but in different capacities (drivers vs. passengers). This data suggests a need for targeted road safety campaigns focused on male drivers, particularly those who operate motorbikes.

6.1.4 Accident data in relation to weekdays vs weekends

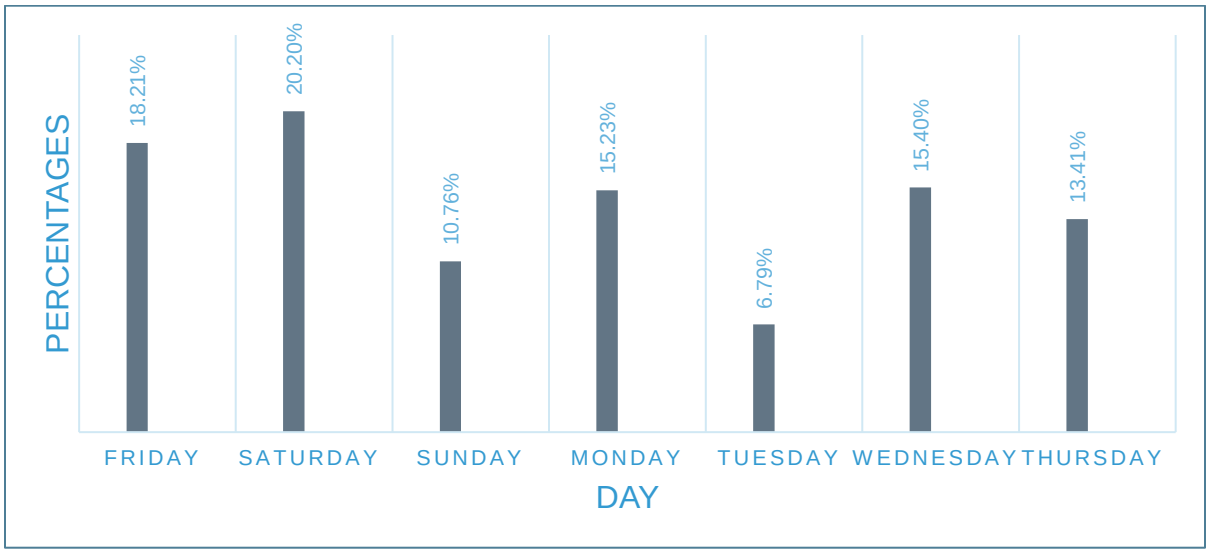

Figure 5: Accident relation according to week days

Key findings: The weekly distribution of accidents shows that Saturdays have the greatest accident rate (20.20%) and Sundays have the lowest (10.76%). There are also higher accident rates on Fridays and Mondays rather than other days of the week (18.21% and 15.23%, respectively). **Interpretation:** Accidents tend to increase during the weekends, particularly on Saturdays, probably as a result of more people traveling for social and recreational purposes. This pattern might be the result of both increased use of the roads and potentially riskier driving practices related to weekend activities. The rush of the start of the workweek may be the reason for the higher accident rates on Mondays, while less traffic may be the reason for the lower rates on Sundays.

