



INFLUENCE OF ROAD SIGN AWARENESS AND COMPLIANCE ON ROAD ACCIDENTS AMONG PEDESTRIANS AND VEHICLE OPERATORS IN ADAMAWA STATE, NIGERIA.

BY

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Abstract

Road accidents remain a serious public health challenge in Nigeria, with poor awareness and compliance with road signs a significant contributory factor. This study investigated the influence of road sign awareness and compliance on the incidence of road accidents among pedestrians and vehicle operators in Adamawa State. Using a cross-sectional design, data were collected from 400 respondents via structured questionnaires and analyzed using descriptive and inferential statistics. Results show that the majority of respondents demonstrated low awareness and poor compliance with road signage, and these deficiencies were significantly associated with higher self-reported road accident involvement. Recommendations include enhanced public education, targeted enforcement, and improved signage visibility.

Keywords: Road sign awareness, compliance, road accidents, pedestrians, vehicle operators, Adamawa State

Introduction

Road traffic accidents remain one of the leading causes of injury, disability, and premature death globally, posing significant public health and socio-economic challenges. According to the World Health Organization (WHO, 2023), approximately 1.19 million people die annually because of road traffic crashes, with low- and middle-income countries accounting for over 90% of these fatalities. Despite having only about 60% of the world's vehicles, these countries experience a disproportionately high burden of road traffic injuries. This situation reflects the combined effects of inadequate infrastructure, weak enforcement of traffic regulations, limited public awareness, and risky road user behaviors.

In Nigeria, the problem of road traffic accidents has persisted despite various policy interventions and the establishment of regulatory agencies such as the Federal Road Safety Corps (FRSC). Available reports indicate that thousands of lives are lost yearly on Nigerian roads, with many more individuals suffering

permanent injuries and economic hardship (FRSC, 2022). Human factors, including ignorance of traffic rules, reckless driving, speeding, and non-compliance with road signs, have been consistently identified as major contributors to road crashes across the country (Abdulkareem et al., 2019; Okenwa et al., 2024). Among these factors, road sign awareness and compliance play a critical role in shaping road user behavior and traffic safety outcomes.

Road signs are essential components of traffic management systems designed to provide regulatory instructions, warnings of potential hazards, and guidance information to road users. They function as visual communication tools that promote orderly traffic flow and reduce conflicts between vehicles and pedestrians (Shetty et al., 2024). When road users understand and obey traffic signs, they are better equipped to anticipate road conditions, adjust driving behavior, and make safe crossing decisions. Conversely, inadequate awareness or disregard for

road signs often leads to unsafe practices such as speeding, illegal overtaking, ignoring pedestrian crossings, and failure to obey traffic signals, all of which increase the likelihood of accidents.

Despite the importance of road signs, empirical evidence suggests that many road users in Nigeria exhibit limited knowledge of traffic signs and low compliance with traffic regulations. Anene (2022) reported that a significant proportion of Nigerian drivers are unable to correctly interpret standard traffic symbols, while Abdulkareem et al. (2019) found widespread non-compliance with traffic signals among commercial drivers in northern Nigeria. Similar patterns have been observed among pedestrians, who frequently ignore designated crossing points and traffic signals, thereby exposing themselves to serious injury risks (Uyeh-Nwaezeigwe, 2024). These findings suggest that the effectiveness of road signage in improving traffic safety is compromised by behavioral and knowledge-related challenges.

Adamawa State, located in northeastern Nigeria, has experienced increasing road traffic activity due to urban expansion, commercial transportation growth, and population mobility. Major towns such as Yola, Mubi, and Jimeta serve as transportation hubs connecting neighboring states and international routes. However, the growing volume of road users has not been matched by proportional improvements in traffic safety education and compliance enforcement. Reports from road safety authorities and local studies indicate that road accidents remain frequent in the state, with pedestrians and commercial vehicle operators among the most affected groups (Musa et al., 2021). Factors such as poor road sign visibility, limited public sensitization, weak enforcement, and inadequate driver training further exacerbate the problem. Although several studies have examined road safety issues in Nigeria, there remains a limited body of empirical research focusing specifically on the combined influence of road sign awareness and compliance on accident occurrence in Adamawa State. Most existing studies concentrate on major metropolitan areas such as Lagos, Abuja,

and Port Harcourt, leaving a research gap in northeastern Nigeria where traffic patterns, socio-economic conditions, and infrastructural challenges differ significantly. Understanding the level of awareness and compliance among both pedestrians and vehicle operators in this region is essential for developing context-specific interventions that can effectively reduce accident rates.

