ASSESSING THE TRAINING AND SAFETY STATUS OF MOTORCYCLE TRANSPORTATION IN KAKAMEGA COUNTY IN KENYA

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Assessing the training and safety status of motorcycle transportation in Kakamega County in Kenya

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A Thesis submitted to the in partial fulfilment for the Degree of Master of Science in Occupational Health and Safety in the Jomo Kenyatta University of Agriculture and Technology.

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.

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This thesis has been submitted for examination with our approval as university supervisors.

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DEDICATION

"Dedicated to all who positively contributed and supported in making this a successful undertaking"

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LIST OF ACRONYMS AND ABBREVIATIONS

BAC	Blood Concentration
g/dc	gram per decilitre
IEET	Institute of Energy and Environmental Technology
ILO	International Labour Organization
Km/h	Kilometres per hour
KNBS	Kenya National Bureau of Statistics
MAIDS	Motor Accidents in depth study
NGOs	Non-Governmental Organizations
NHTSA	National Highway traffic Safety Administration
OSHA	Occupational Safety and Health Act
PPE	Personal Protective Equipment
ROSA	Road Safety
RTID	Road Traffic Injury and Deaths
RTIRN	Road Traffic Injury Research Network
SPSS	Statistical Package for Social Sciences
WBCSD	World Business Council for Sustainable Development
WHO	World Health Organization

ABSTRACT

The objective of the study was to assess the training and safety levels of the motorcycle transportation in Kakamega County. Data was collected through simple random sampling where 480 questionnaires, were administered to *boda boda* operators, health facilities and law enforcement officers. The study found that majority of the *boda boda* operators were operating without valid licenses; only 35.6% of the operators were licensed; contrary to the Kenyan Traffic Act which requires each operator to have a valid license. The study indicated that 51% of the operators were trained in motorcycle riding through apprenticeship; 33% through driving school and 16% through self-training. Majority of the *boda boda* operators (61%) have not been trained on road safety. This shows a gap in safety training programmes and implementation of the same. The study result showed a relationship between the number of years in operation and accidents. Majority of the operators involved in the accidents had been in operation for less than 5 years whereas those who had been in business for more than 10 years had fewer accidents. There was significant statistical relationship between the number of years in operation of the *boda boda* and involvement in an accident (χ^2= 3.299, df= 3, $p < 0.05$). The results also show that there was significant statistical difference between the licensed *boda boda* operators who had an accident (χ^2= 1.172.; df = 1 $p < 0.05$). Licensed operators who had undergone training in the driving school were aware of the risks and hazards involved while riding the *boda boda* hence observed road safety measures. Operators who did not have safety training but were involved in accidents constituted 53% compared to 47% who had gone through training. Those who had undergone through safety training and had got accidents (χ^2=4.744,df=1,$p<0.05$) was significant.

The results also indicated that most accidents involving *boda boda* riders were as a result of inexistent road safety measures and lack of training. The study has demonstrated that there is a gap in training and awareness on *boda boda* safety measures hence an urgent need to implement training and awareness programmes to improve the knowledge, perceptions and practices of *boda boda* operators in Kakamega County.

CHAPTER ONE

INTRODUCTION

1.1 Background

Over the recent years, the number of motorcycles all over the world has increased tremendously. In China, for example, two wheeled scooters and motorcycles have played an important role in the developing world, with a current world fleet of a few hundred million (WBSCD, 2002). In countries in sub-Saharan Africa, Latin America and Asia, the increase and use of motorcycles as a preferred means of public transport has been significantly attributed to the fact that the transport mode offers certain transport advantages in the form of easy manoeuvrability, ability to travel on poor roads and demand responsiveness. Commercial motorcycle service growth has also led to an increase in road accidents, traffic management problems, pervasive noise and an increase in local air pollution and greenhouse gas emissions (Kumar, 2011).

According to WBSCD (2001), road crashes kill at least 1.3 million people each year and injure 50 million worldwide, a toll greater than deaths from a disease such as Malaria as reported by World Health Organization (WHO). Ninety percent of these casualties are in low and middle income countries. Each year 260,000 children die on the roads and another million are seriously injured, often permanently disabled. By 2015 road crashes are predicted by WHO to be the leading cause of premature death and disability for children aged 5 years and above. The road injury epidemic is a crisis for public health and is a major contributor of poverty (Ward and Billingsley, 2009; WHO, 2009). Motorcyclists are reported to bear over 16 times of the Killed and Serious Injury (KSI) rate in the UK, per million vehicle kilometers. Clarke *et al*, (2004) report informed that although motorcyclists make up less than 1% of vehicle traffic, their riders suffer 14% of total deaths and serious injuries on Britain's roads.

Edson and Tandoc (2007) further add that young motorcyclists below the age of 18 make up a significant percentage of injuries and fatalities among road users in many countries because of lack of proper training, riding while they are under age and not complying with the traffic rules. Factors such as over speeding, lack of Personal Protective Equipment (PPE), risk-taking behaviour and drunk-driving contribute to this rising trend.

As a result, road traffic crashes and injuries constitute a major health, economic and developmental challenge for many African countries. A research carried out by Chen (2010) indicates that with only 4% of the world's motor vehicles, African roads witness more than 10% of the world total collision fatalities. In the research, Chen further emphasizes that with further motorization, the number of road traffic crashes, injuries and fatalities are expected to increase. A study by the World Bank (WB) involving five African countries on a five-year growth rate in road accidents, road fatalities and road injuries is tabulated in table 1.1 below (Lagarde, 2007). Lagarde suggests that efforts to prioritize road safety by African governments have to be stepped up. The table below shows the number of road accident occurrence, related fatalities and related injuries.

Table 1.1: Road accidents, fatalities and injuries in five African countries

COUNTRY	NUMBER OF ROAD ACCIDENTS	ROAD FATALITIES	ROAD INJURIES
Benin	70	47	89
Ivory coast	32	5	34
Kenya	15	41	35
Tanzania	36	57	27
Zimbabwe	46	28	48

Source: (World Bank, 2007)

Boda boda (Commuter mode of transport in Kenya) transportation refers to the use of bicycles, tricycles and motorcycles. In Kenya bicycle taxis started being used in the 1960's for transportation of people and smuggled goods across Kenya-Uganda border (border to border), hence named '*boda boda*.' From the 1990's light engine motorcycles (50-80cc) started being imported into the country and have gradually replaced bicycles as taxis. The advantages of motorcycle transportation -"*Boda boda*"- are that it is inexpensive, quick, evades traffic, can use narrow paths in peri-urban areas, available day and night and can also be fun to ride (Odera, 2009). A Daily Nation publication (3rd October 2010) estimated that in Kenya, the number of

motorcycles leapt from 3,759 units in 2005 to 91,151 in 2009 as a result of zero rating the tax on motorcycles below 250cc in 2008. The landmark tax exemption slashed the price of Chinese made models from an average of seventy thousand to between thirty and forty thousand shillings

Fatality from Road Traffic Injuries (RTI) in Kenya is estimated to have increased by 578% between 1962 and 1992, rising from 7.3 to 8.6 per 100,000 populations (Macharia, 2009). According to Odero *et al.* (2003), nearly 3,000 people are killed on Kenyan roads annually, translating to approximately 68 deaths per 10,000 registered vehicles. This figure is interpreted to be 30-40 times greater than in highly motorized countries (Odera *et al.* 2003).

On average, 10.3% of crash victims die, 32.5% are seriously injured, and 57.2% slightly injured each year. The most severe form of collision is between the vehicle and pedestrians, with the highest case fatality rate (24%) compared to other types of collision which include single vehicle (18%), vehicle-bicycle (17%), vehicle-vehicle (12%), and vehicle-motorcycle (8%) (Odera *et al*., 2003).

In Western Kenya, *boda boda*s are the most popular means of transport especially for short distances hence revolutionised the movement of people, as these have driven once popular bicycles out of business (Kisia, 2010). However, the new mode of transport has come with its share of misfortunes as they become a common sight, so are the number of accidents (RTIRN, 2010). The accidents are so frequent necessitating many hospitals to establish special wards for *boda boda* victims and relevant stakeholders to carry out road safety campaigns. Most of the motorcycle crashes patient survivors in Kakamega Provincial General Hospital are in wards two and seven. Majority of the *boda boda* victims get admitted in ward six which is reserved for patients with head injuries. (Kisia, 2010).

To curb this menace, the Tuktuk *Boda boda* Motorcycle Welfare Association came up with an initiative to reduce motorcyclist casualty in Kenya, referred to *Tukbodabike Safe*. It works towards casualty reduction targets in an effort to reduce the number of people killed and seriously injured in road collisions. The main strategy is to engage with the post riders in a conflict free environment to consider and analyze why motorcycle crashes are happening, which will include the attitudinal and motivational issues (www.tukbodabike.com).

As the government persists to develop ways and means of dealing with the situation, the *boda boda* population continues to register a drastic increase with a relative increase of death and injury incidences.