6.1.5 Accident pattern in relation to age demographic

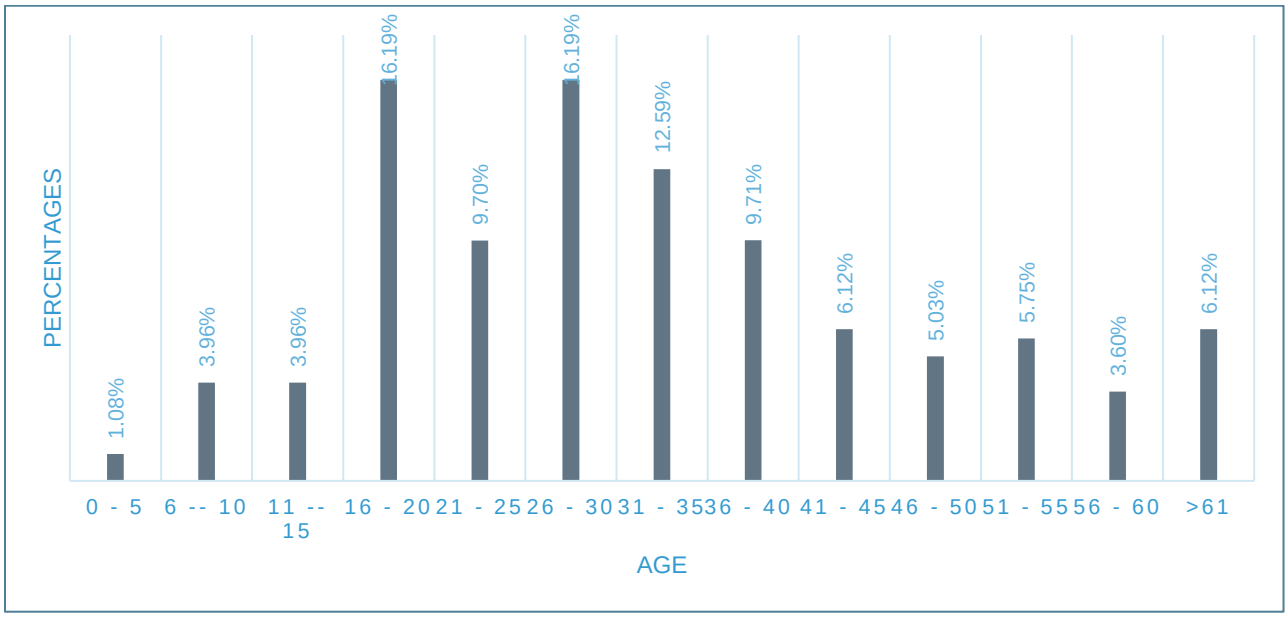

Figure 6: Accident relation according to age

Key Findings: Accidents are most common in the 16-20 and 26-30 age groups, each accounting for 16.19% of the total. Other prominent groups include 31-35 (12.59%) and 21-25 (9.70%).

Interpretation: Younger drivers, particularly those in the 16-20 age range, are more prone to accidents, which could be linked to inexperience, risk-taking behavior, or distracted driving. The spike in accidents for the 26-30 age group might be due to increased commuting and frequent road use for professional or family purposes. These insights point to the need for targeted road safety campaigns focusing on younger drivers and commuters in these age brackets.

6.1.6 Accident pattern according to weather

After collecting the weather data, we have found that in August and September Dhaka city had faced the highest number of rainfall between July to December.
(https://www.timeanddate.com/weather/bangladesh/dhaka/historic)

August		
	No. of Accidents	Total Days
Rainy Day	363	11
Normal Day	752	20

September		
	No. of Accidents	Total Days
Rainy Day	339	9
Normal Day	827	21

August-September			
	No. of Accidents	Total Days	Average
Rainy Day	702	20	35
Normal Day	1579	41	39

Figure 7: Accident relation according to weather

Key insight: Road accidents are more prevalent during the rainy season due to reduced visibility, slippery road surfaces, and longer braking distances. Rainwater creates a thin film on roads, mixing with oil and debris, making them more hazardous and increasing the likelihood of skidding. Wet conditions also reduce tire traction, making it harder for drivers to maintain control of their vehicles. Additionally, poor visibility due to heavy rain or fog limits drivers' ability to react to obstacles or sudden changes in traffic.

6.2 Limitation of manual analysis and necessity of hypothesis testing

Manual analysis, such as observing trends in charts and summarizing accident data, provides a good overview of patterns and helps identify potential risks based on factors like age, vehicle type, and time. However, this approach is often not enough to draw definitive conclusions. It relies heavily on visual interpretation and can be prone to bias, lacking statistical rigor. This is where hypothesis testing becomes crucial. Hypothesis testing allows us to statistically validate whether observed trends are significant or merely due to chance. By testing relationships (e.g., whether gender or weather significantly impacts accident rates), we can make data-driven conclusions with greater confidence. It helps in generalizing findings beyond the sample data, making the analysis more robust, and providing a stronger basis for policy-making and safety interventions.

