

Assessment of Factors Influencing Drivers' Speeding Behaviour in Calabar Metropolis

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Received: 18th August, 2025

Reviewed: 14th September, 2025

Accepted: 16th December, 2025

ABSTRACT

Speeding remains one of the leading contributors to road traffic crashes in urban areas, particularly in rapidly growing cities with increasing traffic demand. This study assessed the factors influencing drivers' speeding behaviour in Calabar Metropolis using a data-driven approach. Speed observations were collected from 960 vehicles across three major corridors including Murtala Mohammed Highway, Marian Road, and UNICAL Abraham Odia Stadium Road representing different road environments within the metropolis. Descriptive statistics, cross-tabulation, and inferential analysis were employed to examine the influence of driver demographics, vehicle type, and road characteristics on speeding behaviour. The results revealed that the average vehicle speed was 81.99 km/h, exceeding typical urban speed thresholds, with extreme speeds reaching 181.82 km/h, indicating the presence of high-risk drivers. The speed distribution was positively skewed, suggesting that a small group of drivers contributes disproportionately to overall speeding risk. Gender analysis showed that 39.0% of female drivers and 36.1% of male drivers exceeded the speed threshold. Vehicle type significantly influenced driving speed ($p = 0.034$), with motorcycles and taxis recording the highest mean speeds, reflecting the operational pressures associated with commercial transport. Road type also played a critical role, as UNICAL Abraham Odia Stadium Road recorded the highest proportion of speed limit violations (48.19%), despite having lower mean speeds than the highway corridor. The findings indicate that speeding behaviour in Calabar is strongly shaped by road characteristics, vehicle type, and operational pressures rather than demographic attributes alone. The study highlights the need for targeted enforcement, improved speed management strategies, and the deployment of intelligent transport technologies to enhance road safety in the metropolis.

Keywords: *Speeding, Behaviour, Road, Safety, Calabar, Drivers.*

I. INTRODUCTION

Road traffic safety remains a major global concern due to the rising number of crashes and fatalities

linked to unsafe driving behaviours, particularly speeding. Excessive speed increases the likelihood of accidents and also worsens the severity of injuries when crashes occur. According to the World Health

Organization, speeding contributes to nearly one third of road traffic deaths worldwide, making it a critical issue for road safety management [1]. The problem is more severe in many developing countries where road infrastructure, enforcement of traffic regulations, and public awareness of safe driving practices remain limited.

In Nigeria, rapid urban growth and increasing vehicle ownership have intensified road safety challenges. Previous studies show that driver behaviour, especially speeding, is a major contributor to road traffic crashes in many Nigerian cities [2], [3]. In Calabar, the capital city of Cross River State, the transport system includes private cars, taxis, buses, and other commercial vehicles that support daily movement within the city. However, the increase in traffic has also been accompanied by a rise in road accidents, many of which are associated with unsafe driving behaviours such as speeding.

Research has shown that speeding behaviour is influenced by several factors including driver characteristics, road conditions, and traffic environment [4], [5]. Recent transportation studies have increasingly adopted data driven approaches to better understand these behaviours. By combining traffic data, spatial information systems, and social demographic information, researchers can identify patterns of unsafe driving more accurately [6]. In this context, this study assesses the factors influencing drivers speeding behaviour in Calabar Metropolis using a data driven approach in order to provide evidence that can support improved road safety policies and traffic management strategies.

II. LITERATURE REVIEW

A. Speeding and Road Safety

Speeding occurs when a driver operates a vehicle above the legal speed limit or at a speed that is unsafe for existing road and traffic conditions. It is widely recognized as one of the most common traffic violations and a major cause of road crashes worldwide. High speeds reduce a driver's ability to react to sudden hazards, increase braking distance, and make collisions more severe when they occur. According to the World Health Organization, speeding is responsible for nearly one third of road traffic deaths

globally and remains one of the most important behavioural risk factors affecting road safety [1].

Research has consistently shown that as vehicle speed increases, the chances of a crash and the severity of injuries also increase. Higher speeds leave drivers with less time to respond to unexpected situations and greatly increase the impact during collisions, which can lead to serious injuries or fatalities for drivers, passengers, pedestrians, and other road users [7]. In many developing countries such as Nigeria, the effects of speeding are worsened by poor road infrastructure, weak enforcement of traffic regulations, and low public awareness of safe driving practices, making the control of speeding behaviour a key priority for improving road safety.