Against this background, the present study investigated the influence of road sign awareness and compliance on road accident occurrence among pedestrians and vehicle operators in Adamawa State. By examining the extent of road sign knowledge, compliance behavior, and their relationship with accident involvement, this study seeks to provide empirical evidence that can inform traffic safety policies, educational programs, and enforcement strategies. The findings are expected to contribute to the growing body of literature on road safety in Nigeria and offer practical recommendations for improving road user behavior and reducing traffic-related injuries and fatalities in the state.

Road traffic accidents (RTAs) are a major cause of injury, disability that sometimes leads to death worldwide. In Nigeria for instance, the incidence remains high despite efforts by authorities to mitigate them through policies and enforcement. Road signs are critical communication tools that inform road users about regulatory, warning, and guidance information aimed at reducing crashes. Effective signage and road traffic regulation compliance reduce misinterpretation and risky behaviours (Dewi, 2025). However, studies in Nigeria and elsewhere have documented limited awareness and compliance with road signs among drivers and pedestrians. For example, research in Southern Nigeria found out that there is low understanding of traffic signs and symbols among drivers, with implications for safety (Anene, 2022). A study in Obafemi Awolowo University community reported that even where awareness was moderate, actual compliance was low among pedestrians (Uyeh-Nwaezeigwe, 2024). In some Nigerian cities, non-compliance remains a recognized driver of accidents (Abdulkareem et al., 2019).

These studies highlight the need to understand the local dynamics of awareness and compliance in parts of Nigeria such as Adamawa State.

Research Question:

The following research questions were used to guide the study

1. What is the level of road sign awareness among pedestrians and vehicle operators in Adamawa State?
2. What is the level of compliance with road signs among pedestrians and vehicle operators in Adamawa State?
3. What is the relationship between road signage, drivers' awareness, compliance with traffic rules and the occurrence of road accident in Adamawa State.
4. What is the relationship between road sign awareness and road accident occurrence in Adamawa State

Research hypotheses:

The following hypothesis were tested at 0.05 level of significance

1. There is no significant relationship between road sign awareness and road accident occurrence among pedestrians and vehicle operators in Adamawa State.
2. There is no significant relationship between road sign compliance and road accident occurrence among pedestrians and vehicle operators in Adamawa State.

Literature Review

The review was made based on conceptual, empirical, and theoretical perspectives.

Concept of Road Signs and Traffic Safety

Essentially, road signs are visual communication tools designed to regulate traffic flow, warn road users of potential hazards, and provide guidance for safe navigation. According to Shetty et al. (2024), traffic signs serve as critical safety instruments that support orderly road usage and reduce conflict between road users. Proper interpretation of traffic signs allows drivers and pedestrians to make informed decisions that minimize accident risks. Road sign awareness refers to the ability of road users to recognize, interpret, and understand traffic symbols and instructions. Compliance, on the other hand, involves the actual adherence to the instructions conveyed by these signs. Anene (2022) emphasized that awareness alone is insufficient without

compliance, as behavioral response determines the safety outcome. Studies consistently demonstrate that inadequate comprehension of signs and disregard for traffic regulations increase the likelihood of accidents. Road signage is a core and basic component of traffic safety management systems. Effective signs communicate hazards, regulatory information, and navigational guidance quickly and clearly to all road users (Dewi, 2025). Comprehension and familiarity with signs directly influence compliance, which in turn affects accident rates (Case Studies on Transport Policy, 2020).

Road Sign Awareness and Compliance in Nigeria

Some empirical evidence from Nigeria suggests that road sign awareness and compliance remain a big problem. Ezeifeka and Ogbogu (2025) observed that many Nigerian drivers struggle to interpret standardized traffic symbols due to limited training, literacy barriers, and inadequate public education. Their findings revealed that misinterpretation of signs often results in improper driving decisions, contributing to crash occurrence. Similarly, a study assessing signage awareness among Nigerian motorists found that less than half of respondents demonstrated adequate knowledge of common traffic signs, with educational background and driving experience significantly influencing comprehension levels (IJAEM, 2022). This suggests that awareness disparities exist across population groups, further complicating traffic safety outcomes.

