



## Determinants of Road Traffic Accidents Among Motorcycle Riders In Four Selected Sub-Counties, Kitui County, Kenya

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### Abstract

**Background:** Over 50 million instances of serious injuries have been documented annually, while 1.2 million instances of mortality related to traffic accidents are disclosed around the world. This study aimed to establish the determinants of road traffic accidents among motorcycle riders in selected four Sub-counties in Kitui County, Kenya.

**Material and Methods:** The study employed a descriptive cross-sectional study design. Multi-stage sampling was employed to recruit study respondents for this study. Quantitative data was collected using a structured questionnaire while Key informant interview guides were used to capture qualitative data. Frequency and percentage were used to examine descriptive data while the association between two or more variables of interest was examined using logistic forward linear regression. Qualitative data was analyzed thematically.

**Results:** From this study, there was a positive statistical association between environmental factors in motorcycle accidents ( $R=.392$ ;  $p.05$ ), translating to environmental factors being responsible for around 15.1% of possible motorcycle accidents. There was a positive statistical association between personal characteristics and motorcycle accidents ( $R=.291$ ;  $p.05$ ), translating to personal characteristics being responsible for around 8.5% of possible motorcycle accidents. Lastly, there was a positive statistical association between riding skills and motorcycle accidents ( $R=.342$ ;  $p.05$ ), translating to riding skills being responsible for around 10.2% of possible motorcycle accidents.

**Conclusion:** From this study motorcycle accidents are a public health concern. In addition, environmental factors, personal characteristics, and riding skills were found to be statistically associated with motorcycle accidents.

Keywords; Boda-Boda, Fatal Injury, Motorcycle, Road traffic accident.

### Introduction

Unseen pandemics and automobile crashes have a significant impact on the environment, society, economy, and health<sup>1</sup>. Road accidents cause roughly 1.3 million deaths and 50 million disabilities around the world each year, which have an impact on the daily lives of individuals<sup>2</sup>. Furthermore, at the scene of an accident, within a few minutes, about 50% of these fatalities from traffic accidents take place. To improve the victim's chances of survival, bystanders must act quickly.<sup>3</sup>

According to the World Report on Road Safety, 68 countries have seen an increase in the total amount of

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mortality cases reported for 2010, with countries that are developing accounting for 84% of these deaths<sup>4</sup>. Nowadays, motorcycles are the most common type of two-wheeled vehicle. Due to their effectiveness and dependability, motorcycles continue to be the most popular mode of public transport in economically advanced nations like

China, Asia, Vietnam, and Indonesia<sup>5</sup>. The World Economic Survey report from 2010 states that the following countries continue to have the most significant motorcycle industries. A total of 83,000 motorcycle riders were injured in 2021<sup>6</sup>. During that year, there were 468 injuries for every 100 million vehicle miles driven. The number of fatalities from powered two- and three-wheeled vehicles, including motorcycles, mopeds, scooters, and electrical bikes (e-bikes), is increasing and accounts for nearly 30% of all traffic crash deaths<sup>7</sup>.

In low and middle-income nations, motorcycle use is becoming the most preferred mode of transport. In a report produced by WHO, 69% of the automobiles in developing nations consist of motorcycles a figure that is expected to increase as time goes on<sup>8</sup>. The chance of mortality cases being reported due to road traffic is higher in African countries for example it is estimated that twenty-four point two persons per one hundred thousand persons (24.2/100,000) population die due to road accidents in Africa as compared to the European countries (10.3/100,000) according to WHO report<sup>9</sup>.

According to a World Health Organization (WHO) report, rapid automobile adoption without concurrent funding for roadway security strategies may be partially to blame for the higher death rates observed in Kenya, Uganda, South Sudan, Rwanda, and other developing nations<sup>10</sup>. Ugandans invented motor process services for transportation, or "boda boda"<sup>11</sup>. Originally offered on bicycles, this form of transportation has since developed in Kenya to incorporate motorcycles. In Kenya, the market for motorcycles is growing, and many people use them as their primary means of transportation in remote, undeveloped villages alongside other hard-to-reach places<sup>12</sup>.