1.2 Statement of the Problem

Kakamega County is a hilly and rocky county and the second most populous county in Kenya. It has a population of about 1.66 million people (KNBS, 2011). This population relies on various modes of transport to connect to various destinations. Most of the roads connecting interior parts of the county are all weather and restrict most forms of vehicles. The most efficient and common mode of transport available in the county is the roads. The *boda boda* industry is the highest user of this mode. This research intends to show how *boda boda* operation has contributed to most of the accidents in the county. However, medical information indicates that there are high incidents of *boda boda* traffic related casualties in surgical wards within the county. This has far reaching implications on the road users and the economy. Accurate statistics on training and safety measures undertaken by *boda boda* operators are not available for users such as researchers and the occupational health and safety sector to develop policy related interventions. This study attempted to address issues revolving training and safety undertaken by the *boda boda* industry in the county.

1.3 Research Objective

1.3.1 Main objective:

To assess training and safety status of boda-boda users in Kakamega County, Kenya.

1.3.2 Specific objectives:

a) To investigate the training level undertaken by motorcycle operators on road safety in Kakamega County.
b) To examine the trends of the accident burden over the past five years in Kakamega County
c) To evaluate the safety measures in place
d) To investigate the awareness levels of safety of *boda boda* riders and commuters.

1.4 Null Hypothesis

Lack of training and safety measures have made *boda boda* transportation an unsafe means of transport in Kakamega County.

1.5 Research Questions

The research questions which guided the study to capture pertinent issues regarding training and safety of the *boda boda* industry at Kakamega County were:

a) What is the training level of the *boda boda* operators on road safety?
b) What are the trends of the accident burden over the past five years?
c) What are the safety measures taken by the *boda boda* operators?
d) What are the awareness levels of safety of *Boda boda* riders?

1.6 Delimitations

Access to medical information for the research was a great challenge. The information was accessed at a fee for the purpose of filling the pre-set questionnaire. Some medical and hospital institutions were suspicious and reluctant to provide data to the researcher despite being furnished with an introductory letter of research from the university.

1.7 Justification and significance

Road Traffic Injury and Deaths (RTID) is a public health problem in Kenya, primarily affecting spheres and disenfranchised people from lower socioeconomic groups. Medical reports show that traffic related cases in casualty departments register a higher percentage in comparison with other commonplace accidents. Observations have mostly been based on consequences rather than policy status in the road safety sector. However, very limited studies and reports have been made to investigate the training level undertaken by motorcycle operators on road safety and to examine the trends of the accident burden over the past years in Kenya. Carrying out this study will help in gathering data based on available evidence and would provide an explicit objective for road safety managers and policy makers to consider when setting recommended road safety regulations and management strategies. The data generated from this study will be useful in the development of logistics geared towards streamlining of road safety measures affecting the *boda boda* sector in Kenya. When fully implemented, incidents such as loss of life, injuries to passengers, loss of breadwinners within homes, loss of manpower due to injuries and lack of

sustainable income will be avoided. Education and training with emphasis on the *boda boda* industry will be streamlined. The choice of Kakamega County was based on the area's high population of 1,660,651. With emergence of institutions of higher learning such as Masinde Muliro University, commercial banks and enterprises such as hypermarkets and entertainment spots, motorcycles have become the preferred mode of transport. The uptake of motorcycle transport over the traditional bicycle has been evidenced widely in the county.

1.8 Conceptual Framework

The conceptual framework helps the researcher to understand the relationship among variables in the study. In this study the dependent variable was training and safety status of the motorcycle transportation while the independent variable was improved safety measures in the motorcycle transportation.

In summary, the *boda boda* transportation in Kakamega County was evaluated to determine whether lack of training and safety measures have led to the many accidents in the industry.

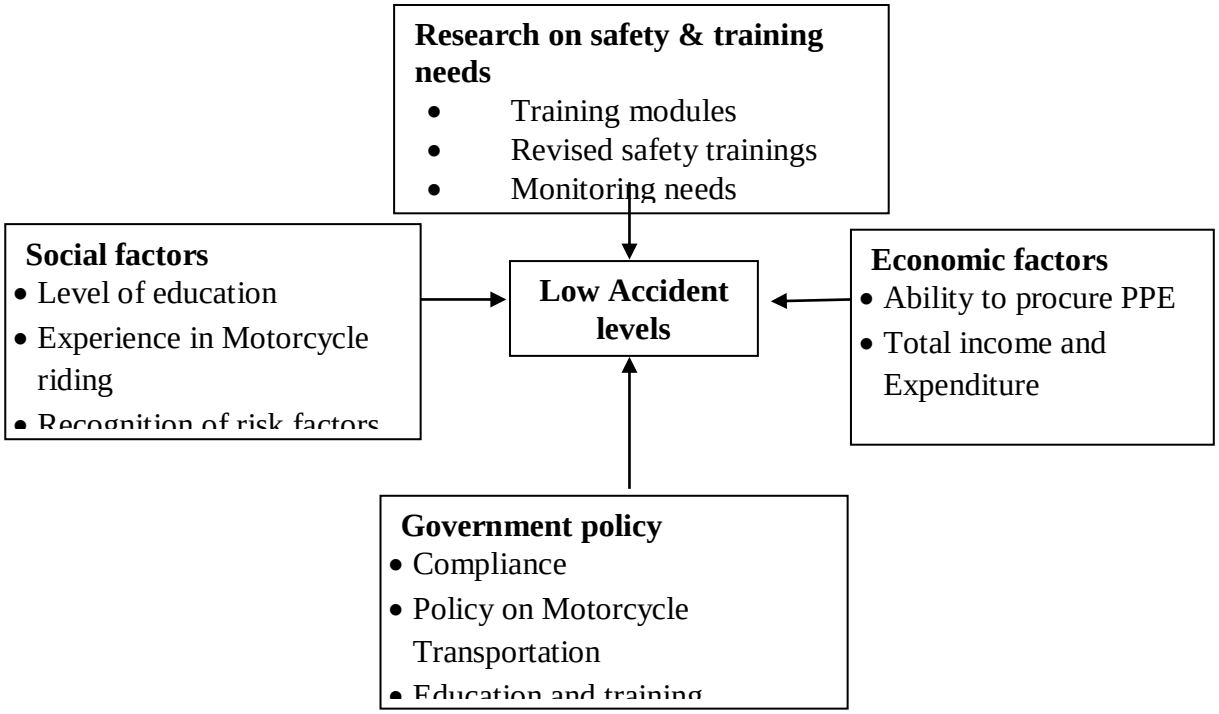

Figure 1.1: Conceptual assessing training and safety status of Bodaboda

CHAPTER TWO

1.0 LITERATURE REVIEW

2.1 Invention and development of motor cycles and their uses

German born Gottlieb Daimler and Wilhelm Maybach invented the first gas-engine motorcycle which was an engine attached to a wooden bike. This was the first internal combustion, petroleum fuelled motorcycle. Gottlieb Daimler used a new engine invented by engineer, Nicolaus Otto. Otto invented the first "Four-Stroke Internal-Combustion Engine" in 1876. He called it the "Otto Cycle Engine" As soon as he completed his engine, Daimler (a former Otto employee) built it into a motorcycle.

In numerous cultures, motorcycles are the primary means of motorised transport. According to the Taiwanese government, for example, "the number of automobiles per ten thousand populations is around 2,500, and the number of motorcycles is about 5,000." In places such as Vietnam, motorcycle use is high due to a lack of public transport and low income levels that put automobiles out of reach for many (Nkede, 2012).

In Vietnam, motorised traffic is dominated by motorcycles. The four largest motorcycle markets in the world are all in Asia: China, India, Indonesia, and Vietnam. The motorcycle is also popular in Brazil's frontier towns. Amid the global economic downturn of 2008, the motorcycle market grew by 6.5%. Recent years have seen an increase in the popularity of motorcycles elsewhere. In the USA, registrations increased by 51% between 2000 and 2005. This is mainly attributed to increasing fuel prices and urban congestion (Nkede, 2012)

2.2 Influence of motorcycles in the transport sector

Motorcycles were introduced as a substitute for bicycles, mainly for efficient connections between destinations. Lately, the transport mode has developed for commercial purposes. In Sub Saharan Africa, the origin of the motorcycle taxi is the “bicycle-taxi” used in the transport of goods and men in rural areas since the colonial era. In Benin, transport by road /*Akassa/* was done by bicycles known as /*kèkè*

kannan/. The passenger transport known as /*taxi kannan/* came later on to complete this activity (Lourdes *et al*, 2012).

In East Africa, Kenya and Uganda developed the *boda boda* in the 1960s. The *boda boda* taxis are part of the African bicycle culture; they started in the 1960s and 1970s and are still spreading from their origin on the Kenyan - Ugandan border to other regions. The name originated from a need to transport people across the "no-mans-land" between the border posts without the paperwork involved using motor vehicles crossing the international border. This started in the Southern border crossing town of Busia (Uganda), where there is about 200 meters between the gates and quickly spread to the Northern border town of Malaba (Kenya). The bicycle owners would shout out "boda boda" (border-to-border) to potential customers. The emergence and use of motorcycles in the various forms of businesses have also impacted on various sectors of the economy. The table below shows representation of motorcycle taxis in the Sub-Saharan Africa (Nkede, 2012).