Okenwa et al. (2024) investigated the attitude of commercial drivers in Enugu State and reported low recognition and interpretation of regulatory signs. The study established a direct relationship between poor sign comprehension and risky driving behaviors such as speeding, wrong overtaking, and failure to observe stop signs. These unsafe practices were identified as major contributors to accident involvement among commercial drivers.

In northern Nigeria for instance, Abdulkareem et al. (2019) found widespread non-compliance with traffic lights and road signs among commercial vehicle operators in Kaduna State. The

authors reported that disregard for traffic control devices significantly increased the frequency of road crashes, especially at busy intersections and highways. These findings reflect a broader national trend of weak enforcement and poor traffic discipline.

Several studies in Nigeria reported that there are significant gaps in drivers' recognition and interpretation of traffic signs. For instance, commercial drivers in Enugu exhibited poor recognition of standard road signs, a factor identified with unsafe driving behavior and accident risk (Okenwa et al., 2024). Similarly, non-compliance with traffic signs and light signals was identified as a leading cause of crashes among commercial drivers in Kaduna State (Abdulkareem et al., 2019). International research underscores that unfamiliarity and misinterpretation of traffic signs are closely linked to non-compliance and crashes (Case Studies on Transport Policy, 2020). A study in the Philippines found that improved visibility and community involvement enhance compliance and reduce accidents (Bermudo & Rabacal, 2025).

Another study was conducted in Adamawa State metropolitan which further supported this pattern. Musa et al. (2021) identified human factors such as ignorance of traffic rules and non-compliance with signage as primary causes of road accidents. The study emphasized that despite the presence of road signs, many road users fail to adhere to traffic regulations, resulting in preventable crashes.

Pedestrian Awareness and Compliance with Road Signs

Pedestrians constitute a vulnerable category of road users whose safety depends largely on their awareness and compliance with traffic signs. Uyeh-Nwaezeigwe (2024) examined pedestrian behavior in a university community and found that although a large proportion of respondents were aware of road signs, actual compliance was significantly lower. Many pedestrians crossed roads at undesignated points and ignored pedestrian crossing signs, increasing exposure to traffic hazards. This big gap between awareness and practice highlights the behavioral dimension of

traffic safety. According to Shetty et al. (2024), behavioral attitudes, perceived risk, and enforcement visibility strongly influence whether road users comply with traffic regulations. Without consistent enforcement and education, pedestrians often underestimate the dangers associated with non-compliance.

Global Perspectives on Road Sign Awareness and Compliance

Some international studies confirm that road sign awareness and compliance are essential determinants of traffic safety outcomes. A systematic review conducted by Hassan et al. (2025) revealed that age, driving experience, and education significantly influence traffic sign comprehension and accident involvement. Younger and less experienced drivers were found to exhibit lower compliance rates and higher crash involvement compared to older drivers.

In India for instance, Shetty et al. (2024) reported that poor adherence to traffic rules and weak understanding of signage were major contributors to urban road accidents. Similarly, studies in Pakistan observed that although students demonstrated moderate awareness of road signs, risky behaviors such as speeding and crossing without observing signals remained prevalent (Khan et al., 2021). These international findings align with Nigerian studies, suggesting that poor awareness and compliance represent a global challenge that requires integrated policy interventions involving education, enforcement, and infrastructure improvement.

Structural and Enforcement Challenges

Apart from individual behavior, infrastructural and institutional factors play a significant role in shaping compliance outcomes. Enimola (2022) reported that inadequate placement, vandalization, and poor maintenance of road signs in Nigeria reduce their effectiveness. In many locations, faded or obstructed signs fail to convey critical information, leading to confusion among road users. Weak enforcement further compounds the problem. According to Independent Newspaper (2024), limited manpower, corruption, and inconsistent traffic monitoring undermine compliance efforts. Road safety experts argue that public education campaigns must be

supported by strict enforcement measures to achieve sustainable behavioral change.