B. Determinants of Drivers' Speeding Behaviour

Drivers' speeding behaviour is shaped by a combination of demographic and behavioural factors. Characteristics such as age, gender, and driving experience have often been linked to differences in speeding tendencies. Research shows that younger drivers, especially males, are more likely to exceed speed limits because they tend to take greater risks and underestimate traffic dangers [8], [9]. These patterns are commonly associated with limited driving experience and a stronger desire for excitement while driving.

Psychological traits and road conditions also influence how drivers choose their speed. Drivers who are overly confident in their skills or who seek excitement are more likely to violate speed limits, particularly when road conditions appear safe [10]. Traits such as impulsiveness and aggression have also been linked to risky driving behaviour [11]. In addition, the design of the road environment can affect speed choice, since wide and straight roads often make drivers feel comfortable driving faster. In Calabar, the absence of traffic calming measures on some major corridors has been identified as a factor that may encourage speeding among drivers [12], while social perceptions of confident driving may also influence speed behaviour [13].

C. Traffic Regulations and Enforcement in Controlling Speeding

Traffic regulations and enforcement play an important role in controlling speeding and improving road safety. Speed limits and penalties provide a legal

framework that guides drivers and discourages unsafe driving practices. Studies show that drivers who are aware of speed limits are more likely to obey them than those with little knowledge of traffic regulations [14]. However, in many developing countries the effectiveness of these rules is often weakened by poor road signage, limited public awareness, and weak enforcement systems.

Driver compliance is also strongly influenced by the likelihood of being caught and punished for traffic violations. When drivers believe enforcement is weak or irregular, they are more likely to exceed speed limits. Research shows that areas with limited patrol presence and few speed monitoring devices tend to experience higher rates of speeding violations [15]. Modern enforcement technologies such as radar guns and speed cameras have improved speed control in many countries by making monitoring more consistent [16]. Nevertheless, challenges such as limited resources and institutional constraints continue to affect enforcement effectiveness in countries such as Nigeria [17].

D. Technological and Strategic Approaches to Managing Speeding Behaviour

Technological innovations are increasingly being used to address speeding and improve road safety. One example is Intelligent Speed Assistance, which uses digital maps and GPS to inform drivers about speed limits or restrict vehicle speed. Studies show that the use of such systems can significantly reduce speed violations among drivers [18]. However, the adoption of these technologies in many developing countries is still limited due to economic and infrastructural challenges.

Other technologies such as telematics and vehicle monitoring systems have also helped improve driver behaviour, especially in commercial transportation. These systems allow real time tracking of vehicle speed and driving patterns, which encourages drivers to follow speed limits more closely [19]. In addition to technology, physical road measures like speed bumps and roundabouts, as well as public education campaigns, have been shown to reduce speeding and improve driver compliance with traffic regulations [20].

E. Research Gap

Despite the growing research on speeding and road safety, important gaps still exist in the literature. Many studies focus mainly on general driver behaviour or accident statistics and do not fully examine the local factors that influence speeding in specific urban areas, particularly in developing countries where road conditions and enforcement systems differ. In Nigeria, only a few studies have analysed the determinants of drivers speeding behaviour using comprehensive data analysis that combines demographic, environmental, and behavioural factors. In addition, very limited research has focused on Calabar despite its increasing traffic challenges. This study therefore addresses this gap by using a data driven approach to examine the factors influencing drivers speeding behaviour in Calabar Metropolis in order to support improved road safety policies and traffic management strategies.

III. METHODOLOGY

A. Research Design

This study adopted an observational research design to examine drivers speeding behaviour under real traffic conditions in Calabar Metropolis. Vehicle speeds were recorded directly on selected road segments, allowing the study to capture drivers responses to actual road conditions such as traffic flow, road signs, and road classification. The study followed a cross sectional approach in which data were collected at the same time across several locations in the city. This made it possible to observe differences in speeding behaviour across driver characteristics such as age, gender, vehicle type, and driving experience.