Table 2.1: Representation of Motorcycle taxis in sub Saharan Africa

Country	Name
Benin	*Zémidjan* (Take me fast. A rapid door-to door transport)
Cameroon	*Bendskin* (the word originates from a traditional dance from the western region of the country)
Kenya	*Boda-boda* (Boarder to boarder)
Niger	Kabu-kabu
Nigeria	*Okada (former Nigerian airline known for its rapidity of service.*
Uganda	*Boda-boda* (Boarder to boarder)*
Togo	*Oléyia*

**Source:* This name is used for bicycles as well as for motorcycles* (Nkede, 2012)

2.3 Influence of motorcycles on Health and safety

According to the WHO report (2012) over 90% of the accidents occur in low and middle income countries. Beyond the enormous suffering they cause, road traffic accidents bear potentials to drive families into poverty as crash victims and their families struggle to cope with the long term consequences of the event. Road traffic accidents also place a huge strain on national health systems, many of which suffer from woefully inadequate levels of resources.

As a measure to appreciate and deal with the issue, the WHO has categorically recognized traffic accidents as a key health factor affecting human communities and has encouraged member states to develop policies aimed at slowing down current trends (WHO, 2012).

Table 2.2: Leading Causes of death, 2004 and 2030 projection compared

TOTAL 2004		
RANK	**LEADING CAUSE**	**%**
1	Ischaemic heart disease	12.2
2	Cerebrovascular disease	9.7
3	Lower respiratory infections	7
4	Chronic Obstructive pulmonary disease	5.1
5	Diarrhoea diseases	3.6
6	HIV/AIDS	3.5
7	Tuberculosis	2.5
8	Trachea,bronchus,lung cancers	2.3
9	Road traffic injuries	2.2
10	Premature and low birth weight	2
11	Neonatal infections and other	1.9
12	Diabetes mellitus	1.9
13	Malaria	1.7
14	Hypertensive heart disease	1.7
15	Birth asphyxia and birth trauma	1.5
16	Self-inflicted injuries	1.4
17	Stomach cancer	1.4
18	Cirrhosis of the liver	1.3
19	Nephritis and nephrosis	1.3
20	Colon and rectum cancers	1.1

TOTAL 2030		
RANK	**LEADING CAUSE**	**%**
1	Ischaemic heart disease	12.2
2	Cerebrovascular disease	9.7
3	Chronic Obstructive pulmonary disease	7
4	Lower respiratory infections	5.1
5	Road traffic injuries	3.6
6	Trachea,bronchus,lung cancers	3.5
7	Diabetes mellitus	2.5
8	Hypertensive heart disease	2.3
9	Stomach cancer	2.2
10	HIV/AIDS	2
11	Nephritis and nephrosis	1.9
12	Self-inflicted injuries	1.9
13	Liver cancer	1.7
14	Colon and rectum cancers	1.7
15	Oesphagus cancer	1.5
16	Violence	1.4
17	Alzheimer and other dementia	1.4
18	Cirrhosis of the liver	1.3
19	Breast cancer	1.3
20	Tuberculosis	1.1

Source: World health statistics 2008 (http://www.who.int/whos)

Road traffic injuries are seen to be in the ten leading indicator in the cause of death and its projected by 2030 would be the fifth leading indicator in the cause of death in the world (WHO, 2008)

2.4 Motorcycle safety

Guilan Province is one of thirty two provinces in Iran, due to close proximity of villages together and with cities and towns, the number of motorcycles is high and their abundance attracts the attention of everybody. According to the statistics published by transportation and terminals organization in Iran, Guilan Province is ranked 4th in terms of losses and damages from road traffic accidents throughout the country. In every 8 hours, one person in this province loses his/ her life because of an accident (Davodi & Rezvany, 2004).

At the state of Victoria in Australia, research was undertaken to determine the key issues, appropriate countermeasures, the size of the effects, the overall cost of measures, and the acceptability of measures to riders and road safety stakeholders. Highest priority was accorded to measures demonstrating significant reductions in injuries to riders for relatively low cost. Research into critical safety issues was given priority where effective countermeasures have not been established. Preliminary evaluations of the countermeasures implemented to date show promising reductions in injuries to riders and it is expected that the measures will return crash cost savings well in excess of the program costs. Targeted research and development expenditure is expected to return considerable benefits over the longer term (Dale, 2006).

Research by Elliot, 2003 attempted to show the wider spectrum of motorcycle type and performance, and several categories of motorcycle use that may be associated with different types of accident and levels of risk. The interaction with variables such as rider's age, sex, motivation, and level of exposure, implies that the 'motorcycle safety problem' is probably much more heterogeneous than the car safety problem, and that subsets of the problem may need to be researched.

Based on their observations Chalya *et al*. (2010) state that motorcycle users are vulnerable on the road and represent an important group to target for reducing road traffic injuries. They go ahead informing that even in developed countries with low morbidity and mortality rates from motorcycle injuries, the risk of dying from a motorcycle crash is 20 times higher than from a motor vehicle crash.

Another study by Naddumba (2001) carried out in Uganda at Mulago hospital in Kampala Uganda on *boda boda* injuries cited that over speeding and drunk riding were the major source of injuries while non-use of protective gear magnified the extent of case fatalities and severity of injuries. Naddumba also found out that the business fraternity was the most affected since it was found to be rushing between work stations. He noted that the most common injuries involved the lower extremities followed by head injuries and soft tissue injuries.

2.5 International best practises

2.5.1 Global Policy level

Research carried out by the World Health Organization in 2009 signalled a growing concern in the global community about the scale of the health losses associated with escalating motorization and a recognition that urgent measures had to be taken to sustainably reduce their economic and social costs. Resources for the research were an initiative by the World Bank and World Health Organization, through global community industry specific experts and civil society who were mobilized to develop a solution at a global scale (WHO, 2009; 2011). The research outputs yielded the *World report on road traffic injury prevention (2009).* The objective was to present a comprehensive overview of what is known about the magnitude, risk factors and impact of road traffic injuries, and about ways to prevent and lessen the impact of road crashes. Kenya was among the privileged to issue a presidential statement in the preface section of the report considering her extreme records. Implementation of the report's recommendations was considered a priority by the UN general assembly. The report does not focus on the various classes of motorised transport but provides a general perspective.

Guidelines were prepared in the year 2011 to propose implementation strategies of the World Report on Road Traffic Injury Prevention report by Governments (WHO, 2011). The guidelines have emphasized on the following six major recommendations:

i. Identifying a lead agency in government to guide the national road safety effort,
ii. Assess the problem, policies and institutional settings relating to road traffic injury and the capacity for road traffic injury prevention in each country,
iii. Prepare a national road safety strategy and plan of action,
iv. Allocate financial and human resources to address the problem,
v. Implement specific actions to prevent road traffic crashes,
vi. Minimize injuries and their consequences and,
vii. Evaluate the impact of these actions and support the development of national capacity and international cooperation.

In general, the two reports encourage manufacturers in developed countries to focus their safety on innovative strategies while developing countries are required to focus more on good governance to improve on implementation and practice by stakeholders.

2.5.2 Industry level

According to the ROSA (Road Safety) project (2011), the use of signs and markings on roads to provide important information to improve road safety. Using signs and markings will regulate, warn and guide road users by relaying the message. Signs and markings need to be applied in a consistent way, placed at logical locations, easy to understand and visible. On conspicuity, the ROSA project (2011) emphasizes that motorized vehicles need to have their lights on to help in increasing conspicuity during the day time. Use of reflective clothing will further enhance their conspicuity.

Research on best practises for motorcycle safety on antilock brakes show that 13% of an average of 2500 motorcycles fatalities was related to braking manoeuvres. Tests done on motorcycles with antilock braking systems have shown substantial benefits on wet road surfaces and exceed the performance of motorcycles with standard braking systems. Antilock braking systems were found to eliminate wheel lock up

and allowed motorcyclists to maintain steering control hence decreasing stopping distances and improve stability (Casey and Rosenkopf, 2004).

The Graduate Motorcycle Licensing System that is being done in Canada by Nova Scotia registry of motors vehicles ensures an approach to licensing of the new riders that is comprehensive and cautious. Riders who do not hold Nova Scotia driver license are required to acquire licenses through graduate motorcycle licensing system being done by Nova Scotia registry of motors vehicles. The system ensures an approach to licensing of the new riders that is comprehensive and cautious. Those riders without Nova scotia driver license will be required to complete level 1-3 training in order to achieve full licensing (Casey and Rosenkopf, 2004).

The use of motorcycle helmets is effective in reducing severe head and neck injuries, hence the likelihood of deaths in the event of a crash reduced. A study conducted in Washington State showed those victims that crashed and were not wearing helmets were 3 times as likely as those with helmet to sustain head injuries and 4 times as likely to incur severe head injuries while in Colorado individuals not wearing helmets were 2.4 times more likely as those wearing helmets to suffer a head injury in a crash (Houston and Richardson, 2007).

2.6 Motorcycle Development in Kenya

In Kenya, bicycles are being replaced by motorcycles. The motorcycle taxis have acquired the name *boda boda*. Piki-piki is a Swahili term being used also to describe motorcycles (Howe *et al*, 2006). In 2011 it was estimated that about 140,215 motorcycles had been registered by the Kenya Revenue Authority (*KBS, 2012*).