6.3 Hypothesis testing

6.3.1 Association Between Vehicle Type and Day of Week in Road Accidents Using Chi-Square Test

Null Hypothesis (H0): The kind of vehicle involved in collisions does not depend on the day of the week.

Alternative Hypothesis (H1): The day of the week has an impact on the kind of vehicle involved in collisions.

Observed and Expected Values

Observed Values (O): The actual counts of accidents involving different vehicle types on different days of the week.

OBSERVE VALUE (o)						
	Motorbike	Rickshaw	CNG	Car	Bus	Total
WEDNESDAY	52	10	14	8	9	93
THURSDAY	41	7	14	7	12	81
FRIDAY	54	10	27	6	13	110
SATURDAY	57	8	18	7	32	122
SUNDAY	35	6	11	2	11	65
MONDAY	51	12	9	9	11	92
TUESDAY	14	5	3	2	17	41
Total	304	58	96	41	105	604

Table 3: Observed value of Chi square test (Vehicle type and day of week)

Expected Values (E): The expected counts of accidents under the assumption that the type of vehicle involved in accidents is independent of the day of the week.

EXPECTED VALUE (E)					
	Motorbike	Rickshaw	CNG	Car	Bus
WEDNESDAY	46.807947	8.930464	14.78146	6.312914	16.16722
THURSDAY	40.768212	7.778146	12.87417	5.498344	14.08113
FRIDAY	55.364238	10.56291	17.48344	7.466887	19.12252
SATURDAY	61.403974	11.71523	19.39073	8.281457	21.20861
SUNDAY	32.715232	6.241722	10.33113	4.412252	11.29967
MONDAY	46.304636	8.834437	14.62252	6.245033	15.99338
TUESDAY	20.635762	3.937086	6.516556	2.783113	7.127483

Table 4: Expected value of Chi square test (Vehicle type and day of week)

Chi-Square Calculation

The "Chi-Square Distribution" column shows the contribution of each vehicle type to the overall Chi-Square statistic.

CHI Square Calculation					
	Motorbike	**Rickshaw**	**CNG**	**Car**	**Bus**
WEDNESDAY	0.5759153	0.128091	0.041314	0.450863	3.177357
THURSDAY	0.0013178	0.077848	0.098452	0.410118	0.307581
FRIDAY	0.0336164	0.029999	5.180035	0.288173	1.960265
SATURDAY	0.3158588	1.178205	0.099745	0.19829	5.490889
SUNDAY	0.1595638	0.009361	0.043305	1.318818	0.007947
MONDAY	0.4761175	1.134287	2.161919	1.215341	1.559009
TUESDAY	2.133836	0.28696	1.897654	0.220352	13.67475

Results

- **Chi-Square Statistic (X^2):** 46.34
- **Degrees of Freedom (df):** 24
- **p-value:** 0.004025

Conclusion

The null hypothesis can be rejected because the p-value (0.004) is smaller than the typical significance level (e.g., 0.05). This suggests that the type of vehicle involved in accidents and the day of the week have a statistically significant correlation.

Key Takeaways
• There is enough evidence to suggest that the type of vehicle involved in accidents is significantly related to the day of the week.

- Some types of vehicles might be more prone to accidents on specific days, which could help inform targeted safety measures.

6.3.2 Association between vehicle type and the number of male accidents using chi-square test

Hypotheses

Null Hypothesis (H0): The quantity of male-related collisions is unaffected by the kind of vehicle.

Alternative Hypothesis (H1): There is a correlation between the kind of vehicle and the frequency of male accidents.

Observed and Expected Values

Observed Values (O): The actual counts of male accidents involving different types of vehicles.

Observed Value (O)	
VEHICLE TYPE	NO. OF ACCIDENTS (MALE)
MOTOR BIKE	301
RICKSHAW	44
CNG	74
CAR	34
BUS	89
Total	542

Table 5: Observed value of Chi square test (Vehicle type and male accidents)

Expected Frequencies (E): The expected counts under the assumption that the number of male accidents is independent of the vehicle type.