Systematic and purposive sampling techniques were used to obtain a representative sample of drivers across the study area. Vehicles were observed at regular intervals at selected points, while roads with high traffic activity were deliberately selected to capture a wide range of driving behaviours. The study used both primary and secondary data sources. Field observations and speed measurements formed the primary data, while official traffic regulations were used to determine the legal speed limits. Data were analysed using descriptive statistics and inferential methods such as chi square tests, analysis of variance, and regression analysis to identify patterns and factors influencing speeding behaviour

B. Study Area

Drivers' speeding behaviour is shaped by a combination of demographic and behavioural factors. Characteristics such as age, gender, and driving

The study was conducted in Calabar, the capital city of Cross River State in southern Nigeria. Calabar is a major administrative, commercial, and tourism centre in southeastern Nigeria and plays a significant role in regional transportation and economic activities. The city is geographically situated between latitudes 4°45'N and 5°30'N and longitudes 8°15'E and 8°21'E. It occupies a land area of approximately 406 km² and had a population of 371,022 according to the 2006 national census, with more recent estimates placing the population at over 400,000 residents. Figure 1 shows the map of Calabar Metropolis used for the study.

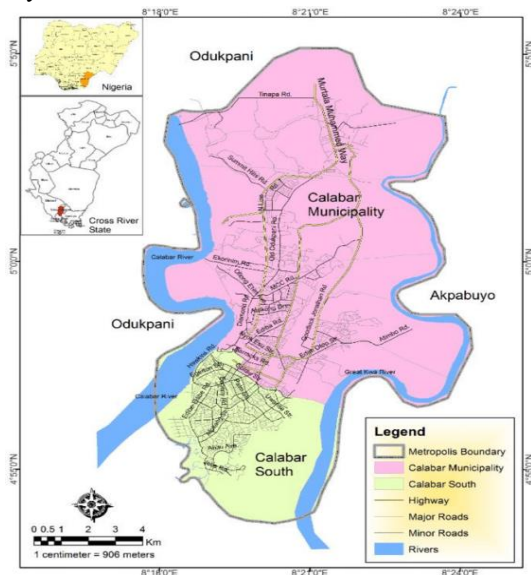


FIGURE 1: A MAP SHOWING CALABAR METROPOLIS SHOWING WARDS AND MAJOR ROAD NETWORK

Calabar is located on a peninsula bordered by the Atlantic Ocean, the Calabar River, the Great Kwa River, and the Cross River estuary. The city's transportation system comprises a mixture of urban and semi-urban road infrastructure that accommodates both intra-city and intercity travel. Major roads serve as important corridors for commercial vehicles, private cars, taxis, buses, and motorcycles, which collectively facilitate daily mobility within the metropolis.

The increasing level of urbanization and economic activities within the city has resulted in higher traffic

volumes and growing transportation challenges. These challenges include congestion, poor road signage, inconsistent enforcement of traffic regulations, and risky driving practices such as speeding. The presence of diverse road types and varying traffic conditions within Calabar provides an appropriate setting for evaluating drivers' speeding behaviour within an urban transportation environment

C. Population and Sample

The target population for this study consisted of drivers operating within Calabar Metropolis, particularly those travelling along major road corridors such as Murtala Mohammed Highway, Marian Road near Cross River State Micro Finance Bank, and the University of Calabar road corridor near Abraham Ordia Stadium. These locations were selected because of their high traffic activity and importance within the city transport network. A total of 960 drivers were observed during the study, including 606 males and 354 females, while the vehicles recorded included 229 private cars, 285 buses, 236 taxis, and 210 motorcycles. The sample was obtained through direct field observation using systematic sampling to select vehicles at regular intervals and purposive sampling to focus on busy road segments with higher traffic and accident risk

D. Data Sources and Instruments

Data for the study were gathered from both primary and secondary sources to provide a clear understanding of factors influencing drivers' speeding behaviour. Primary data were obtained through field observations and speed measurements carried out on selected road segments in Calabar Metropolis. Vehicle speeds were recorded using the Smart Speed App installed on Android smartphones with GPS capability, which automatically captured speed, travel time, and distance as vehicles moved along the study routes. To improve accuracy and confirm the recorded values, additional methods such as stopwatch timing, radar speed detection, and video observation were also considered. Observers stationed at both ends of a 50 meter road section recorded the entry and exit times of vehicles, and these measurements were used to calculate speeds and validate the application data.