In the World health Organization report *(WHO, 2004)*, The Kenya government's move to zero-rate duty on motorcycle imports saw an increase in the number of persons adopting motorcycle use over the traditional bicycle option. This shift naturally saw an increase in the indices attributed to motorcycle related accidents. By zero rating duty on motorcycles, the intention was to have affordable means of transport and create employment opportunities for Kenyans especially the youth. The

graph below demonstrates trends in road accidents between the year 1970 and 2006 in Kenya, according to WHO (2004).

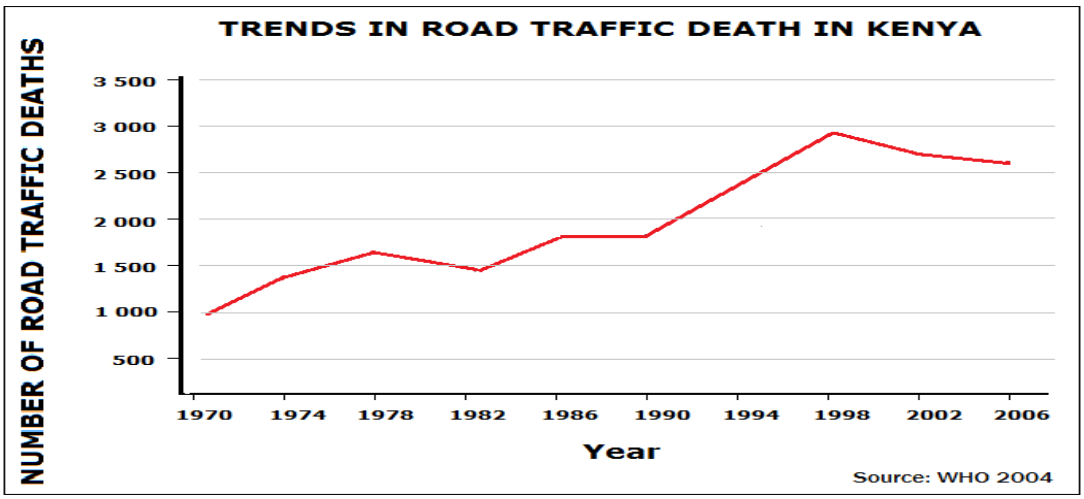

Figure 2.1: 1970-2006 Trends in Road traffic deaths in Kenya

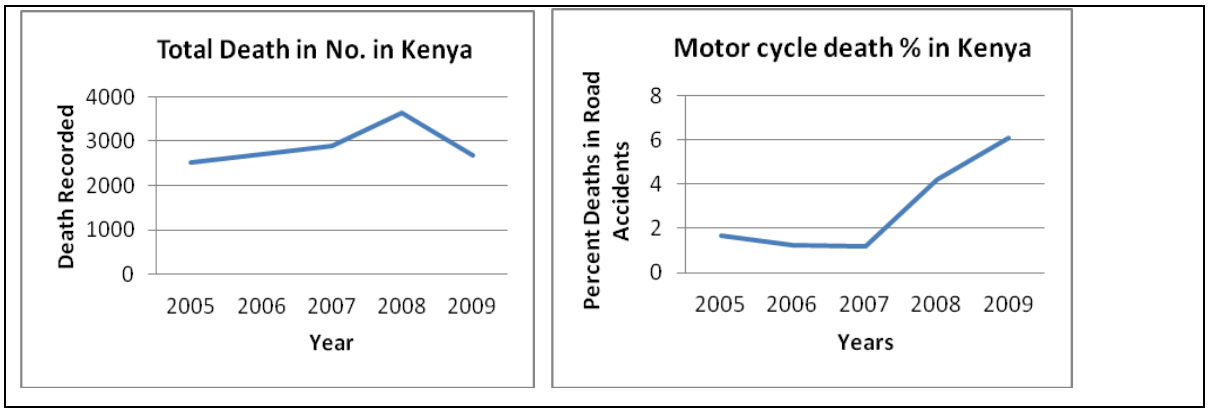

Figure 2.2: Number of Deaths and Motorcycle deaths in Kenya

Figure 2.2 shows trends of deaths recorded and percentage deaths recorded resulting from motor cycle accidents between the years 2005 and 2009 in Kenya. The figure illustrates that trends of road accidents drastically increased from the year 2007 as a result of switching from bicycles to the more efficient motorcycles and also as a result of zero rating of taxes affecting motorcycles between 50 and 250cc in 2008.

According to the WHO, 2004 report on road traffic injury prevention, over 3000 Kenyans are killed as a result of road accidents every year, most of them between the

ages of 15 and 44. The statement elaborates that the impact cost to the Kenyan economy from these accidents is in excess of US$ 50 million exclusive of the actual loss of life.

Despite the move to zero rate levies charged on importation of motorcycles, the Kenyan government appreciates road traffic injuries as a major public health problem amenable to prevention and has taken up the road safety challenge. It has focused on specific measures to curtail the prevalent disregard of traffic regulations and mandating speed limiters in public service vehicles among other measures. The country is already implementing recommendations of the World report on road traffic injury prevention as a guide to promoting road safety in their countries. (WHO, 2004).

The Kenya *Boda boda* Trust Plan targets to provide technical services for over two million motorcycles in all the 47 counties (Odour, 2011). In Kakamega and Kisumu there is an estimate of 70,000 and 30,000 *boda boda*s respectively. Oduor says that the idea by the *boda boda* trust plan to employ technical personnel in motorcycle clinic to provide basic skills on maintenance of the cycles and offer free repairs.

According to Mwangi (2011), the National Road Safety Council rolled up a road safety training programme for motorcycle operators countrywide which targeted more than 40,000 riders. He further says that despite the training, the number of accidents rose from 2,360 to 4,072 in the year 2009. The deaths were linked to reckless driving and laxity in implementation of traffic laws. Mwangi also blamed the zero rating of taxes on all motorcycles below 250cc which encouraged many youth to join the *boda boda* business. Subsequently, the rate of motorcycle registration increased to 10,000 every month compared to 4, 000 for motor vehicles.

Car and General (C&G) emphasized the magnitude of *boda boda* influence in the country by launching a road safety campaign for over 3,000 jua kali mechanics specialized in the TVS motorcycle model training. The campaign covered Nairobi, Nakuru, Maragua, Kisumu, Kakamega, Kitale, Bungoma, Mumias, Kisii, Kitui and

Mwingi among other areas. C&G has since engaged in sensitizing on safety issues as well as technical handling of the TVS model motorcycles (Cargen times, 2010).

Ruto (2010) reports that when motorcycle passengers are not in helmets, protective suits, gloves and boots, they are 27 times more likely to die in crashes and six times likely to be injured when compared to car passengers. Ruto emphasizes that according to estimates, a motorcyclist is two and half times more likely to be involved in an accident when compared to a motor vehicle driver.

According to the Nairobi traffic police headquarters, the number of road accidents between 2005 and 2010 went up 36 per cent to 12,360. This has been attributed to reckless *boda boda* riders who have little regard for traffic rules. It has been noted that the riders trained themselves for a day or two in an open field and the next day they are in business carrying passengers. They are not exposed to skills tests which consist of observing speed limits, manoeuvring around corners, swerving and adhering to all road signs. (Ruto, 2010)

2.7 Training and awareness in the *boda boda* sector

Formal motorcycle training is one of the important factors in mitigating the risk of motorcycle crashes. However, in the United States there are only 3 states (Maine, Rhode Island, and most recently, Florida) that riders need to be licensed to operate a motorcycle. One needs to have successfully completed the motorcycle training course as part of the licensing requirements. In other states they provide the rider with an exemption to the state road test for motorcycle if they successfully complete approved courses in the training thus no serious expectation of competent, safe motorcycling (Odera, 2009).

2.8 Related Research Work

A Study by Odera 2009 indicates that accidents involving motorcycles are on the increase in Naivasha and its environs mainly due to lack of proper training among riders, over-speeding and overloading. Odera further cites limited research on motorcycle injuries as one impediment in addressing the issue hence the need for this

study. A research by Lutomia and Khanbhai (2012) indicated that injuries related to motorcycles contribute significantly to the number of road traffic injuries. The study determined the pattern of injuries sustained after the motorcycle crash among patients that were examined at Kakamega Provincial General Hospital.

Chalya et al. (2010) researched on injuries that were majorly constituted by motorcycles but were neglected as an emerging health problem in developing countries. In their study they looked at the injury pattern and treatment outcomes of motorcycle injuries among patients. In their research, motorcyclists accounted for the majority (52%) of those who got injured by a motorcycle. Most of the patients (92%) sustained blunt object injuries while musculoskeletal and head injuries were the most common body regions that were injured.

Sisimwo *et al*. (2014) in their research found out that the major cause of road traffic injuries among the victims attended to at Kitale level IV hospital were due to commercial motorcycle crashes and mostly the youth who were in their reproductive age were involved in commercial motorcycle crashes. In their research those who were injured in the crashes were pedestrians, riders and passengers. Those who suffered severe head injuries were riders and passengers without helmets at the time of crash. Most of the riders did not undergo formal training before riding the motorcycles. They further found out that motorcycle and vehicle collisions were the common recorded and accounted for the majority of injuries.

