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Original Article

Geographical Perspective on Driving Attitudes and Behavior: A Case Study in Mogadishu, Somalia

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Abstract - *Accurate driving behaviors are a critical challenge faced by countries globally, contributing significantly to human and economic losses in both developing and developed nations. This research aims to investigate the attitudes and practices of professional drivers towards road traffic rules and regulations in Mogadishu, Somalia. A survey questionnaire, including the DBQ and background information, was administered to a randomly selected sample of 385 drivers, and the Statistical Package for Social Sciences (SPSS) software was used for data analysis. The study revealed a strong sense of personal responsibility for road safety among participants and a general aversion to risky driving behaviors. Statistical analyses highlighted significant differences in accident involvement and unsafe driving behaviors based on marital status, vehicle type, gender, and educational level. Married individuals and Tuk-tuk drivers reported higher accident involvement compared to single individuals and SUV drivers. Furthermore, Individuals with higher education levels exhibited safer driving behaviors. These findings underscore the need for targeted road safety interventions considering demographic and vehicle-related factors to improve driving behaviors and reduce accident rates in Mogadishu.*

Keywords - *Accident involvement, Driving behavior, Driving attitude, Risk behaviors, Driver behavior questionnaire.*

1. Introduction

Globally, road traffic accidents claim approximately 1.19 million lives annually while injuring between 20 and 50 million people, many permanently. A disproportionate burden of these fatalities and injuries is borne by low- and middle-income countries, which account for 92% of global road traffic deaths despite possessing approximately 60% of the world's vehicles. Vulnerable road users, including pedestrians, motorcyclists, and cyclists, comprise a significant portion of all victims. These crashes impose substantial economic burdens on individuals and nations alike, accounting for roughly 3% of global GDP [1].

Africa faces a disproportionately high rate of road traffic deaths. With a staggering 26.6 fatalities per 100,000 people, the continent has the world's highest road death rate compared to the global average of 17.4. This crisis is particularly alarming considering Africa boasts only 46.6 cars per 1,000 people, a stark contrast to Europe's 510.3 [2, 3].

In fact, Africa accounts for a shocking 20% of global road fatalities despite having just 2.3% of the world's vehicles. This means the region experiences a disproportionate number of road deaths relative to its vehicle population. Pedestrians are particularly vulnerable, comprising 39% of fatalities, while motorcyclists have the lowest risk at 7%. This statistic may be skewed due to inadequate data collection on road user fatalities across many African nations. Nonetheless, Africa undeniably has the highest rate of road deaths and a larger population of vulnerable road users [4, 5].

Road Traffic Accidents (RTAs) are complex events influenced by various factors, including road conditions, vehicle design, and human behavior. Research consistently underscores the paramount role of human error in accident causation, with driver error identified as the primary culprit in approximately 75% of all crashes [6, 7]. Addressing this critical issue has led to the widespread adoption of the "3 E's" approach: education, enforcement, and engineering. Implemented in numerous countries, this strategy has demonstrated efficacy in modifying driver attitudes, behaviors, and, ultimately, accident rates [8, 9, 10]

However, a significant knowledge gap exists regarding motorist conduct and the underlying causes of reckless driving in Somalia. Unlike many other nations, the country lacks comprehensive scientific research to inform targeted interventions. This dearth of data is attributable to challenges in designing and implementing behavior change programs within the Somali context.

To bridge this gap and mitigate the devastating consequences of road accidents, a comprehensive study is imperative. By investigating the root causes of reckless driving in Somalia and drawing on global best practices, this research aims to develop effective strategies for reducing fatalities and injuries on the country's roads [11-15].

To gather comprehensive data on driver behavior, a questionnaire-based methodology will be implemented. This approach will adhere to rigorous statistical standards to ensure data reliability and validity.

The collected data will inform the development of a theoretical framework aimed at understanding the relationship between demographic variables, driver behavior and accident involvement. This will serve as a foundation for developing effective interventions to enhance road safety in Mogadishu.