Structured questionnaires and brief driver surveys were also conducted to collect social and behavioural information from drivers. The surveys gathered details

on driver age, gender, driving experience, vehicle type, and their views on traffic law enforcement. Secondary data were obtained from official regulatory documents that outline traffic control and speed regulations within the study area. These documents provided the statutory speed limits used as reference points in the study, which include 90 km/h for the University of Calabar road segment

E. Variables of the Study

The study examined several variables that reflect drivers' characteristics and the conditions under which they drive. The independent variables included driver identification number, age, gender, years of driving experience, vehicle type, road type, and time of observation, as these factors are widely known to influence driving behaviour. The dependent variables were vehicle speed measured in kilometres per hour and speeding status, which was determined by comparing each vehicle's recorded speed with the legal speed limit for that road segment. The posted speed limit for each road served as the control variable and provided the benchmark used to identify vehicles that exceeded the permitted speed

F. Data Analysis

The collected data were analysed using both descriptive and inferential statistical techniques to better understand drivers' speeding behaviour in Calabar Metropolis. The process began with data cleaning and coding to ensure that all observations were complete and accurate. Demographic variables such as age, gender, and driving experience were grouped into categories, while continuous variables like vehicle speed and driver age were kept in numerical form. Descriptive statistics including frequencies, percentages, means, and standard deviations were then used to summarise the characteristics of the drivers and vehicles, providing insight into vehicle distribution, gender composition, and average speeds across the different road segments.

Further analysis involved cross tabulation to explore relationships between speeding behaviour and driver characteristics. Inferential statistical methods were also applied to test the significance of these relationships. Analysis of Variance was used to examine whether average vehicle speeds differed across road types and vehicle categories, while regression analysis helped identify the factors that

influence speeding behaviour, including age, driving experience, vehicle type, road type, and time of observation. All analyses were carried out using Microsoft Excel for data organisation, statistical computation, and presentation of results

IV. RESULTS AND DISCUSSION

A. Descriptive Characteristics of Drivers and Observations

A total of 960 vehicle observations were recorded across three major corridors within Calabar Metropolis. The demographic distribution indicates that male drivers constituted 63.13% of the sample, while female drivers accounted for 36.88% as shown in Table I below

TABLE I
DEMOGRAPHIC CHARACTERISTICS OF DRIVERS

Demographic Characteristic	Category	Frequency (n)	Percentage (%)
Gender	Male	606	63.13
	Female	354	36.88

This distribution reflects the typical gender composition of urban driving populations in many Nigerian cities, where male drivers dominate commercial and intercity transport activities. The predominance of male drivers suggests that behavioural interventions aimed at reducing speeding may require particular focus on this group.

The observational dataset also captured variations in vehicle types and road categories. As shown in Table II below, buses represented the largest share of vehicles observed (29.69%), followed by taxis (24.58%), private cars (23.85%), and motorcycles (21.88%).

TABLE III
OBSERVATION CHARACTERISTICS

Observation Characteristic	Category	Frequency (n)	Percentage (%)
Vehicle Type	Car	229	23.85
	Bus	285	29.69
	Taxi	236	24.58
	Motorcycle	210	21.88

Road Type	Murtala Mohammed Highway	407	42.4
	Marian Road	387	40.31
	UNICAL A. Odia Stadium Road	166	17.29

The dominance of commercial transport vehicles highlights the importance of public and informal transit systems within Calabar's mobility structure. In terms of spatial coverage, Murtala Mohammed Highway accounted for 42.40% of observations, followed by Marian Road (40.31%) and UNICAL Abraham Odia Stadium Road (17.29%). These differences reflect variations in traffic volume and functional road classification across the metropolitan network.

B. Speed Characteristics and Distribution

The descriptive statistics of observed speeds reveal clear evidence of elevated driving speeds across the study area. As presented in Table III, the mean speed was 81.99 km/h, with a median speed of 78.26 km/h and a mode of 75.31 km/h

The speed distribution was positively skewed (skewness = 1.91) and exhibited high kurtosis (5.72), indicating the presence of extreme high-speed observations within the dataset. The maximum recorded speed reached 181.82 km/h, far exceeding typical urban speed limits and highlighting the

presence of a small but critical group of high-risk drivers.