A research by Manyara (2013) on combating road traffic accidents in Kenya, considered the subject as a major challenge for the emerging economy. It highlighted on the nature and causes of road traffic accidents that have been analyzed. It was clear that behavioural part of the rider contributed to the growing burden of the traffic accidents while corruption by the traffic police and poor roads were the root causes to the problem. It was recommended that the government should have policies aimed at engaging the stakeholders.

Chepchieng *et al. (*2012) in their research investigated the influence of urban transport policy on the growth of motorcycle and tricycles in Kenya. They emphasized on the need for policy makers to respond quickly in addressing the

challenges faced, the pace of business and service provision in the transport sector in Kenya. They recommended the formulation of an all-inclusive urban transport by the policy makers that will take care of the safety precautions of motorcycle transportation.

A study by Nesoba, 2010 carried out in Kenya on flooding of cheap motorcycle imports indicates that the saturation contributed to the increase in unregulated taxi services as well as contributing to the main cause of road accidents. Nesoba details that motorcycles have become a safety concern specifically due to high operating numbers and constraint in speed. She adds that as a form of transport, motorcycles are relatively prone to accidents.

A study by Bishop *et al.* (2013) conducted in Tanzania on Implementation of a Road Safety Programme for the Bago to Talawanda Road recommended educating road users and the community on associated risks and advised on how they should adapt the changes. The project developed a strategy for ensuring safety of the rural communities.

A research by Mutiso and Behrens (2011) on *Boda Boda* Bicycles, Taxis and their role in Urban Transport System highlighted case studies of Kisumu and Nakuru. The report brings out the positive role the *boda boda* industry has played in the respective transport systems. It highlighted that due to the increase in motorcycle operations in these towns, there is need for adoption of clear relative policy guidelines.

2.9 Legal Requirements in Kenya

In Kenya, to legally operate a motorcycle, one must be 18 and over, possess a valid driving license and wear a helmet and reflective clothing while riding. The key statutory laws associated with safety of motorcycle operation in Kenya are constituted in the Occupational Health and Safety (OSHA), 2007, the Traffic Act CAP 403 of 2009 and the legal notice No. 33 of 2012. Specific areas of the acts are highlighted in the sub sections below:

2.9.1 Occupational Health and Safety (OSHA), 2007

OSHA, 2007 Section 12(1) provides that the duties of an employed persons is to ascertain that all necessary precautions to ensure his own safety and health, and that of any other person in his workplace or within the environs of his work place. Use of suitable personal protective appliances and clothing that is required and comply with safety and health rules, regulations, instructions and procedures of this Act

In relation to operation of the motorcycles, section 55 of the Act states that all machinery and equipment whether fixed or mobile that are being used either at the workplace or as a workplace shall be used for work they are designed for and be operated by a competent person.

The Act in section 71(1) emphasizes on machinery, equipment, PPE appliances and hand tools used in a workplace must comply with prescribed safety and health standards and be appropriately installed, maintained and safeguarded.

Section 99(1) of OSHA, 2007 talks on training and supervision of inexperienced workers whereby no person be employed at any machine unless he has been fully instructed and has received sufficient training on how to operate the machine. In addition he can be under adequate supervision by a person who has thorough knowledge and experience of the machine. Section 101 (1) additionally states that adequate, effective and suitable protective clothing and appliances should be provided including where necessary, suitable gloves, footwear, goggles and head coverings. Industry specific regulations do not exist for specific reference to the *boda boda* industry.

2.9.2 Traffic Act Cap 403

Section 85 of the Act guides against driving on the road or other public places when under the influence of an alcoholic drink or a drug to an extent to be incapable of having proper control. Upon conviction, an offender shall be liable to a fine not exceeding one hundred thousand Kenya Shillings or imprisonment for a term not exceeding two years or both.

Section 86 provides that a person driving recklessly or at speed or in a manner which is dangerous to the public shall be guilty of an offence and will be fine not exceeding one hundred thousand shillings or to imprisonment for a term not exceeding two years or to both. Further to this, section 87 provides that a person driving without due care or attention in such a manner to be annoyance to the public shall be guilty of an offence and liable to a fine not exceeding one hundred thousand shillings.

In section 89(1) of the Traffic act, it is stated that no more than one person should be carried by a rider while part (2) prohibits carrying unusual load (large size or heavy). The section clarifies that the way it is carried should not pose danger to persons using the road. Any person contravening the provisions of this section shall be guilty of an offence and liable to a fine not exceeding two thousand shillings

Provision by section 25(1) states that no person shall ride on a motorcycle of any kind or class without wearing a helmet. Sub section (2) states that a person who rides a motorcycle shall provide a helmet and jacket to be worn by passenger. It further states passengers shall wear helmet and reflective jacket. It also states that motorcycles must be insured against third party risks and the helmet should be of good shape, construction and quality.

According to the Kenya Traffic Act of 2009 (CBS), one needs to have gone through driving school programmes, then assessed and passed relevant classes of driving tests. The various classes of driving levels are indicated in the Act as shown in table 2.3 below:

Table 2.3: Classes for drivers training and licensing

No.	Type of vehicle	Class
1	Omni busses	A
2	Heavy commercial vehicles	B
3	Commercial vehicles exceeding 4,000Lb tyre weight	C
4	Tractors	D

5	Motor cars and commercial vehicles not exceeding 4,000Lb tyre weight	E
6	Motorcycles including 50cc capacity	F
7	Motorcycles over 50cc capacity	G
8	Invalid carriages	H
9	Special type	I

Section 31(1) states that driving license shall not be granted by a licensing officer in respect to any class of motor vehicle unless the officer is satisfied that he has passed a test of competency to drive that class of motor vehicle and he holds a certificate of competency for that class. Additionally to the section, no license shall be granted to any person under the age of eighteen.

Section 39 of the act states that driving tests shall be conducted by driving examiners. The driving test shall include a test of application, knowledge of rule of the road, knowledge of recognised road signals and road signs, knowledge of any authorised road or Highway Code and physical fitness to drive a motor vehicle of the class for which the license is required. Section 60 of the Traffic Act states that it shall be unlawful for more than one person in addition to the driver to be carried on any two wheeled motorcycle.

Section 105A (1) states that a person holding a license issued to section 30 of this Act shall after every three years from date of issuance, or renewal of license undergo an eye test.

2.9.3 Legal Notice No. 33 of 2012

The National Transport and Safety Authority Act the cabinet secretary for transport and infrastructure in consultation with the board made the following regulations for operation of motorcycles:

Part 1 section 3 states that the regulation shall apply to all motorcycle operating on public roads in Kenya. While Part 2 Section 4(1) states no motorcycle shall be

registered, sold or transferred by any person without the following protective gear namely two helmets and two jackets that have reflectors.

Part 3 Section 5 directs that the operator will provide the rider and passenger with helmets, not to permit any person to ride their motorcycle unless he has a valid driving license, ensure not to carry more than one person at a time and ensure the motorcycle is insured against third party risks. Section 6 emphasizes on riders to have a valid license, not to carry a person without wearing helmet and reflective jacket, not to carry more than one passenger, carry goods that are provided under the regulation, to ensure that the headlights are on at all times when riding and obey traffic rules.

Section 7 of the legal notice no 33 of 2012 states that every passenger riding on a motorcycle shall wear a helmet and reflective jacket, not be carried on a motorcycle that has a pillion passenger and to sit astride in the seat behind the driver.

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Study area

This study was carried out in the Kakamega County, the second largest county in Kenya in with a population of 1,660,651 according to the census figures of 2009. It borders Bungoma County to the West, Nandi County to the East, Vihiga County to the South and Lugari to the North. It lies between latitude 0^0 17' 18"North and $34^0$45' 19"East, covering an area of 1,395 km^2.

The quest for a devolved system of governance in Kenya saw the introduction of the county system in Kenya, following the promulgation of the Constitution of Kenya in 2010 (GOK, 2010). Before then, the research area fell under Kakamega district of Western Province. The district had seven divisions namely Kabras, Navakholo, Shinyalu, Lurambi, Ikolomani, Ileho and Municipality. The average population density is 495 persons per km^2. The county lies within altitude 1250 -2,000 meters above sea level (a.s.l.) with average annual rainfall ranging from 1250 -1750 mm. The average temperature in the county is 22.5^0C most of the year. (Kakamegamc.org/kk-county). Figure 3.1 shows the location of Kakamega County in Kenya with its respective administration boundaries.