2. Literature Review

Understanding driving attitudes and behaviors requires a comprehensive examination of various geographical, cultural, socioeconomic, and infrastructural factors. The city of Mogadishu, Somalia, presents a unique case due to its complex historical and political context, which significantly influences local driving practices. To gain a holistic view of how geographical contexts shape driving behaviors, it is beneficial to compare and contrast findings from studies conducted worldwide. This literature review matrix summarizes key studies on driving attitudes and behaviors from diverse geographical settings, providing insights that can inform the understanding and improvement of road safety in Mogadishu. By exploring these global perspectives, we aim to identify common patterns and unique challenges that can guide the development of effective strategies for enhancing driving behavior in Mogadishu.

Table 1. Summary of key studies on driving attitudes and behaviors from diverse geographical settings

Study	Countries	Measures	Key Findings
[16]	Jordan	Driver Behavior Questionnaire (DBQ), including violations, errors, and lapses.	-Younger and less experienced drivers committed more violations, errors, and lapses. Males reported a higher number of violations, while females were found to have committed more errors and lapses. -Drivers with higher education levels exhibited fewer violations, errors, and lapses.
[17]	Finland, Iran, Great Britain, Greece, Turkey and the Netherlands	Driver Behavior Questionnaire (DBQ), including aggressive violations, ordinary violations and errors	- Significant differences in driving styles and accident rates between "safe" Northern / Western European countries and Middle Eastern / Southern European countries. - The three-factor structure of the Driver Behavior Questionnaire (DBQ), measuring aggressive, ordinary, and error-based violations, showed partial consistency across six countries.
[18]	Australia	Driver Behavior Questionnaire (DBQ), including violations, errors, lapses, and aggressive violations.	The study validated the widely used DBQ measure in an Australian context while also identifying potential issues with its applicability for younger and older drivers that may require further investigation.
[19]	China	The study used a revised DBQ that includes 23 items total. Of the original 24 DBQ items, the study modified 5, left 8 unchanged, removed 11, and added 10 new items based on field-observed driving behaviors.	- Male drivers, drivers with 3-5 years of driving experience and those in their thirties exhibited higher rates of unsafe driving practices - The study proposed an objective approach to modify DBQ items, surpassing the limitations of subjective evaluation.
[20]	Britain, Finland, and The Netherlands.	Driver Behavior Questionnaire (DBQ) to measure driver errors, violations, and lapses.	- The study underscored some challenges associated with the cross-cultural application of traffic behavior questionnaires. While the overall factor structures demonstrated similarity across countries, the study found some variations in the factor structures.
[21]	Turkey	DBQ and Depression Anxiety Stress Scales (DASS-21)	- Drivers of minibuses, vans, and pickup trucks were more prone to being involved in accidents and also exhibited higher levels of depression, anxiety, and stress symptoms compared

			to commercial taxi drivers. - Reductions in road traffic crashes may be achieved by preventing people from driving when fatigued, sleepy or sleep-deprived, especially during rush hours.
[22]	India	DBQ including violations, relatively harmless lapses and dangerous errors.	- Demographic factors like gender, age, socioeconomic status, and driving experience were determined to be significant predictors of aberrant driving behaviors - Younger drivers, male drivers, and drivers with fewer years of experience exhibited higher levels of offences and faults compared to older, female, and more experienced drivers. - Drivers from lower socioeconomic backgrounds showed higher levels of all three types of aberrant behaviors (offences, faults, lapses).
[23]	Indonesia	Manchester Driving Behavior Questionnaire (DBQ).	- Risky driving behavior and eco-driving behavior scores showed a strong positive correlation (r: 0.727). - To enhance the long-term effectiveness of eco-driving behavior adoption, the authors recommend incorporating education on safe driving practices into eco-driving training programs.
[24]	Iran	Manchester Driver Behavior Questionnaire (DBQ)	- The study found that older and more experienced drivers tended to commit fewer driving violations.
[25]	Kuwait	Manchester Driver Behavior Questionnaire (DBQ) including errors, lapses and violations.	- Human factors, including driving styles and skills, are identified as key contributors to the high accident rates - Road accident fatality rates in the GCC countries, including Kuwait, surpass those of European countries and the USA. -The study suggests the need for further examination of the DBQ structure and driver behavior in the Kuwaiti and GCC context.
[26]	Malaysia	Malay-language version of the Manchester Driver Behavior Questionnaire (DBQ) to investigate the driving behaviors of older car drivers and motorcyclists in Malaysia.	- The study found a difference between older motorcycle riders and older car drivers in their perception of driving "lapses". This difference, the authors suggest, supports the idea that declining cognitive abilities in older age can contribute to a higher risk of attention-related problems while driving.
[27]	Spain	- Manchester Driver Behavior Questionnaire (DBQ), which has subscales for lapse errors and ordinary and aggressive violations. -The DBQ was translated into Spanish for this study.	- Spanish drivers seemed to exhibit a different pattern of aberrant driving behaviors compared to samples in other countries where the DBQ has been used. - However, consistent with prior research, the strongest predictor of self-reported crash involvement among Spanish drivers was the "violations" factor, encompassing both regular and aggressive driving behaviors.
[28]	Oman	Elements from the Behavior of Novice Young Drivers Scale (BNYDS) and DBQ were incorporated.	Nearly 40% of the study's participants reported being involved in a car crash. Statistical analysis revealed that driving while experiencing negative moods, fatigue, or distractions was a strong predictor of crash involvement. The researchers emphasize the need for further development of reliable self-reporting tools to better identify drivers at higher risk of accidents.
[29]	Qatar and the United Arab Emirates	Manchester Driver Behavior Questionnaire (DBQ), including errors,	The study revealed that UAE drivers scored higher on nearly all aspects of the (DBQ), indicating riskier driving behaviors. Within the UAE sample, men and women showed very similar