The histogram of speed observations shown in Figure 2 confirms a right-skewed distribution, where most drivers operate near moderate speeds while a smaller proportion travel at substantially higher speeds

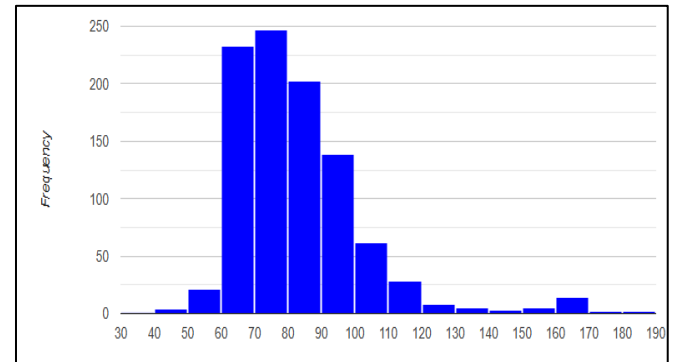


FIGURE 2: HISTOGRAM OF OBSERVED VEHICLE SPEEDS IN ALL THE DIFFERENT LOCATIONS: MUTALE MOHAMMED HIGHWAY, MARIAN ROAD, AND UNCIAL ABRAHAM ODIA STADIUM ROAD.

This pattern is characteristic of urban traffic streams in which a minority of drivers contribute disproportionately to speeding risk. The relatively high standard deviation (18.90 km/h) further indicates considerable variability in driving behaviour, suggesting that factors such as road type, traffic conditions, and vehicle characteristics may influence speed choice.

TABLE III
DESCRIPTIVE STATISTICS OF VEHICLE SPEEDS

Statistic	Mean (km/h)	Median (km/h)	Mode (km/h)	Standard Deviation	Sample Variance	Minimum (km/h)	Maximum (km/h)	Range (km/h)	Skewness	Kurtosis	Count
Value	81.99	78.26	75.31	18.9	357.34	41.76	181.82	140.05	1.91	5.72	960

C. Gender Differences in Speeding Behaviour

The relationship between driver gender and speeding behaviour was examined using cross-tabulation analysis. As shown in Table IV, 36.1% of male drivers and 39.0% of female drivers exceeded the established speed threshold.

Although males constituted the majority of drivers in the dataset, the proportional rate of speeding among female drivers was marginally higher.

TABLE IV
CROSS-TABULATION OF GENDER AND SPEEDING STATUS

Gender	Speeding (Yes)	Speeding (No)
Male	219	387
Female	138	216
Total	357	603

Mean speed comparisons across road types as presented in Table 5 reveal that male drivers generally

recorded slightly higher average speeds on major corridors such as Murtala Mohammed Highway, whereas differences between genders were minimal on urban roads such as Marian Road and Unocal Abraham Odia Stadium Road.

TABLE V
MEAN SPEED BY GENDER ACROSS ROAD TYPES IN
CALABAR METROPOLIS

Road Type (Location)	Gender	Mean Speed (km/h)
Mutala Mohammed Highway Road	Male	88.49
	Female	86.64
Marian Road (Urban Road)	Male	78.78
	Female	77.9
UNICAL Abraham Odia Stadium Road	Male	77.72
	Female	74.78

These results suggest that gender alone may not be a strong predictor of speeding behaviour within the study area. Instead, situational factors such as traffic density, road design, and travel urgency may play a more significant role in influencing driver speed choice.

D. Influence of Road Type on Speeding Behaviour

Substantial differences in speed characteristics were observed across the three study corridors. The comparative statistics presented in Table VI show that Murtala Mohammed Highway recorded the highest average mean speed (87.98 km/h), followed by Marian Road (78.23 km/h) and Unocal Abraham Odia Stadium Road (73.64 km/h).

The disparity was particularly evident on UNICAL Abraham Odia Stadium Road, where the 85th percentile speed reached 86.29 km/h despite a lower posted speed limit, and 48.19% of drivers exceeded the allowable speed. In contrast, 35.14% of drivers on Murtala Mohammed Highway and 33.07% on Marian Road exceeded the respective limits. These findings indicate that although average speeds remain close to the design expectations of the roads, a significant proportion of drivers operate above the legal thresholds.