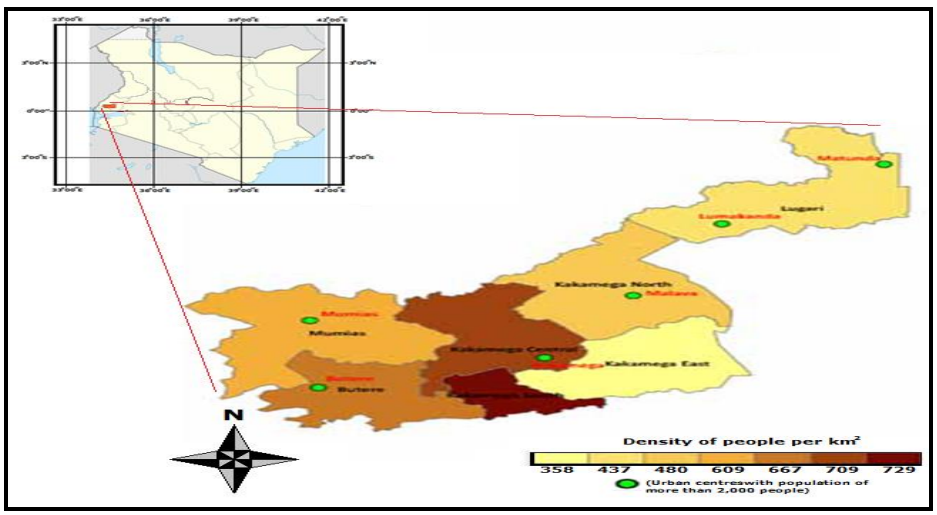

Figure 3.1: Map of Kakamega County in Kenya: **Source: KNBS**

3.2 Research design

This is a descriptive study making a detailed examination of an abstracted sample from Kakamega county *boda boda* operators' population. Both qualitative and quantitative research techniques were applied during the data collection and treatment processes.

Sample size

A sample unit was represented by an individual motorcycle transport operator. The census report of (2009) stated that there were about 8,925 motor cycles in Kakamega County. Time and cost factors contributed to determination of sample size. To manage the exercise, clustered simple random sampling was employed. Purposive sampling was used to identify traffic police units as well as level four, five and private hospitals which provided complementary data.

In his research paper, Lenth 2001 explains that appropriate sample size planning is often important and almost always difficult. It requires care in eliciting scientific objectives and in obtaining suitable quantitative information prior to the study. A successful resolution of the sample size problem requires the close and honest collaboration of statisticians and subject-matter experts.

Elise and Jonathan (2002) specify three criteria necessary to determine the appropriate sample size: the level of precision, the level of confidence or risk and the degree of variability in the attributes being measured. According to Israel (2009), different approaches can be used to determine the sample size like using a census for small populations, imitating a sample size of similar studies, using published tables, and applying formulas to calculate a sample size.

The results are tabulated in table 3.1 below. Respondents per category were determined based on Bartlett *et al.* (2001). Bartlett *et al* 2001 developed a table to be used to select sample size for a research problem based on three alpha level and set alpha rate.

Table 3.1: Numbers of respondents interviewed during the study

Divisions	Population	People with motorcycles	Motorcycle %	*Boda boda*s sampled
Kakamega Central (Lurambi)	65,121	1,954	3	79
Kakamega East (Malava)	34,177	718	2.1	75
Kakamega North (Shinyalu)	40,635	853	2.1	76
Kakamega South (Ikolomani)	23,144	417	1.8	69
Butere	54,441	1,034	1.9	77
Lugari	59,476	1,903	3.2	79
Mumias	78,685	2,046	2.6	83
TOTAL	**355,679**	**8,925**		**536**

3.3 Methods

3.3.1 Sampling procedure

The target populations for the study were the *boda boda* operators, hospital representatives and police in Kakamega County who were assessed through a survey. Mugenda and Mugenda (2003) define a survey as an attempt to collect data from members of a population in order to determine the current status of the population with respect to one or more variables. According to Mugenda and Mugenda (2003), the Simple Random Sampling is a probabilistic sampling technique which ensures each subject, object or respondents have an equal chance of representation.

The researcher identified *boda boda* operators who are the main users of the motorcycles for transportation. Records from level four, level five and private hospitals and police station were used to identify the casualties and fatalities involved in *boda boda* accidents within the county.

3.4 Data collection instrument

3.4.1 Questionnaire

The research was carried out using both primary and secondary sources of data. Collection of primary data involved the use of questionnaires, site visits and oral interview schedules. A total of 536 questionnaires were issued for the exercise. Out of these, 450 no. were collected back from *bodaboda* operators, 12 no. from health facilities and another 12 were collected from police stations. The questionnaires were used to gather information concerning personal details, experience, training and safety of *bodaboda* operators. Questionnaires addressing the police and health facilities were used to gather information relating to bodaboda transportation (incident related), basing on relevant records. Secondary data included sited literature from libraries, the internet, reports from health facilities and law enforcement, various publications and regulatory organizations.

3.4.3 Data Analysis

A large part of the information was quantitative, which was analyzed using a computer data processing programme known as the Statistical Package for Social Scientists (SPSS) version 16. Another substantive part of the information was qualitative. Data from the open ended questions were coded to enable quantitative analysis. Quantitative data involved collecting data from *boda boda* operators, health facilities and law enforcement in a form that was converted to numerical indices. The SPSS programme facilitated the preparation of code books, tabulations and drawing statistical inferences.

Descriptive statistics was used to summarize the basic features of the data provided by respondents from field surveyed, in the study. Together with graphical analysis using descriptive numbers, they form the basis of virtually every quantitative analysis of data.

The study used frequencies and percentages as they easily communicated the research findings. The frequencies were used to show the number of times a response occurred or the number of subjects in a given category. Percentages were used to compare sub groups that differed in proportion and size.

Inferential statistics was used to make judgments of the probability that an observed difference between groups was a dependable one or one that might have happened by chance, in this study. Thus, inferential statistics was used to make inferences from our data to more general conditions. In relation to this, chi-square analyses were used to assess the relationship between the following: safety and training status of the operators, casualties and fatalities from the hospital and police stations, the training levels of the *boda boda* operators and age of the respondents, those with valid driving licenses, years of operations, kilometres they ride in a day, the number of days they work in a week, where they went for training, if they had done any road safety training, topics covered during road safety training, use of reflector jacket, causes of accidents, use of headlong, type of PPE used, common motorcycle accidents, number of passenger carried and number of passenger licensed to carry

CHAPTER FOUR:

4.0 RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents the interpretation and discussion of the findings from the data collected during the research field survey in Kakamega County. The main areas of concern were:

i. To determine training levels of the *boda boda* operators,
ii. To assess the accident burden trends over the past five years,
iii. To investigate the safety practises observed by the *boda boda* operators
iv. To determine the existing national policies on road traffic addressing issues on training and safety status of motorcycle transportation.

The findings of the study were presented and interpreted as per the research questions consistent with the above mentioned research. The results were presented in tables, pie charts and bar graphs. Descriptive and inferential statistics were used for data analysis.

4.2 Demographic Data

The parameters used from demographic characteristics in this study include:

i. The level of education,
ii. Possession of valid driving licence,
iii. Shifts of operation,
iv. Days or frequency of operation per week,
v. Age of *boda boda* operator
vi. Practical experience of *boda boda* operators.

These are as presented in the subsections below:

4.2.1 Level of education

The study considered education level of bodaboda operators, which is an important factor related to their training needs. The outcome was as displayed in table 4.1 below:

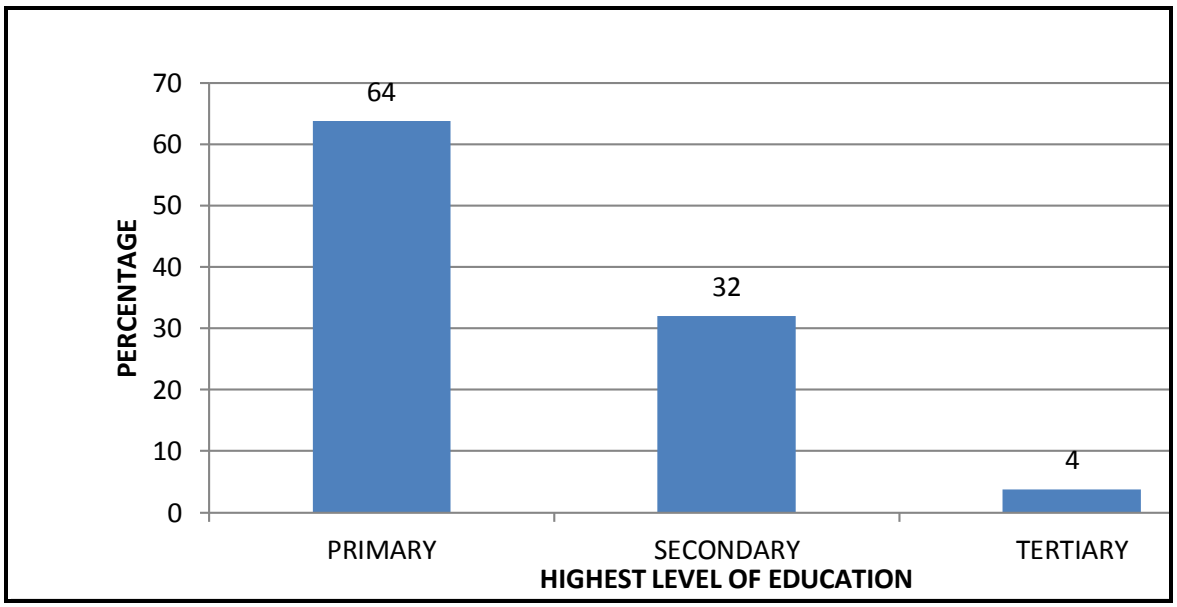

Figure 4.1: Level of Education

Out of the respondents, 64% had primary level education, 32% had secondary level of education and the rest (4%) had tertiary level of education (Figure 4.1). From the research it shows that all the respondents at one point had gone to school.