VEHICLE TYPE	NO. OF ACCIDENTS (MALE)	Expected Frequencies (E)
MOTOR BIKE	301	108.4
RICKSHAW	44	108.4
CNG	74	108.4
CAR	34	108.4
BUS	89	108.4
Total	542	108.4

Table 6: Expected value of Chi square test (Vehicle type and day of week)

Calculation

The individual contributions to the Chi-Square statistic from each vehicle type are shown in the "Chi-Sq Value Contribution" column.

VEHICLE TYPE	NO. OF ACCIDENTS	Expected Frequencies	Chi-Sq Value
MOTOR BIKE	301	108.4	342.202583
RICKSHAW	44	108.4	38.2597786
CNG	74	108.4	10.9166052
CAR	34	108.4	51.0642066
BUS	89	108.4	3.47195572
Total	542		445.915129

Results

- Chi-Square Statistic (X^2): 445.92
- Degrees of Freedom (df): 4
- p-value: 3.31838×10−95

Conclusion

This p-value is much smaller than the usual significance level (e.g., 0.05) because it is so small (3.31838×10−953.31838 \times 10^ {-95}3.31838×10−95). The null hypothesis can be rejected as a result. This suggests that there is a statistically significant correlation between the kind of vehicle and the frequency of accidents involving men.

Key Takeaways
Significant Association: There is a strong indication that the type of vehicle is related to the occurrence of accidents among males. Some vehicles are involved in accidents more frequently than others.

6.3.3 Association between age and the number of accidents using chi-square test

Hypotheses

Null Hypothesis (H0): A particular age influences the number of accidents that are happeing. Alternative Hypothesis (H1): Age is linked to the number of accidents (i.e., age influences the number of accidents)

Observed and Expected Values

Observed Values (O): The actual number of accidents for each age group.

Observed Value (O)	
AGE	**No. of Accident**
0 - 5	3
6 - 10	11
11 - 15	11
16 - 20	45
21 - 25	27
26 - 30	45
31 - 35	35
36 - 40	27
41 - 45	17
46 - 50	14
51 - 55	16

AGE	No. of Accident
56 -- 60	10
>61	17
Total	278

Table 7: Observed value of Chi square test (Age and number of accidents)

Expected Values (E): The expected number of accidents for each age group if the number of accidents is independent of age.

Expected Value (E)		
AGE	**No. of Accident**	**Expected**
0 -- 5	3	21.38462
6 -- 10	11	21.38462
11 -- 15	11	21.38462
16 -- 20	45	21.38462
21 -- 25	27	21.38462
26 -- 30	45	21.38462
31 -- 35	35	21.38462
36 -- 40	27	21.38462
41 -- 45	17	21.38462
46 -- 50	14	21.38462

AGE	No. of Accident	Expected
51 -- 55	16	21.38462
56 -- 60	10	21.38462
>61	17	21.38462
Total	278	21.38462

Table 8: Expected value of Chi square test (Age and number of accidents)

Chi-Square Calculation

The "Contribution" column shows the contribution of each age group to the overall Chi-Square statistic.

AGE	No. of Accident	Expected	Contribution
0 -- 5	3	21.38462	15.80547869
6 -- 10	11	21.38462	5.042888766
11 -- 15	11	21.38462	5.042888766
16 -- 20	45	21.38462	26.07885999
21 -- 25	27	21.38462	1.474543442
26 -- 30	45	21.38462	26.07885999
31 -- 35	35	21.38462	8.668788046
36 -- 40	27	21.38462	1.474543442
41 -- 45	17	21.38462	0.899003874

AGE	No. of Accident	Expected	Contribution
46 -- 50	14	21.38462	2.550083011
51 -- 55	16	21.38462	1.355838406
56 -- 60	10	21.38462	6.060874377
>61	17	21.38462	0.899003874
Total	278		101.4316547

Results

- Chi-Square Statistic (X^2): 101.43
- Degrees of Freedom (df): 12.
- p-value: 2.91755E-16

Conclusion:

The p-value, 2.91755E-16, is significantly smaller than the usual threshold for significance (e.g., 0.05) due to its extreme smallness. We thus reject the null hypothesis.This suggests that age and the quantity of accidents have a statistically significant connection.