		lapses, and Aggressive and Ordinary Violations.	DBQ scores. Significantly, self-reported accident involvement was high in both countries: 80.5% of Qatari drivers and 55.8% of UAE drivers reported experiencing at least one road accident.
[30]	Bulgaria, Romania, and Serbia	- Driver Behaviour Questionnaire (DBQ) Extended version with 27 items, including Aggressive violations, general violations, omissions, and errors.	Romanian drivers displayed riskier driving behaviors, scoring higher on numerous measures of errors and traffic violations. Speeding violations were prevalent in all three countries. Furthermore, the study found a consistent link across all three samples: drivers who engaged in more errors or violations were also more likely to report being involved in traffic accidents.
[31]	Ghana	Manchester Driver Behavior Questionnaire (DBQ), Self-Reported Crash Involvement and Traffic Citations.	- Both driving errors and traffic violations, independently of each other, showed a correlation with a higher likelihood of self-reported crash involvement. - Compared to UK drivers, Ghanaian drivers reported engaging in more frequent violations and errors.
[32]	Tunisia	Driver Behaviour Questionnaire (DBQ) and Principal Component Analysis (PCA)	- Speeding was the most common aberrant behavior reported and a major road safety concern. - Tunisia's road fatality rate surpasses that of many developed countries. - Males, particularly younger ones, reported higher frequencies of violations. - Younger drivers reported fewer lapses than older drivers.
[33]	Nigeria	Driver Behavior Questionnaire (DBQ) including driving violations, driving errors, and positive driving behavior	- The study population comprised 880 truck drivers, of which 799 were male and 79 were female. - 64.0% of the drivers reported being involved in a road traffic collision. - Common risky behaviors identified include driving through red lights, using phones while driving, and expressing anger through aggressive driving actions.
[34]	Brazil and Portugal	Driver Behavior Questionnaire (DBQ) and Updated Risk Behavior Items (URBI)	- Brazilian drivers were more likely to engage in risky driving behaviors, such as speeding and drunk driving, compared to their Portuguese counterparts. - Human factors, such as distraction and fatigue, were significant contributors to risky driving behaviors in both countries. - The improved road conditions in Portugal led to safer driving practices, while deficiencies in Brazil's infrastructure correlated with higher risk behaviors. - Differences in traffic law enforcement impacted driver behavior; stricter penalties in Portugal led to better compliance with traffic regulations.
[35]	North America	Driver Behavior Questionnaire (DBQ), 82 items were considered.	- There was a significant prevalence of both error and violation behaviors among participants, indicating common risky practices in North American driving. - Younger drivers reported higher rates of violations, while older drivers exhibited more errors attributed to lapses in attention. Males generally reported more aggressive driving behaviors compared to females.

Key findings from these studies highlight the influence of demographic factors, cultural contexts, and vehicle types on driving behaviors. Several consistent patterns emerge, such as younger and less experienced drivers committing more violations and errors, while higher education levels are generally associated with safer driving behaviors.