Despite these variations, the 85th percentile speeds exceeded the posted limits at all locations as shown in Figure 3, indicating a consistent tendency toward non-compliance with regulatory speed thresholds

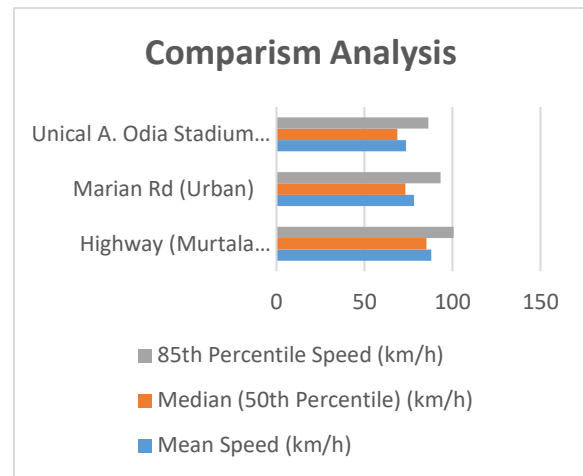


FIGURE 3: STATISTICS VALUES ACROSS ALL THREE ROADS

The histograms for individual corridors as presented in Figures 4 - 6 further illustrate positively skewed speed distributions, with long tails extending toward higher speeds

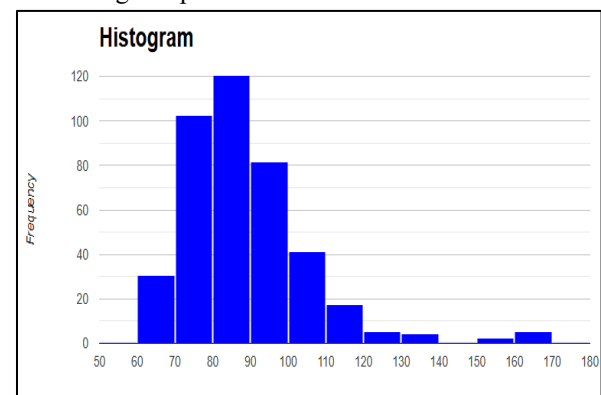


FIGURE 4: HISTOGRAM OF OBSERVED VEHICLE SPEEDS ON THE MURTALA MOHAMMED HIGHWAY

This suggests that drivers tend to maintain moderate speeds under normal conditions but engage in opportunistic speeding when traffic conditions allow. The cumulative speed distribution curves shown in Figures. 7 – 9 further reinforce this observation by demonstrating that a substantial share of drivers travels above statutory limits, particularly under free-flow traffic conditions.

TABLE VI
COMPARATIVE SPEED STATISTICS ACROSS THE THREE STUDY LOCATIONS IN CALABAR

Road Type	Mean Speed (km/h)	Median (50th Percentile) (km/h)	85th Percentile Speed (km/h)	Speed Limit (km/h)	%of Drivers Exceeding Limit	Sample Size (n)
Highway (Murtala Mohammed Road)	87.98	85.31	100.62	70	35.14%	407
Marian Road (Urban Road)	78.23	73.17	93.26	50	33.07%	387
UNICAL Abraham Odia Stadium Road	73.64	68.7	86.29	50	48.19%	83