Key Takeaways
Significant Association: The result suggests that age is significantly associated with the number of accidents. This could imply that certain age groups are more prone to accidents than others.

6.3.4 Association Between Vehicle Type and Number of Accidents Involving Females using chi-square test

Hypotheses

- Null Hypothesis (H0): There is no substantial relation between the type of vehicle and the number of accidents involving females.
- Alternative Hypothesis (H1): There is a substantial relation between the type of vehicle and the number of accidents involving females.

Observed and Expected Values

Observed Values (O): The actual number of accidents involving females for each vehicle type.

Observed Value (O)	
VEHICLE TYPE	**NO. OF ACCIDENTS (FEMALE)**
MOTOR BIKE	17
RICKSHAW	18
CNG	24
CAR	11
BUS	26
TOTAL	96

Table 9: Observed value of Chi square test (Vehicle type and female accidents)

Expected Values (E): The expected number of accidents for each vehicle type if accidents are distributed evenly among vehicle types.

Expected Value (E)		
VEHICLE TYPE	**NO. OF ACCIDENTS (FEMALE)**	**Expected**
MOTOR BIKE	17	19.2
RICKSHAW	18	19.2
CNG	24	19.2
CAR	11	19.2
BUS	26	19.2
TOTAL	96	

Table 10: Expected value of Chi square test (Vehicle type and female accidents)

Chi-Square Calculation

The "Chi-Square Distribution" column shows the contribution of each vehicle type to the overall Chi-Square statistic.

VEHICLE TYPE	NO. OF ACCIDENTS (FEMALE)	Expected	Chi square distribution
MOTOR BIKE	17	19.2	0.2521
RICKSHAW	18	19.2	0.075
CNG	24	19.2	1.2
CAR	11	19.2	3.5031
BUS	26	19.2	2.4083
TOTAL	96		7.4385

Results

- Chi-Square Statistic (X^2): 7.4385
- Degrees of Freedom (df): 4
- p-value: 0.1145

Conclusion

Considering that the p-value (0.1145) exceeds the conventional significance level (e.g., 0.05), the null hypothesis cannot be rejected. The number of accidents involving females in our data does not exhibit a statistically significant correlation with the type of vehicle. Put differently, the distribution of accidents among various car types is not appreciably different from what would be predicted in the absence of any association.

Key Takeaways
No Significant Association: The result indicates that the type of vehicle is not significantly associated with the number of accidents involving females. The accidents seem to be evenly distributed across different vehicle types.

6.3.5 Association Between Gender and Day of the Week for Accidents using chi-square test

Hypotheses

- Null Hypothesis (H0): There is no notable relation between gender and the day of the week.
- Alternative Hypothesis (H1): There is a substantial association between gender and the day of the week.

Observed and Expected Values

Observed Values (O): The actual number of accidents for males and females for each day.

Observed Value			
Day	**Male**	**Female**	**Total**
FRIDAY	88	22	110
SATURDAY	108	14	122
SUNDAY	52	13	65
MONDAY	82	10	92
TUESDAY	35	6	41
WEDNESDAY	72	21	93
THURSDAY	74	7	81
Total	511	93	604

Table 11: Observed value of Chi square test (Gender and day of week)

Expected Values (E): The expected number of accidents for each day of the week if accidents are distributed evenly among genders. These are calculated based on the proportion of males and females in the total number of accidents.

Expected Value		
Day	**Male**	**Female**
FRIDAY	93.06291	16.93709
SATURDAY	103.2152	18.78477
SUNDAY	54.99172	10.00828
MONDAY	77.83444	14.16556
TUESDAY	34.68709	6.312914
WEDNESDAY	78.68046	14.31954
THURSDAY	68.52815	12.47185

Table 12: expected value of Chi square test (gender and day of week)

Chi-Square Calculation

(O-E)^2 / E		
	Male	**Female**
FRIDAY	0.275438	1.51343
SATURDAY	0.221808	1.218754
SUNDAY	0.162759	0.8943
MONDAY	0.222934	1.224936
TUESDAY	0.002823	0.01551
WEDNESDAY	0.567213	3.116623
THURSDAY	0.436918	2.400701

Results

- **Chi-Square Statistic (X^2):** 12.27
- **Degrees of Freedom (df):** 6
- **p-value:** 0.0561

Conclusion

The null hypothesis cannot be rejected because the p-value (0.0561) is higher than the usual threshold for significance (e.g., 0.05). This indicates that your data do not support a statistically significant relationship between gender and the day of the week. Stated differently, the distribution of accidents between genders on different days does not deviate appreciably from the expected distribution in the absence of association.