Gender differences are also evident, with males often reporting more violations and aggressive driving behaviors compared to females. Specific vehicle types, such as Tuk-tuks and minibuses, are associated with higher accident involvement, emphasizing the need for targeted interventions for different driver groups.

Cultural and regional differences play a significant role in driving behaviors, with studies from Western and Northern European countries generally reporting safer driving practices compared to Southern European, Middle Eastern, and developing countries. The implementation and effectiveness of the Driver Behavior Questionnaire (DBQ) vary across different contexts, suggesting the need for localized adaptations to accurately capture driving behaviors.

Overall, the matrix underscores the importance of demographic, cultural, and infrastructural factors in shaping driving attitudes and behaviors. These insights can inform the development of tailored road safety strategies to address the unique challenges faced by different regions, particularly in improving driving behaviors and reducing accident rates in areas like Mogadishu.

3. Materials and Methods

3.1. Sample

A survey was conducted among 385 randomly selected professional drivers, both male and female, in Mogadishu, Somalia. The data was collected using a structured questionnaire and subsequently analyzed using appropriate statistical methods.

3.2. Measures

The measure consisted of two subscales: attitude and behavior. Attitude was assessed using a 5-point Likert scale (1 = Strongly disagree to 5 = Strongly agree) with nine items. Driver behavior was measured using a modified 13-item Driver Behavior Questionnaire (DBQ) assessing aberrant driving behaviors, including violations, errors, and lapses. A 5-point Likert scale (1 = Never to 5 = Always) was used to determine the frequency of these behaviors.

3.3. Demographic Variables

Participants provided demographic information, including gender, Age, marital status, educational level, working hours, and days per week. Additionally, driving-related information was collected, such as years of driving experience, salary, vehicle type, ownership, possession of a driving license, driving school attendance, and involvement in accidents (both at fault and not at fault).

3.4. Statistical Analysis

Data analysis was performed using Statistical Package for Social Sciences (SPSS). Descriptive statistics, including mean, median, mode, and standard deviation, were calculated to summarize the data. Independent t-tests were used to explore potential differences in attitudes, behaviors, and accident involvement based on demographic variables. The reliability of the scales used in the study was evaluated by calculating Cronbach's alpha, a measure of internal consistency.

4. Results and Discussion

Table 2 outlines the demographic and driving-related characteristics of a study population comprising 385 individuals. The data reveals a predominantly male sample (98%) with a mean age of approximately 30 years. Marital status was evenly distributed, with 42% single and 58% married. Educational attainment varied, with 21% below basic, 19% basic, 35% with high school education, and 25% holding university degrees. Participants primarily worked long hours, with 44% working 9-12 hours daily and 43.5% working more than 12 hours. Driving experience was moderate, with 48% having 2-5 years of experience. Tuk-tuks were the most common vehicle type used by participants, accounting for 60% of the sample, followed by vans (17%) and SUVs (23%).

Table 2. Background of the respondents

Variable	Frequency	Percent
Gender		
Male	377	98%
Female	8	2%
Total	385	100%
Marital Status		
Single	159	42%
Married	226	58%
Total	385	100%
Age		
<20	45	12%
20-29	172	45%
30-39	121	31%
40-49	35	9%
>50	12	3%
Total	385	100%
Level of Education		
Education Level	Frequency	Percent
Below Basic	83	21%
Basic	73	19%
High School	134	35%
University Degree	95	25%
Total	385	100%
Working Hours Per Day		
<8	49	12.5%
9-12	169	44%
>12	167	43.5%
Total	385	100%

Driving Experience		
<1	29	7.5%
2-5	186	48%
6-9	105	27.5%
>10	65	17%
Total	385	100%
Type of Vehicle		
TUK-TUK	231	60%
VAN	65	17%
SUV	89	23%
Total	385	100%