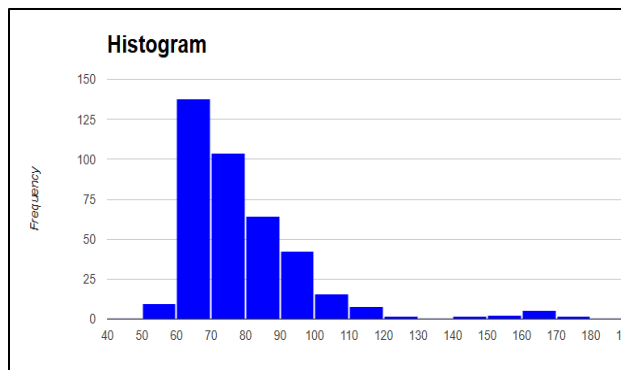


FIGURE 5: HISTOGRAM OF OBSERVED VEHICLE SPEEDS IN MARIAN ROAD

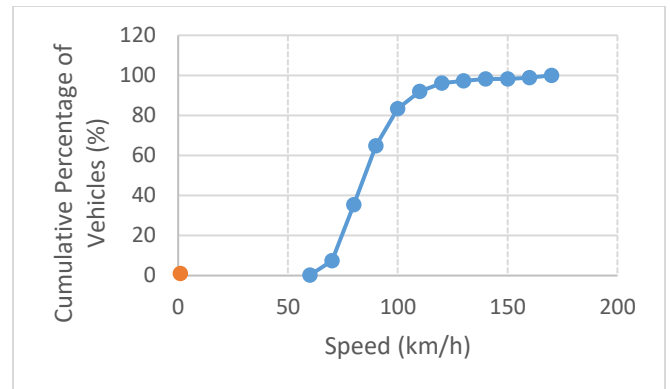


FIGURE 7: CUMULATIVE SPEED DISTRIBUTION CURVE FOR MURTALA MOHAMMED HIGHWAY ROAD

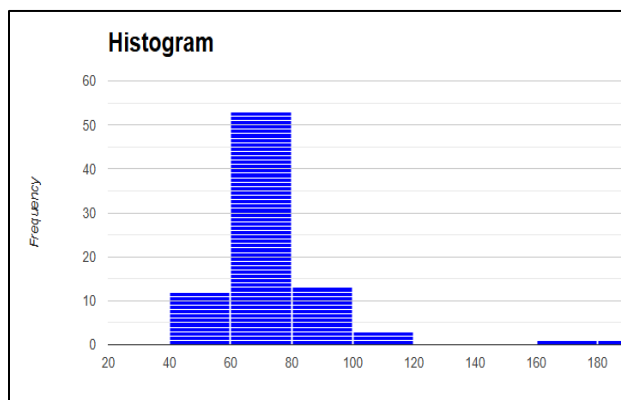


FIGURE 6: HISTOGRAM OF OBSERVED VEHICLE SPEEDS IN UNICAL ABRAHAM ODIA STADIUM ROAD

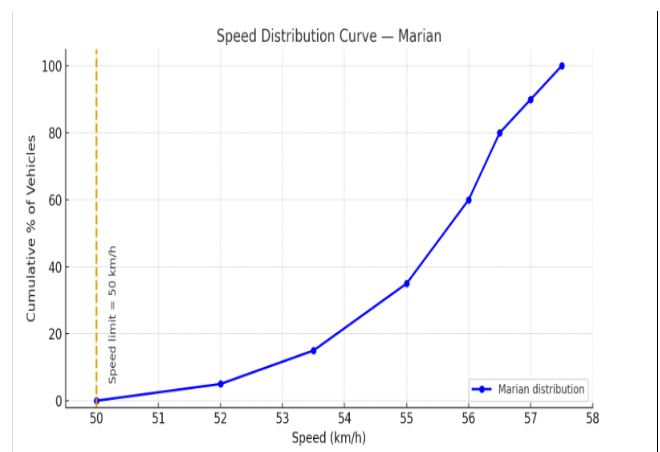


FIGURE 8: THE SPEED DISTRIBUTION CURVE ILLUSTRATES THE CUMULATIVE PERCENTAGE OF VEHICLES

speed (83.54 km/h), followed by taxis (82.83 km/h), cars (81.25 km/h), and buses (80.77 km/h).

Although the differences appear relatively modest, statistical analysis using one-way ANOVA confirmed that the variation in mean speeds across vehicle

A. Influence of Vehicle Type on Speeding Behaviour

Vehicle type was also found to significantly influence observed driving speeds. As indicated in Table VII, motorcycles recorded the highest mean

categories was statistically significant ($F = 2.91$, $p = 0.034$).

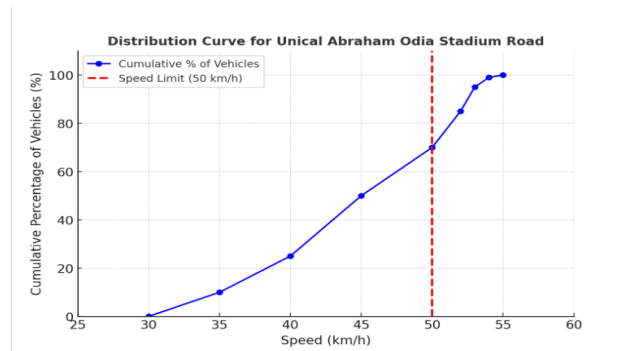


FIGURE 9: THE DISTRIBUTION CURVE FOR UNICAL ABRAHAM ODI A STADIUM ROAD

TABLE VIII
SPEEDING INCIDENCE BY VEHICLE TYPE

Vehicle Type	Frequency (n)	Percentage (%)	Mean Speed (km/h)
Car	229	23.85	81.25
Bus	285	29.69	80.77
Taxi	236	24.58	82.83
Motorcycle	210	21.88	83.54
Total	960	100	—