Key Takeaways
No Significant Association: The result indicates that the distribution of accidents for males and females is not significantly different across the days of the week.

6.3.6 Regression analysis on Effects of Weather Conditions on Road Accidents

Hypotheses

- Null Hypothesis (H_0): Weather conditions have no effect on the number of road accidents. (All regression coefficients for the weather dummy variables are equal to zero.)
- Alternative Hypothesis (H_1): Minimum one weather condition has a momentous consequence on the number of road accidents. (At least one regression coefficient for the weather dummy variables is not zero.)

Data Overview

- Accidents: The number of road accidents.
- Rainy Day (1/0): A dummy variable where 1 represents a rainy day and 0 represents a non-rainy (normal) day.
- Normal Day (1/0): A dummy variable where 1 represents a normal day and 0 represents a rainy day. However, in the provided output, the coefficient for the normal day is zero, which means it's not being used directly in this regression.

Accidents	Rainy Day	Normal Day	Accidents	Rainy Day	Normal Day
24	1	0	33	0	1
29	1	0	40	0	1
28	1	0	32	0	1
32	1	0	39	0	1
34	1	0	38	0	1
33	1	0	23	0	1
30	1	0	30	0	1
40	1	0	28	0	1
40	1	0	39	0	1
35	1	0	55	0	1
38	1	0	40	0	1
35	1	0	37	0	1
42	1	0	38	0	1
35	1	0	40	0	1
30	1	0	39	0	1
57	1	0	38	0	1
40	1	0	40	0	1
34	1	0	34	0	1
32	1	0	38	0	1
34	1	0	43	0	1
48	0	1	56	0	1
48	0	1	36	0	1
41	0	1	58	0	1
41	0	1	41	0	1
27	0	1	33	0	1
38	0	1	33	0	1
31	0	1	40	0	1
38	0	1	34	0	1
51	0	1	43	0	1
32	0	1	31	0	1

Table 13: Accident data in relation to weather

Calculation & Result

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.216909							
R Square	0.04705							
Adjusted R	0.013949							
Standard E	7.330045							
Observatio	61							
ANOVA								
	df	*SS*	*MS*	*F*	*ignificance F*			
Regressior	2	156.5135	78.25674	2.912986472	0.0623			
Residual	59	3170.044	53.72956					
Total	61	3326.557						
	Coefficients	*andard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*Ipper 95.0%*
Intercept	38.5122	1.144761	33.64214	3.37519E-40	36.22153	40.80286	36.22153	40.80286
Rainy Day	-3.4122	1.999239	-1.70675	0.093127635	-7.41266	0.588272	-7.41266	0.588272
Normal Da	0	0	65535	#NUM!	0	0	0	0

Table 14: Regression and anova test data

Result Analysis

The p-value for the overall model 0.09312

Conclusion
The importance of the Model: At the level of confidence of 5%, we are unable to reject the null hypothesis because the p-value for the entire model (0.09312) is higher than 0.05. This indicates that there is no statistically significant relationship between the number of traffic accidents in your dataset and the weather.
Interpretation of rainy-day Coefficient: Although the coefficient for "Rainy Day" suggests a decrease in accidents on rainy days, the effect is not statistically significant (p-value = 0.0931). This means that we do not have strong enough evidence to conclude that rainy days significantly reduce the number of accidents compared to normal days.