Theoretical Link Between Awareness, Compliance, and Road Safety

The relationship between awareness, compliance, and road accident occurrence can be explained using behavioral and risk perception theories. These theories suggested that individuals who possess adequate knowledge of traffic signs are more likely to comply with safety regulations and avoid risky behavior. However, when awareness is low or enforcement is weak, road users may develop negative attitudes toward traffic rules, leading to habitual violations and increased accident risk (Hassan et al., 2025). This theoretical linkage supports the argument that improving awareness without addressing compliance behavior may produce limited safety outcomes. Effective road safety interventions must therefore target both cognitive understanding and behavioral enforcement.

The literature reviewed indicated that road sign awareness and compliance significantly influence road safety outcomes. Studies conducted in Nigeria and other countries consistently shows that low awareness and poor compliance contribute to high accident rates. Structural challenges such as inadequate signage and weak enforcement further exacerbate the problem. These findings justify the need for localized studies such

as the present research in Adamawa State to generate evidence-based solutions tailored to specific traffic environments.

Methodology

A descriptive cross-sectional survey was employed to assess road sign awareness, compliance behaviour, and road accident involvement among pedestrians and vehicle operators. The study was conducted in Adamawa State, Nigeria, encompassing selected urban and rural areas with diverse road traffic patterns. A total of 400 respondents (200 vehicle operators and 200 pedestrians) participated. Participants were selected through multistage sampling across two urban and two rural LGAs. Additionally, 30 traffic safety officers were engaged to provide contextual data on accident patterns and enforcement. Data were collected using a structured questionnaire and interviews. The questionnaire captured demographics, awareness of road signs, compliance behaviors, and accident involvement. Data were analyzed with SPSS. Descriptive statistics (frequencies, means) described awareness and compliance levels. Inferential statistics (Pearson correlation, regression) examined relationships between variables.

Results and Discussion.

Research Question 1: What is the level of road sign awareness among pedestrians and vehicle operators in Adamawa State?

Table 1: Frequency and Percentage on Distribution of road sign awareness among vehicle operators in Adamawa State

Awareness Level	Frequency	Percentage (%)
Low Awareness	238	59.5
Moderate Awareness	102	25.5
High Awareness	60	15.0
Total	400	100

Results in table 1 shows that 59.5% of respondents demonstrated low awareness of road signs, while only 15% showed high awareness. This indicates a major knowledge gap among road users in Adamawa State. Descriptive statistics were used to analyze respondents' awareness of road signs. Based on the result is presented in Table 1. The findings show that 238 respondents (59.5%) demonstrated low awareness,

while 102 respondents (25.5%) had moderate awareness, and only 60 respondents (15.0%) exhibited high awareness of road signs. This indicates that the majority of road users in Adamawa State lack adequate knowledge and understanding of road signs, which may negatively affect safe road usage. The level of road sign awareness among pedestrians and vehicle operators in Adamawa State is generally low. This finding agrees with that of Ezeifeka and

Ogbogu (2025) who observed that many Nigerian drivers struggle to interpret standardized traffic symbols due to limited training, literacy barriers, and inadequate public education.

Research Question 2: What is the level of compliance with road signs among pedestrians and vehicle operators in Adamawa State?

Table 2: Frequency and Percentage on Distribution of Road Sign Compliance Levels

Compliance Level	Frequency	Percentage (%)
Low Compliance	256	64.0
Moderate Compliance	94	23.5
High Compliance	50	12.5
Total	400	100

Result in table 2 revealed that 64% of respondents exhibited low compliance with road signs. This confirms widespread disregard for traffic regulations among both drivers and pedestrians. The results indicated that 256 respondents (64.0%) showed low compliance with road signs, while 94 respondents (23.5%) demonstrated moderate compliance, and only 50 respondents (12.5%) reported high compliance. This finding suggests that most road users frequently violate traffic regulations, including speed limits, pedestrian crossings, and stop signs, which increases the risk of road traffic accidents. This means that compliance with road signs among pedestrians and vehicle operators in Adamawa State is

poor and unsatisfactory. This finding agrees with the observation of Uyeh-Nwaezeigwe (2024) who examined pedestrian behavior in a university community and found that although a large proportion of respondents were aware of road signs, actual compliance was significantly lower. Many pedestrians crossed roads at undesignated points and ignored pedestrian crossing signs, increasing exposure to traffic hazards

Research Question 3: What is the relationship between road signage, driver's awareness, compliance with traffic rules, and the occurrence of road accidents in Adamawa State?