Table 3. Means and standard deviations of items of driver attitude questions

Item	Mean	Standard Deviation
I think traffic safety is my personal responsibility	4.2623	0.79140
Personal behavior is the key contributing factor to traffic safety	4.1818	0.73823
Traffic rules must be respected regardless of road and weather conditions	4.0727	0.81324
It is possible that I would ride with a driver that has had something (alcoholic) to drink.	2.0260	0.94613
If I trust a person, I would ride with him/her even if he/she had been drinking alcohol.	2.0935	0.90230
Using a high beam at night is a risk for drivers?	3.1091	1.04759
Do you think overtaking from the Right is not a good practice for drivers?	3.0364	1.23268
Use the wrong side of the road to take a shortcut while driving is dangerous.	2.9091	1.18565
Smoking while driving is risky	2.7792	1.07072

Table 3 presents the mean scores and standard deviations for various attitudes related to road traffic safety. The data collected through a Likert scale survey reveals a positive orientation towards personal responsibility in ensuring road safety. Participants strongly believe that individual behavior is crucial in preventing accidents.

Furthermore, the table highlights a strong aversion to risky driving behaviors such as driving under the influence of alcohol, excessive speeding, and disregarding traffic lanes. These findings suggest a good understanding of the potential consequences of such actions. However, the perception of smoking while driving as a moderate risk warrants further investigation.

Table 4 Presents statistical data on various unsafe driving behaviors, rated on a 5-point scale where 1 indicates "never" and 5 indicates "always." The behaviors assessed include failing to check the rear-view mirror before a maneuver, attempting to overtake someone signaling a right turn, and braking too quickly or steering the wrong way into a skid, among others.

Among the behaviors, "Underestimate the speed of an oncoming vehicle when overtaking" had the highest mean score of 3.1636, suggesting it is a relatively common behavior among respondents. Conversely, "Forget where you left your car in the park" had the lowest mean score of 1.4442, indicating it is the least common behavior. The standard deviations provide further insights into the variability of these behaviors. The behavior "Fail to check rear view mirror before a maneuver" had the highest standard deviation of 1.46815, reflecting significant variability in how frequently respondents engage in this behavior. In contrast, "Forget where you left your car in the park" had the lowest standard deviation of 0.89712, suggesting more consistency in responses regarding this behavior.

Moderate mean scores were observed for behaviors such as "Hit something when reversing that you have not previously seen" (Mean: 2.2909, SD: 1.13355), "Overtake slow driver on the side" (Mean: 2.2675, SD: 1.21561), and "Drive close to the car in front making it difficult to stop in an emergency" (Mean: 2.1273, SD: 1.18888). These behaviors displayed moderate commonality and variability among respondents.

More common behaviors included "Sound your horn to indicate your annoyance at another road user" (Mean: 2.9299, SD: 1.38923) and "Angered by a certain type of driver show your hostility" (Mean: 2.4364, SD: 1.26521), both of which exhibited significant variability. In contrast, less common behaviors such as "Switch on one thing, such as headlights, when you meant to switch on something else, such as wipers" (Mean: 1.7578, SD: 1.05770), "Angered by another driver giving chase" (Mean: 1.8000, SD: 1.09640), and "Get involved with unofficial ‘races’ with other drivers" (Mean: 1.5714, SD: 0.99515) showed relatively lower means and moderate to low variability.

Table 5 presents results from independent t-tests comparing the mean accident involvement of married and single individuals, as well as drivers of SUVs and Tuk-tuks. Married individuals have a significantly *higher* mean accident involvement (3.4602) compared to single individuals (2.1761). This indicates that married individuals are more likely to be involved in accidents on average, compared to single individuals. Drivers of SUVs have a significantly *lower* mean accident involvement (2.2597) compared to drivers of

Tuk-Tuks (3.3667). This implies that SUV drivers tend to be involved in fewer accidents. These findings suggest that marital status and vehicle type are associated with accident involvement. It's crucial to interpret these results cautiously. The analysis only considers a limited set of variables. To gain a deeper understanding, further research is needed, including exploring other factors, calculating effect sizes, and investigating the distribution of accident involvement.

Table 6 presents results from independent t-tests comparing mean unsafe driving behavior scores between different groups. Males exhibit significantly lower unsafe driving behavior compared to females ($t = -3.469$, $p = 0.001$). Similarly, individuals with university degrees exhibit significantly lower unsafe driving behavior compared to those with below basic education ($t = -2.245$, $p = 0.023$). Furthermore, drivers of SUVs have significantly lower unsafe driving behavior compared to drivers of Tuk-Tuks ($t = -2.388$, $p = 0.018$). These findings suggest that gender, education and vehicle type are associated with differences in unsafe driving behavior. However, it's crucial to consider other factors that might influence these results, as this analysis only examines three variables.