6.3.7 Regression Analysis of Weekly Trends in Accident Frequency

Hypothesis

- **Null Hypothesis (H_0):** The week number does not have a substantial effect on the number of accidents. (The coefficient for the "Week Number" is equal to zero.)
- **Alternative Hypothesis (H_1):** The week number has a significant effect on the number of accidents. (The coefficient for the "Week Number" is not equal to zero.)

Data Overview

- **Week Number**: Represents different weeks (1, 2, 3, 4) in the dataset.
- **Accidents**: The number of accidents recorded for each corresponding week.

	1st week	2nd week	3rd week	4th week
Accidents Number	306	277	281	286
	259	234	265	235
	267	262	313	258
	242	272	264	291
	217	282	223	253
	270	318	325	279

Result

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.099784							
R Square	0.009957							
Adjusted R	-0.03505							
Standard E	28.91677							
Observatic	24							
ANOVA								
	df	*SS*	*MS*	*F*	*Significance F*			
Regressior	1	185.0083	185.008333	0.221254	0.642715672			
Residual	22	18395.95	836.179545					
Total	23	18580.96						
	Coefficients	*andard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	263.75	14.45838	18.2420102	9.03E-15	233.7651455	293.7349	233.7651	293.7349
Week Num	2.483333	5.279456	0.47037678	0.642716	-8.465587465	13.43225	-8.46559	13.43225

Table 15: Regression and anova test data (weekly trend in accident)

Result Analysis

Regression analysis:

A high p-value, such as 0.6427, suggests that there is no statistically significant relationship between the week number and the number of accidents.

This p-value reflects the likelihood that the observed results occurred by chance. A p-value of 0.6427 exceeds the 0.05 threshold, suggesting that there is no statistically significant relationship between Week Number and the number of Accidents This number indicates the total data points utilized in the regression analysis.

Conclusion
It can be observed from the regression analysis value that the number of weeks does not significantly predict the number of accidents, as evidenced by the high p-value (0.6427) and low R^2 value (0.0099).
The model has a very low explanatory power, suggesting that other factors might be better predictors of the number of accidents.

CHAPTER 7: Result

Relationship between type of vehicle and day of the week:

The results of the analysis through observation showed that motorcycle accidents were more common on weekends, and that this was associated with increased road usage for social and recreational purposes.

The Chi-Square test (p-value: 0.004) supported the hypothesis that there is a statistically significant correlation between the type of vehicle and the day of the week. This indicates that certain vehicle types, especially motorcycles, are more likely to be involved in accidents on particular days.

Relationship between vehicle type and accidents involving men:

The results of the manual analysis revealed that, with 55.53% of male accidents involving motorbikes, these vehicles were the most involved.

The Chi-Square test (p-value: 3.31838×10^{-95}) yielded a highly valuable result, supporting the hypothesis that motorbikes are heavily involved in accidents involving male riders.

Relationship between age and accident frequency:

The manual analysis revealed that younger people were more likely to be involved in accidents,

especially in the 16–20 and 26–30 age groups.
The hypothesis test result showed that there is a statistically significant correlation between age and accident frequency, with the Chi-Square test (p-value: 2.91755E-16) supporting this association and demonstrating that younger age groups are more likely to have accidents.

Relationship between weather and accident frequency:
The manual analysis result indicated that because of the slick roads and decreased visibility during the rainy season, there may be a rise in accidents.
The hypothesis that the weather has a significant influence on accident rates in Dhaka is called into question by regression analysis (p-value: 0.0931), which did not find a statistically significant relationship between weather and accident frequency.

CHAPTER 8: Analysis & Discussion

By using a combination of manual analysis and statistical hypothesis testing, the study of Dhaka's traffic accident patterns has yielded important insights. An early overview of trends was provided by the manual analysis, which focused in particular on the high frequency of motorbike accidents and the involvement of younger drivers. But hypothesis testing allowed for a more thorough, statistically supported understanding of these trends, supporting or refuting the original observations and revealing patterns that manual review had missed.
Motorcycle accidents were more common on the weekends, especially on Saturdays, according to a manual analysis. The reason for this trend is the rise in traffic and unsafe driving practices that come with more people using the roads for social and recreational purposes on the weekends. The manual observations were validated by the Chi-Square hypothesis test, which yielded a p-value of 0.004 and confirmed a significant association between the type of vehicle and the day of week. This emphasizes the need of focused weekend road safety initiatives, like tighter enforcement of

traffic regulations and public education campaigns emphasizing the safety of motorcycles during high-risk times.