For Kenyans, motorcycle manufacturing has produced over 100,000 jobs. Last but not least, the motorcycle industry has fewer legal requirements, which means that there are fewer constraints, which increases flexibility<sup>13</sup>. Moreover, fewer resources are required for motorcycle riders to receive training, which increases convenience. According to a 2015 Ministry of Health(MOH) medical report, data from Kenya's Nationwide Transportation and Safety Authority (NTSA) revealed that 3,057 people lost their lives in traffic-related deaths in 2015.

This number does not only include motorcyclist collisions. Kitui County, Kenya, faces a significant challenge with road traffic accidents, especially due to factors such as poor road conditions, speeding, and limited enforcement of traffic regulations<sup>14</sup>. Motorcycle accidents are a major contributor to road traffic injuries and fatalities in Kenya, with motorcyclists being particularly vulnerable due to their lack of physical protection compared to other vehicles. Current road safety data in Kitui and many rural areas of Kenya is limited, with most information being general or focused on urban centers. This study aimed to examine the determinants of road traffic accidents among motorcycle riders in four selected sub-counties, Kitui County, Kenya.

## 2. Material And Methods

### 2.1 Study design

The study employed a descriptive cross-sectional study design. This approach helped the researcher to obtain information concerning motorcycle accidents among the youth riders. In addition, the study utilized both qualitative as well as quantitative methods of research approach in the present investigation.

### 2.2 Study area

Kitui County is located in the former Eastern Province of Kenya. Kitui is the county's capital and largest town. The study was conducted in four sub-counties in Kitui county; Kitui Central, Kitui Rural, Kitui East, and Kitui West. A large portion of the county's internal road network is still unpaved, despite the fact that Kitui's main roads particularly those that connect Kitui to other major counties are paved. These unpaved roads, which are frequently dusty or gravelled, and can be difficult to traverse, particularly during wet seasons, which reduces the dependability of rural transportation hence a major source of road accidents.

### 2.3 Study population

There are 1,136,187 people living in Kitui County, according to the most recent census (KNBS, 2019). The county is 30,430 square Kilometers in size. The population of the four sub-counties that were chosen is 223,171. 23% of the population is made up of young people, who were the subject of the research.

Therefore, Motorcycle riders were the target demographic for this study only considered motorcycle riders who engaged in the commercial motorcycling industry in Kitui for the past six months.

## 2.4 Sample size determination

The population of youths in Kitui County in Kenya according to the latest Kenya Bureau of Statistics projection is 261,323 which is over ten(10,000), and was used in the sample size determination using Yamane formulae of 1968. The Yamane Formula (1968) was utilized to calculate the number of participants from this group of 51,329 young people in the research area which yielded a total sample size of 424 respondents.

## 2.5 Sampling technique

Multi-stage sampling was employed in this study where purposive sampling was used to recruit Kitui County as the study site for this study. Stratified random sampling and simple random sampling were employed to recruit study respondents in this study. Participants for Key Informant Interviews were conducted with participants drawn from selected experts in the transport sector in Kitui County such as Police Officers. This was done using purposive sampling techniques.

## 2.6 Data collection tools and procedures

Quantitative data was collected using a structured questionnaire. The structured questionnaire was administered to the youth motorcycle riders in all the selected sub-counties. Section A captured data on environmental factors, Section B on personal factors, and Section C on riding skills influence on motorcycle accidents among Bodaboda riders. Key informant interview guides were used to capture qualitative data.

## 2.7 Statistical analysis

The descriptive study involved a frequency and proportion of youth who had been riding a motorcycle in the past twelve months in the selected sub-counties. Using SPSS V25.0, quantitative data was gathered and analyzed to determine the factors that contribute to motorcycle crashes involving young riders. The association between two or more variables of interest were examined using the robust

statistical method known as logistic forward linear regression. The analyzed data was tabulated, cleaned, coded, and classified as appropriate. Qualitative data was analyzed thematically.