The higher speeds recorded among motorcycles and taxis may be attributed to the operational characteristics of these vehicles. Motorcycles are highly manoeuvrable and can navigate congested traffic easily, which may encourage riders to travel at higher speeds. Similarly, taxi drivers often operate under economic pressures to maximize trip frequency, creating incentives for faster driving. In contrast, buses and private cars generally operate under less intense time constraints, which may contribute to their slightly lower average speeds. The bar chart in Figure. 10 visually illustrates these differences in mean speeds across vehicle categories.

B. Implications for Speed Management

The results indicate that speeding behaviour in Calabar Metropolis is shaped by multiple interacting factors, including road type, vehicle characteristics, and driver demographics. While the average speeds recorded across the study corridors appear relatively close to regulatory thresholds, the elevated 85th

percentile speeds and the presence of extreme outliers reveal persistent speeding behaviour among a subset of drivers. The particularly high violation rate observed on Unical Abraham Odi A Stadium Road suggests that certain corridors may require targeted interventions such as enhanced enforcement, speed-calming infrastructure, and improved signage.

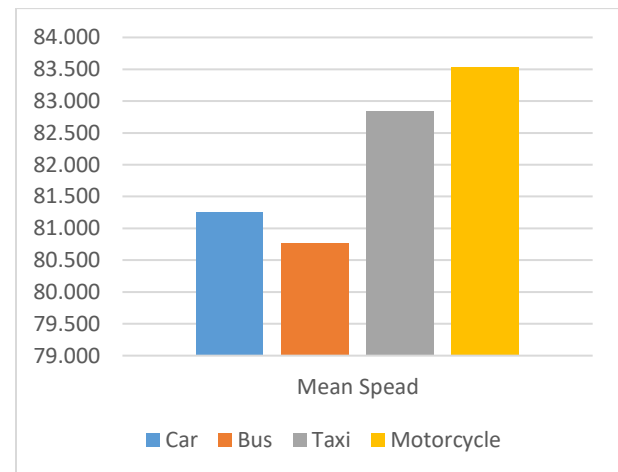


FIGURE 10: BAR CHART OF MEAN SPEEDS BY VEHICLE TYPE IN CALABAR METROPOLIS

Furthermore, the statistically significant differences in speed across vehicle types highlight the need for vehicle-specific enforcement strategies, particularly focusing on commercial motorcycles and taxis, which demonstrate relatively higher mean speeds. Addressing these behavioural patterns through a combination of engineering, enforcement, and education strategies could contribute to improved compliance with speed regulations and enhanced road safety within the Calabar metropolitan road network.

V. CONCLUSIONS

This study assessed the factors influencing drivers' speeding behaviour in Calabar Metropolis using 960 traffic observations collected across different road types, vehicle categories, and driver demographics. The results provide empirical evidence on the prevailing speed characteristics and behavioural patterns among drivers within the study area.

- The descriptive analysis showed that the driving population in Calabar is largely dominated by male drivers, with most drivers having several years of driving experience, indicating a relatively experienced driving community. However, age and driving experience were not significant

- predictors of speeding behaviour, suggesting that contextual factors may be more influential.
- ii. The average observed speed (81.99 km/h) exceeded common urban speed thresholds, with extreme values reaching 181.82 km/h, indicating the presence of a small but critical group of high-risk drivers. The positively skewed speed distribution further confirms that a minority of drivers contribute disproportionately to speeding risk.
- iii. Contrary to common expectations, female drivers exhibited a slightly higher proportional incidence of speeding (39.0%) compared to male drivers (36.1%), suggesting that local socio-economic and operational factors may influence driving behaviour in the study area.
- iv. Vehicle type significantly influenced speeding behaviour, with motorcycles and taxis recording the highest mean speeds. This highlights the influence of commercial and time-sensitive transport operations on risky driving practices.
- v. Road type also played a major role in determining driving speed, as highways encouraged higher operating speeds, while UNICAL Abraham Odia Stadium Road recorded the highest proportion of speed limit violations (48.19%), indicating weak compliance with speed regulations in certain corridors.

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