Table 3: Frequency and Percentage of Road Accident Experience

Response	Frequency	Percentage (%)
Yes	271	67.8
No	129	32.2
Total	400	100

The result in table 3 revealed that approximately 68% of respondents reported involvement in or exposure to road accidents, indicating a high accident prevalence in the study area. This finding

signifies that most of the road users had experiences on road accidents but still they are not being careful regarding compliance.

Research Question 4: To what extent is road sign awareness and road accident occurrence in Adamawa State?

Table 4: Correlation between road sign awareness and road accident occurrence

Variables	r
Awareness vs Accident Rate	-0.481
p-value	.000

The result shows that there is a moderate negative correlation between road sign awareness and accident occurrence ($r = -0.481$, $p < .05$). This means that as awareness increases, accident involvement decreases significantly. The analysis revealed a

moderate negative correlation between road sign awareness and accident occurrence ($r = -0.481$, $p < .05$). This indicates that as awareness of road signs increases, the rate of accident involvement decreases significantly. Similarly, a strong negative correlation

was found between road sign compliance and accident occurrence ($r = -0.563$, $p < .05$). This shows that improved compliance behavior significantly reduces road accident risks. There is a significant inverse relationship between road sign awareness, compliance, and road accident

occurrence. Higher awareness and better compliance lead to fewer accidents. This finding agrees with that of Abdulkareem et al. (2019) who found out that the more aware people are with road sign the lesser the chances of road accidents.

Table 5: Correlation between road sign compliance and accident occurrence

Variables	r	p-value
Compliance vs Accident Rate	-0.563	.000

This result shows that there is a strong negative relationship exists between compliance and accident occurrence ($r = -0.563$). This implies that poor compliance contributes significantly to accident rates.

Multiple regression analysis was conducted to determine the predictive influence of awareness and compliance on road accidents

Table 6: Multiple Regression Analysis Showing Predictors of Road Accidents

Predictor	B	Std Error	Beta	t	p
Constant	2.814	.193	—	14.58	.000
Awareness	-.317	.062	-.352	-5.11	.000
Compliance	-.428	.058	-.471	-7.38	.000

The regression model shows that: Awareness and compliance together explain 41.2% of the variation in road accident occurrence.

Compliance level ($\beta = -0.471$) is the strongest predictor of accident reduction. Both variables significantly predict accident occurrence at $p < .05$.

This confirms that poor awareness and low compliance significantly increase road accident risks in Adamawa State.

Hypothesis 1: There is no significant relationship between road sign awareness and road accident occurrence among pedestrians and vehicle operators in Adamawa State.

Decision rule: Reject hypothesis 1 if p -value < 0.05 .

From Table 4 $r = -0.481$ $p = .000 (< .05)$

The finding revealed that there is a statistically significant relationship between road sign awareness and road accident occurrence based on the result. Lower awareness levels significantly increase accident risk. Therefore, H01 was rejected.

Hypothesis 2: There is no significant relationship between road sign compliance and road accident occurrence among pedestrians and vehicle operators in Adamawa State.

Decision Rule: Reject Hypothesis 2 if p -value < 0.05 .

Result on table 5 shows that $r = -0.563$ $p = .000 (< .05)$

This means that road sign compliance has a significant influence on accident occurrence. Poor compliance contributes substantially to higher accident rates among road users in Adamawa State. Therefore, H02 was rejected.

Conclusion

This study confirms that low awareness and poor compliance with road signs are common among pedestrians and vehicle operators in Adamawa State, contributing to unsafe road behaviours and higher accident incidence. These findings are supported by local and national evidence indicating that inadequate understanding of traffic signs and non-compliance exacerbate crash risk (Okenwa et al., 2024; Abdulkareem et al., 2019). Moreover, the Nigerian context of inadequate signage and enforcement, as reported by road safety advocates, compounds these challenges (Independent Newspaper, 2024). The study demonstrates a clear link between road sign awareness, compliance behaviour, and road accident involvement in Adamawa State. Efforts to address these gaps through education, enforcement,

and infrastructure improvements are urgent.

Recommendations

Based on the outcome of the study, the following recommendation are proffered

1. There should be road safety Education through mass campaigns targeting both drivers and pedestrians on the meaning and importance of road signs.
2. There should be improved signage to enhance visibility, maintenance, and placement of road signs.
3. Enforcement should be strengthened on traffic compliance to deter violations.

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