## 2.8 Ethical consideration

The ethics and researcher committee at Mount Kenya University granted permission for the investigator to carry out this investigation. National Science, Technology, and Innovation Priorities. Kenya Science, Technology and (Innovation NACOSTI) was also consulted for approval. Authorization from Kitui County's national and local authorities as well as the county health department's training committee. The postgraduate school at Mount Kenya University (MKU) was asked for permission. The young individuals who responded or took part were asked for their informed consent.

## 3. Results

### 3.1 Descriptive statistics on respondents' socio-demographic characteristics.

Table 1 below provides descriptive statistics on respondents' socio-demographic characteristics. Concerning the gender of the study respondents, the Majority(90.3%) of the study respondents were males while only a few(9.7%) were females. Regarding the age of the study participants, close to a quarter(27.8%) of the study respondents were aged 18-24 years while only a few(1.7%) of the study partakers were aged less than 18 years. Concerning the marital status of the study respondents, more than half(59.4%) of the study

Table 1: Descriptive statistics on socio-demographic characteristics

Independent variables	Categories	Frequencies	Valid percentage
gender	Male	383	90.3
	Female	41	9.7
Age/Years	Less than 18 years	7	1.7
	18-24	118	27.8
	25-31	109	25.7
	32-38	70	16.5
	39-45	56	13.2
	46-52	29	6.8
	53+	35	8.3
Marital status	Married	252	59.4
	Single	137	32.3
	Separated	35	8.3
Education level	No formal education	11	2.6
	Primary	98	23.1
	Secondary	207	48.8
	College	87	20.5
	University	21	5

respondents were married while only a few(8.3%) reported being separated. Lastly concerning the education status of the study respondents, close to half(48.8%) of the study respondents had attained a secondary school of education while a few(5%) had attained a university level of education.

As indicated in Table 2 below, It was found that (54%) of those surveyed strongly agreed that county-wide regulations for driving and traffic laws reduce accidents. Traffic laws and county-wide driving regulations reduce accidents, according to 18% of respondents; 7% of the people surveyed were undecided about this; and 21% of participants thought strongly that traffic laws and county-wide bringing about regulations do not reduce accidents. More than half of those polled (54%) were in agreement, according to the results, that county-wide driving regulations and traffic laws reduce accidents. Participants were additionally asked to rate their agreement or disagreement with the claim that corrupt county administrators and traffic cops are to blame for motorcycle accidents. More than half (69%) of those surveyed firmly agree that corrupt region administrators and law enforcement officers are to blame for motorcycle accidents. Once more, participants were asked to indicate whether they were in agreement or disagreement with the claim that Kitui County has a higher rate of motorcycle accidents as a result of poor road conditions. More than half (53%) strongly agreed that Kitui County has a higher rate of motorcycle accidents as a result of poor road conditions. Finally, the statement that higher incidents among drivers have been a result of the weather was also posed to those who responded. The majority (71%) of those surveyed firmly concur that the weather has a role in

the rise in motorcycle accidents. Six percent of participants agreed that vehicular accident rates have increased as a result of weather-related factors, six percent disagreed and six percent were strongly opposed, with the remaining seventeen percent of participants strongly disagreeing.

The following environmental factors were assessed in this study; weather conditions, state of the road, and terrain. Table 3 demonstrates a marginally positive association between environmental factors in motorcycle accidents ( $R=.392$ ;  $p.05$ ). A portion of motorcycle accidents was measured with an R- R-square of .154, which was explained by environmental factors. It revealed that environmental factors were responsible for around 15.1% of the possible motorcycle accidents. The model's generalizability was indicated by the adjusted R-square. If not identical, it ought to have been as close to R-square as practicable.