Table 7 presents results from independent t-tests comparing the mean scores of a dependent variable, "Attitude of the driver," across different groups. No statistically significant differences were found in the attitude of the driver based on education level, age, or driving experience. The t-values for all comparisons are relatively small, and the corresponding p-values are greater than the conventional alpha level of 0.05.

Table 4. Means and std deviations of items of driver behavior questions

Item	Mean	Standard Deviation
Fail to check rear view mirror before a maneuver	2.5377	1.46815
Attempt to overtake someone signaling a right turn	1.8753	1.15922
Brake too quickly or steer the wrong way into a skid	1.7351	1.02187
Forget where you left your car in the park	1.4442	0.89712
Hit something when reversing that you have not previously seen	2.2909	1.13355
Underestimate the speed of an oncoming vehicle when overtaking	3.1636	1.43677
Switch on one thing, such as headlights, when you meant to switch on something else, such as wipers	1.7578	1.05770
Overtake slow driver on the side	2.2675	1.21561
Drive Close to the car in front making it difficult to stop in an emergency	2.1273	1.18888
Sound your horn to indicate your annoyance at another road user	2.9299	1.38923
Angered by a certain type of driver show your hostility	2.4364	1.26521
Angered by another driver giving chase	1.8000	1.09640
Get involved with unofficial ‘races’ with other drivers	1.5714	0.99515

Table 5. Independent t tests for accident involvements

Independent T-Test							
Dependent Variable	**Independent Variable**		**Mean**	**St. Deviation**	**Mean Difference**	**t**	**Significance**
Accident Involvement	**Marital Status**	Single	2.1761	2.80039	-1.28408	-2.818	0.002
		Married	3.4602	5.24262	-1.28408	-3.106	
	Type of Vehicle	SUV	2.2597	3.87209	-1.10693	-2.154	0.027
		TukTuk	3.3667	4.75099	-1.10693	-1.970	

Table 6. Independent t-tests for driving behaviors

Independent T-Test							
Dependent Variable	**Independent Variable**		**Mean**	**St. Deviation**	**Mean Difference**	**t**	**Significance**
Behaviour of the Driver	**Gender**	Male	2.1348	0.54407	-0.68254	-3.469	0.001
		Female	2.8173	0.83452	-0.68254	-2.303	
	Education	Below basic	2.1015	0.49443	-0.19892	-2.245	0.023
		University Degree	2.3004	0.66163	-0.19892	-2.289	
	Type of Vehicle	SUV	2.0818	0.54590	-0.16697	-2.388	0.018
		TukTuk	2.2487	0.60427	-0.16697	-2.283	

Table 7. Independent t-tests for attitude of driver

Dependent Variable	**Independent Variable**		**Mean**	**Std. Deviation**	**Mean Difference**	**t**	**Significance**
Attitude of the Driver	**Level of Education**	Below Basic	3.1419	0.32525	-0.06161	-0.974	0.319
		University Degree	3.2035	0.48935	-0.06161	-1.000	
	Age	<20	3.1185	0.48744	-0.06243	-0.646	0.520
		40-49	3.1810	0.33883	-0.06243	-0.675	
	Experience	<1	3.0766	0.47523	-0.06183	-0.696	0.535
		>10	3.1385	0.35898	-0.06183	-0.626	

5. Conclusion

This study aimed to investigate the relationship between geographical factors and driving attitudes and behaviors in Mogadishu, Somalia. The study's results emphasize the importance of personal responsibility and adherence to traffic rules in promoting road safety. The findings reveal significant associations between demographic factors, vehicle type, and both accident involvement and driving behaviors. Married individuals and Tuk-tuk drivers are more likely to be involved in accidents, while males and those with higher education levels tend to exhibit safer driving practices. These insights suggest that tailored road safety programs addressing specific demographic and vehicle-related issues could enhance overall traffic safety in Mogadishu. Further research is needed to explore additional variables and factors influencing driving attitudes and behaviors, providing a more comprehensive understanding of the challenges and potential solutions for improving road safety in this region.

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