As a result of premature school dropout impacting boys in the country (Chege *et al.*, 2013), the youth, more typically among the male gender, would want to venture in quick money making activities such as touting, driving passenger service vehicles or engaging in the *boda boda* business. It is worth noting that the level of education is critical in determination of the level of many aspects of awareness needs. A study done by Amoran *et al*. (2006) showed that motorcyclists with higher levels of education were found to practise safety codes more regularly as compared to illiterate riders who may not be able to interpret road signs thus contributing to road crashes.

4.2.3 Possession of valid Driving licenses

The Traffic Act of Kenya (2009) states that 'No person shall ride a motorcycle unless that person has a valid driving licence issued in accordance with the provisions of the Act'. When probed on the validity of *boda boda* operators 'licences at the study area, the following observations were made and presented in figure 4.2 below:

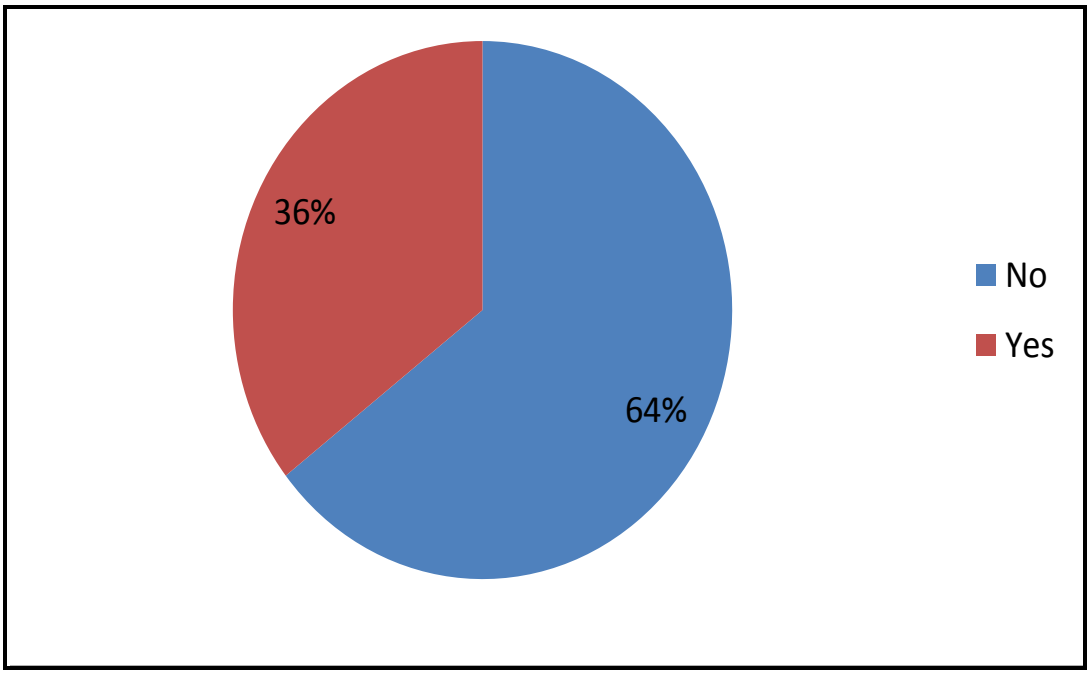

Figure 4.2: Proportion of respondents on validity of driving license

Most of the respondents (64%) did not have a driving license contrary to the Traffic Act.

Valid driving licenses are indicators that operators have gone through requisite trainings and qualifications at recognised training schools.

Further, the OSHA, 2007 Act section 55 states that all machinery, whether fixed or mobile for use either at workplace or as workplace shall only be used for the work which it designed for and be operated by a competent person. This helps in ensuring that he/she understands the rules and procedures in place when using the machine.

4.2.4 Shifts of operations

In many cases, the population of *boda boda* operators per shift will be determined by the trends of the general populations working shifts. The figure below probed to determine the ratio distribution of *boda boda* operators between day and night shifts.

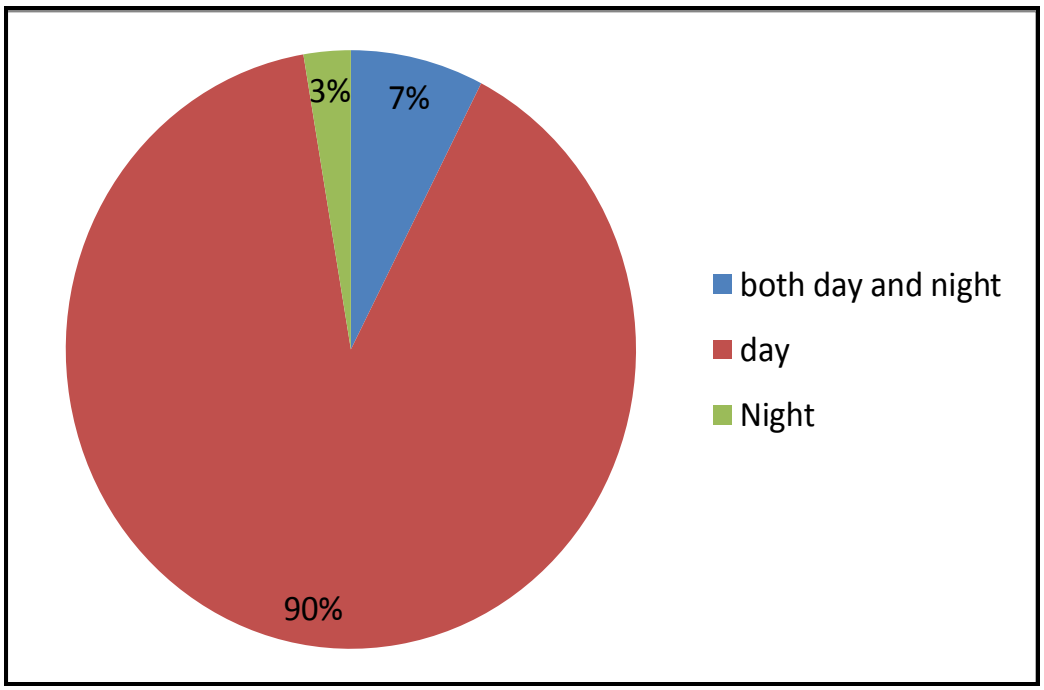

Figure 4.3: Proportion of respondents' hours of operation

From the study it came out that most of the *boda boda* operators (90%) work during the day, (7%) work both day and night and (3%) work at night.

In the study area, an individual *boda boda* operator works for averagely 8 to 12 hours with limited rest intervals or none. In any case, individuals who work for longer hours per day with little rest breaks tend to develop conditions related to fatigue which lead to stress (White and Beswick 2003).

4.2.6 Respondents' days of operation per week

Recurrent long work days in a week bear potentials for yielding fatigue situations and when chronic, could lead to stress situations and impaired health and fitness. The research as shown in Figure 4.5 shows the number of days the *boda boda* operators work in a week.

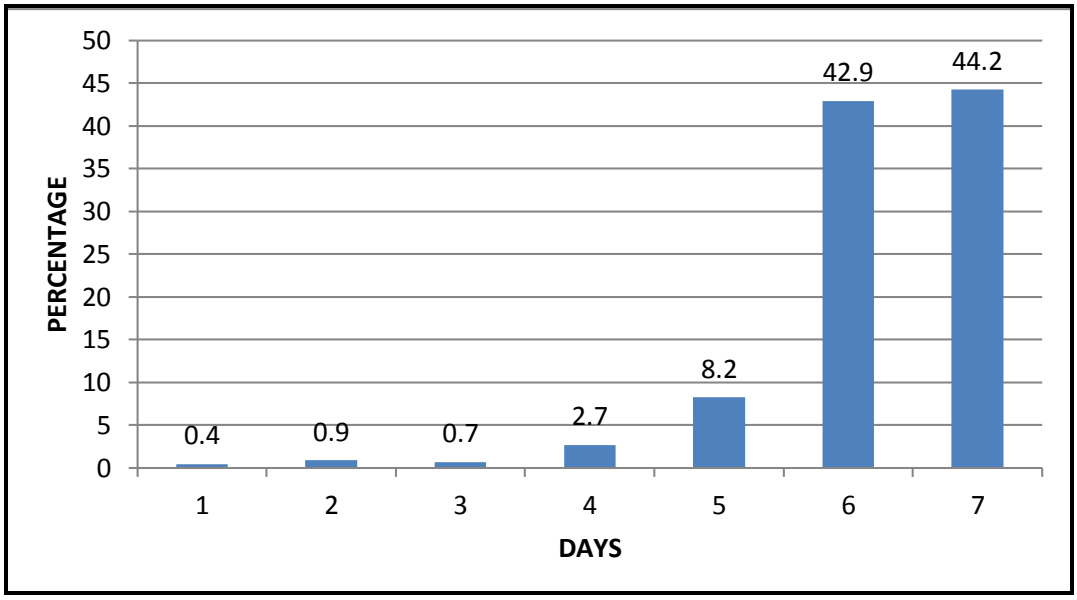

Figure 4.4: Percentage on number day's *bodaboda* worked in a week

Majority of the *boda boda* operators work seven days a week. Majority (44.2%) of the respondents work seven days, 42.9% of the respondents work for 6 days, 8.2% of the respondents work for 5 days, 2.7% of the respondents work for 4 days, 0.7% work for 3 days, 0.9% work for 2 days and the least 0.4% work for a day.