The researcher interviewed Bodaboda riders to investigate the environmental factors influencing motorcycle accidents among Bodaboda riders in selected four Sub-counties in Kitui County. One of the key informants noted that:

*"The area has all-weather roads that are perennially affected by rains every season and on every onset demand for repair is not guaranteed. Drifts along this all weather roads are not done and the few that are done do not allow for two way often block on rain season...."* (Bodaboda riders Chairperson 1, P1, observed)

Another key informant noted that;

*"Poor lighting conditions, such as dimly lit roads or inadequate street lighting, can decrease visibility for motorcyclists, making it harder for them to anticipate obstacles or hazards thus increasing the*

Table 2: Descriptive Statistics on Environmental Factors associated with Motorcycle Accidents

Factors being taken into account	1	2	3	4	Mean
Accidents are decreased by traffic laws and county-wide driving regulation	21	7	18	54	3.81
More motorcycle accidents occur as a result of county administrators' and traffic cops corruption	13	14	4	69	3.94
More motorcycle accidents occur in Kitui County due to the state of the roads	2	11	34	53	3.79
Increased accident rates among drivers are a result of the weather	17	6	6	71	4.21
Mean Likert Mean					3.96

Table 3: Influence of Environmental Factors on Motorcycle Accidents among Bodaboda Riders

Model	Unstandardized coefficients	Standardized coefficients	t	sig
	B	Std. Error	Beta	
(Constant)	3.436	.172		20.004 .000
Environmental factors	.210	.041	.392	5.074 .000
R=.392 <sup>a</sup>				
R <sup>2</sup> =.154				
Adjusted R <sup>2</sup> =.151				
F <sub>ratio</sub> =32.744				
P<.05 <sup>b</sup>				
<b>a. Dependent Variable: Motorcycle Accidents</b>				
<b>b. Predictors: (Constant) weather conditions, state of the road, Terrain.</b>				



likelihood of these accidents occurring.....”

### 3.4 Influence of Personal Characteristics on Motor-Cycle Accidents

The following personal characteristics factors were assessed in this study; riders' attitude, drug and substance use, and overspeeding. Table 4 demonstrates a marginally positive association between personal characteristics in motorcycle accidents ( $R=.291$ ;  $p.05$ ). A portion of motorcycle accidents was measured with an R- R-square of .085, which was explained by personal characteristics. It revealed that personal characteristics were responsible for around 8.5% of the possible motorcycle accidents. The model's generalizability was indicated by the adjusted R-square. If not identical, it ought to have been as close to R-square as practicable.

The researcher interviewed Bodaboda riders to assess personal characteristics contributing to motorcycle accidents among Bodaboda riders in selected four Sub-counties in Kitui County, Kenya. The majority of the interviewees agreed that personal characteristics contributed to motor-cycle accidents. One of the key informants noted that:

*“Drugs and alcohol can impair a rider's judgment, coordination, and reaction time, making it more difficult for them to respond appropriately to hazards on the road. This impairment significantly increases the risk of accidents, as riders may be unable to make split-second decisions to avoid collisions.....”*

### 3.5 Influence of riding skills on motorcycle accidents

The following riding skills factors were assessed in

Table 4: Influence of Personal Characteristics on Motor-Cycle Accidents

Model	Unstandardized coefficients		Standardized coefficients	t	sig
	B	Std. Error			
(Constant)	3.268	.208		15.700	.000
Personal Characteristics	.228	.072	.291	4.994	.000
R=.291 <sup>a</sup>					
R <sup>2</sup> =.085					
Adjusted R <sup>2</sup> =.079					
F <sub>ratio</sub> =24.942					
P<.05 <sup>b</sup>					
a. Dependent Variable: Motorcycle Accidents					
b. Predictors: (Constant) attitude, drug and substance use, overspeeding					

Table 5: Influence of riding skills on motorcycle accidents

Model	Unstandardized coefficients		Standardized coefficients	t	sig
	B	Std. Error			
(Constant)	3.436	.172		20.004	.000
Personal Characteristics	.310	.081	.312	7.028	.000
R=.342 <sup>a</sup>					
R <sup>2</sup> =.102					
Adjusted R <sup>2</sup> =.099					
F <sub>ratio</sub> =35.211					
P<.05 <sup>b</sup>					
a. Dependent Variable: Motorcycle Accidents					
b. Predictors: (Constant), Training levels, Riding experience, Duration of riding.					