More than half of male motorcycle accidents involve motorbikes, according to the manual review, which also revealed a disproportionate involvement of male drivers. With a highly significant p-value of 3.31838×10^{-95}, the hypothesis test further supported this. Male motorcycle riders are more likely to be victims, as supported by this statistical validation, which implies that road safety initiatives should target them especially. More stringent speed limits, the encouragement of helmet use, and perhaps more stringent training or licensing requirements for motorcycle riders—particularly young men—could all be considered intervention strategies. Immediate action is required in response to the alarming issue of the overrepresentation of men in motorcycle accidents.

Younger people were more likely to be involved in accidents, especially those between the ages of 16 and 20 and 26 and 30, according to age-related data. This was supported by hypothesis testing, which highlighted the need for interventions targeted at young people with a significant p-value of 2.91755E-16. Stricter traffic rules, awareness-raising campaigns about the perils of careless and distracted driving, and focused traffic law enforcement are a few examples of these.

Unlike anticipated, there was no discernible relationship between the frequency of accidents and rainy days according to the weather analysis. A p-value of 0.0931 from the regression analysis indicated that there was no statistically significant relationship, despite manual analysis suggesting that rainy conditions might result in more accidents due to reduced visibility and slippery roads. This result goes against popular belief regarding how the weather affects Dhaka traffic accidents. Rather than this, accident rates may be more significantly influenced by other variables like traffic volume, driving habits, and road conditions. Accordingly, addressing these factors should take precedence over concentrating only on weather-related risks in road safety strategies.

The combined analysis identifies important risk areas that need focused solutions. Motorcycle collisions pose a serious risk to public safety, especially when they involve male riders. Likewise, the proportion of younger drivers involved in accidents is disproportionate, highlighting the need for more focused safety campaigns and stringent laws. This finding highlights the complexity of

road safety dynamics in Dhaka, where behavioral factors may outweigh environmental ones, even though weather conditions did not significantly affect accident rates.

A stronger basis for creating efficient safety measures is provided by the combination of manual and hypothesis-based analysis, which enables a more sophisticated understanding of the patterns of traffic accidents. While considering the larger behavioral and infrastructural factors that influence accident rates, policymakers should concentrate on high-risk demographics, such as male motorbike riders and young drivers. Road safety can be significantly improved, eventually lowering the frequency and severity of accidents in Dhaka, by putting these insights into practice and implementing targeted interventions.

CHAPTER 9: Conclusion

This study offers a thorough investigation of Dhaka's traffic accident trends, focusing on the relationships between various accident parameters like vehicle type, age, gender, and environmental conditions. The study's meaningful conclusions about the risks and difficulties associated with Dhaka's roads were reached by combining statistical techniques with manual data analysis. An important conclusion drawn from the research is that accident frequency is more significantly influenced by behavioral factors than by environmental factors, such as weather, especially when it comes to particular vehicle types and demographics. This revelation casts doubt on long-held beliefs regarding the significance of elements like rain and highlights the necessity of improving infrastructure and human behavior in order to increase road safety. The results also brought attention to the weaknesses of specific demographics, particularly young people and motorcycle riders. These groups frequently show up as high-risk groups, suggesting that focused interventions like enhanced road safety education and more stringent laws could significantly lower the number of accidents. According to the study, prevention and behavior modification should be the main goals of any solutions, especially for high-risk populations. It also highlights the significance of recognizing the larger social context in which these accidents occur. In conclusion, this study adds significant understanding into the fundamental reasons behind traffic accidents in Dhaka. It emphasizes the need for data-driven interventions and policies that focus on the most vulnerable drivers. Dhaka can significantly reduce the frequency and severity of traffic accidents and ultimately contribute to a safer urban environment by putting into practice targeted strategies that address both behavioral and infrastructural factors.

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