this study; Training levels, riding experience, and duration of riding. Table 5 demonstrates a marginally positive association between riding skills in motorcycle accidents ( $R=.342$ ;  $p.05$ ). A portion of motorcycle accidents was measured with an R-square of .102, which was explained by riding skills. It revealed that riding skills were responsible for around 10.2% of the possible motorcycle accidents. The model's generalizability was indicated by the adjusted R- R-square. If not identical, it ought to have been as close to R-square as practicable.

The researcher interviewed Bodaboda riders on the influence of riding skills on motorcycle accidents among Bodaboda riders in selected four Sub-counties in Kitui, Kenya. The majority of the interviewees agreed that riding skills influenced motorcycle accidents. One of the key informants noted that:

*“Riding a motorcycle requires a unique set of skills that can only be acquired through practice and experience. Novice riders may struggle with basic maneuvers such as braking, cornering, and balancing, which are essential for safe riding. As riders gain more experience, they become more proficient in these skills, reducing the likelihood of accidents.....”*

Another key informant noted that;

*“Novice riders often lack the skills and proficiency needed to handle a motorcycle safely in various situations. They may struggle with basic maneuvers such as braking, cornering, and balancing, which increases the likelihood of errors that could lead to accidents.....”*

#### 4. Discussion

From this study, there was a statistical association between environmental factors and motorcycle accidents. Rain, fog, and dust reduce visibility, making it harder for riders to see obstacles or be seen by other drivers. In addition, Sharp curves, steep inclines, and uneven or rough terrain challenge a rider's control over the motorcycle which often leads to road accidents. The findings from this study were concurrent with those of a study by Mohammad et al<sup>15</sup>. Another study carried out in the United States was also concurrent with the findings of this study<sup>16</sup>. From this study, poor road state was a significant factor associated with a motorcycle accident. Motorcycle instability can result from potholes, and uneven road surfaces. Unexpectedly running into a pothole or bump can cause a loss of control, especially when riding faster. In addition to affecting stopping distances, uneven surfaces can throw riders off balance. These findings agreed with those of a study carried out in Kenya but were contrary to a scoping review carried out in Africa<sup>17,18</sup>. There was a marginally positive association between personal characteristics in motorcycle accidents from this study. From this study, Personal characteristics such as over-speeding and drug abuse were significantly associated with motorcycle accidents. Excessive speed reduces a rider's reaction time, making it harder to respond to sudden obstacles or changes in traffic conditions. Drugs, including alcohol, impair a rider's cognitive abilities, coordination, and judgment, all of which are critical for safe motorcycle operation. These findings were concurrent with those of an exploratory study by<sup>19</sup>. However, this was contrary to a Canadian study<sup>20</sup>. Lastly, there was a marginally positive association between riding skills and motorcycle accidents. Proficient riding skills enable motorcyclists to effectively handle their bikes in various situations, including cornering, braking, and maneuvering in traffic. Riders with strong handling skills are better equipped to respond to unexpected hazards and maintain control in challenging conditions, reducing the risk of accidents. These results agreed with those of a scoping review carried out in Africa<sup>18</sup>. This was contrary to a Kenyan study which found no association between riding skills and motorcycle accidents<sup>12</sup>.

#### 5. Conclusion

From this study motorcycle accidents are a public health concern. In addition, environmental factors, personal characteristics, and riding skills were found to be statistically associated with motorcycle accidents. Motorcycle accidents can be avoided and their effects lessened with increased promotion and enforcement of relevant legislation and interventions. Motorcycle injury prevention will lessen the impact on the public health system as well as the morbidity, hospitalization, severity, and fatalities associated with accidents.

#### 6. Acknowledgments

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#### 7. Competing Interests

The author declares that there is no conflict of interest.

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