4.2.5 Age of *boda boda* operators

It was important to probe *boda boda* operators on their age factor since this bears a potential bearing on road safety levels. Age distributions among those interviewed were as shown in figure 4.5 below:

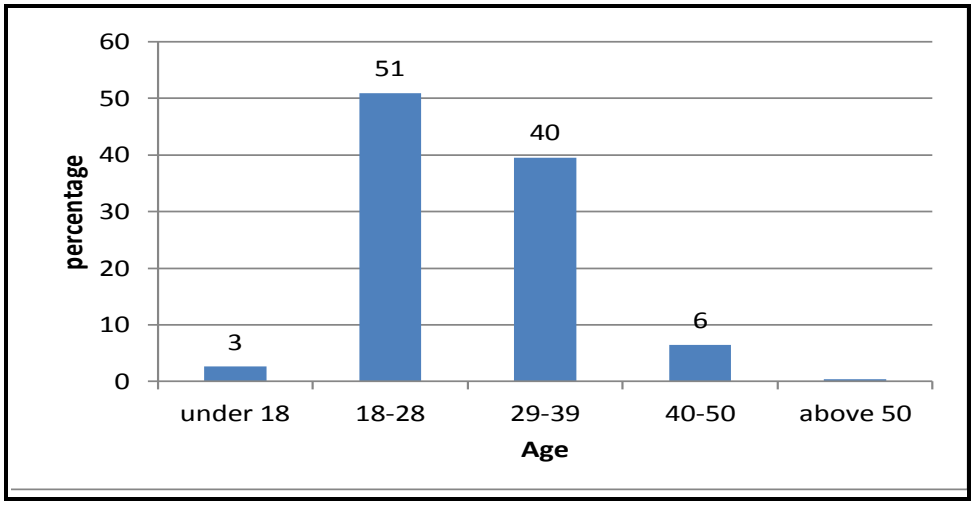

Figure 4.5: Percentage *boda boda* respondents in different age groups

It was observed that 51% of the respondents were between 18 – 28 years, 40% were 29 - 39 years, 6% were 40 – 50 years, 3% were under 18 years of age and 0.4% were above 50 years.

Glaiza *et al*. (2011) explained in their study that young riders are usually involved in speeding which increases the risk of getting into accidents. Further, older riders, apart from being less risky are generally more experienced than young drivers. Glaiza concludes that they might have encountered riding problems in the past, which imparted learning on the value of being cautious on the road. This case is likely to be as observed in Kakamega County.

Sisimwo *et al.* (2014) stated that youth in reproductive age group were mostly involved in commercial motorcycle crashes. Most riders in the study area are young and have attained low levels of education.

4.2.7 Practical experience of operators

When probed on practical experience in terms of years of operation in the *boda boda* industry, the following observations were made:

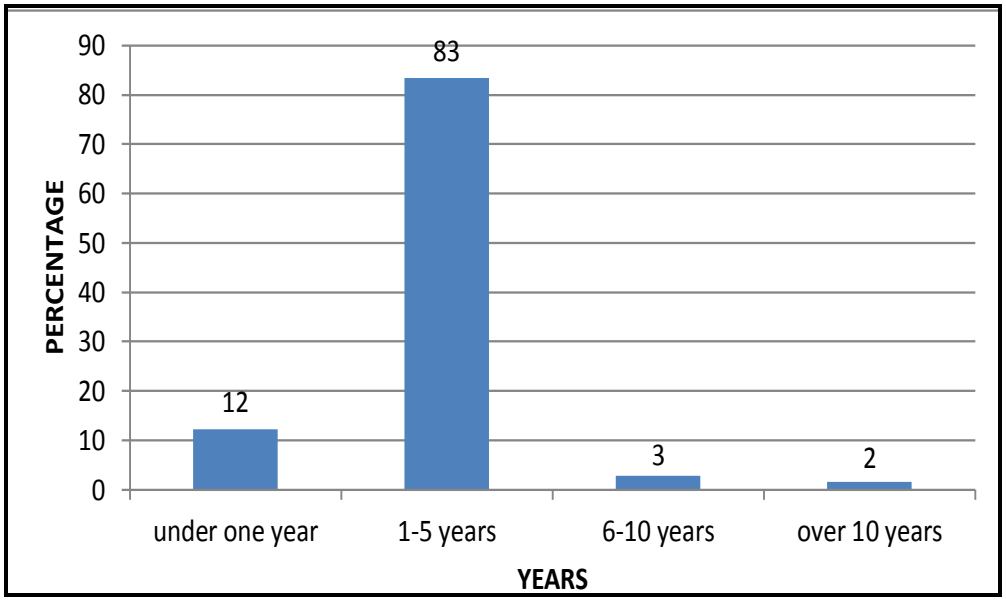

Figure 4.6: Percentage years *boda boda* respondents been in operation

The findings show that majority of the *boda boda* operators (83%) have been riding for 1-5 years. 12% of the operators who were probed had operated below one year. Those riding for 6-10 years represented 3% of the respondents while the rest represented 2%.

The observed trends for those with experience below 5 years coincide with the government's move to exempt tax on motorcycles below 250cc capacity (Daily Nation October, 2010). The move saw many young individuals venture in the *boda boda* industry, which could seemingly be exploited without costly investment commitments. Most of the operators ferry passengers between various points as opposed to goods. Relative to this observation, it also came out from the research (see section 4.2.5) that most of these operators are the youthful individuals. Most of those with experience of between 6 to 10 years and those above 10 years do not fall within the youthful age bracket.

4.3 Investigate the training level

The operators were probed on their competence in bodaboda riding, their mode of training and road safety training. Topics guiding the process covered their competency in *boda boda* riding, modes of training, training against passengers being carried and road safety training against accidents. The following observations were made:

4.3.1 Competence in *boda boda* riding

Under *boda boda* riding competence, we refer to the fitness, capability, skill and readiness a driver must have in order to drive safely on the road. When probed on rider competence, the following was observed.

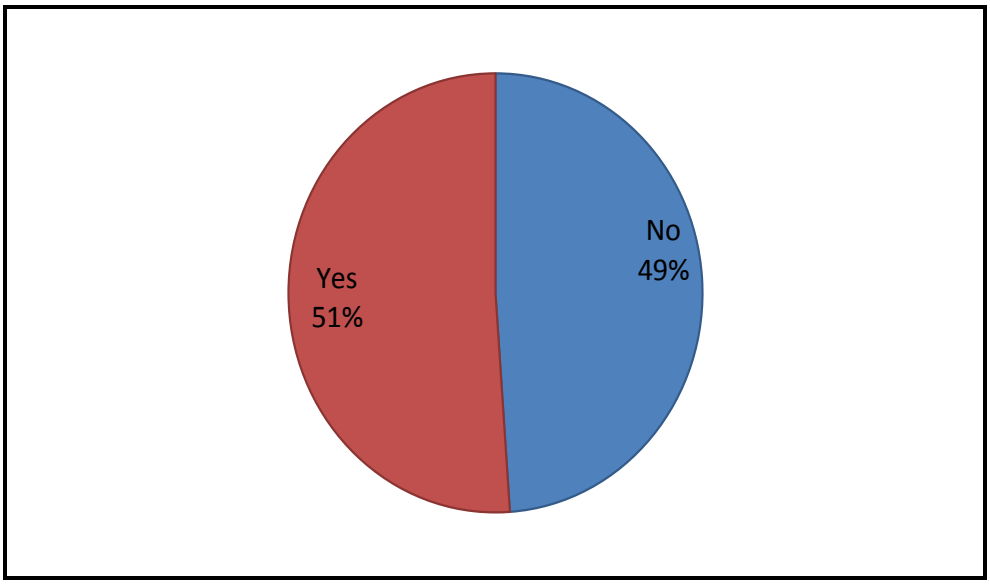

Figure 4.7: Motorcycle training among *boda boda* operators

The study found that, majority of the *boda boda* operators (51%) had undergone motorcycle training while the rest (49%) had not.

According to standard definitions, competence motivation is defined as the drive to be good at something. The competent riders are the learning individuals who profit from their experience and continually improve their skills. They tend to perform their jobs capably because of the inner satisfaction they feel from doing it well and the esteem they gain from others who notice it: in this case, their ride mates, customers and their managers (Ndyabawe, 2003).

Competence motivation differs from achievement motivation. Achievement-oriented individuals enjoy getting things done and moving onto the next objective. They are concerned with quantifiable goals, which serve as yard sticks for measuring the amount of their success. Competence-oriented workers place greater value on the level of their own capabilities, and are more responsive to quality-oriented goals regarding services.

4.3.2 Mode of training

In this context, mode of training refers to the various means a rider acquired his or her training experience before engaging in the *boda boda* industry. The figure 4.8

below shows how respondents were distributed according to their respective modes of training.

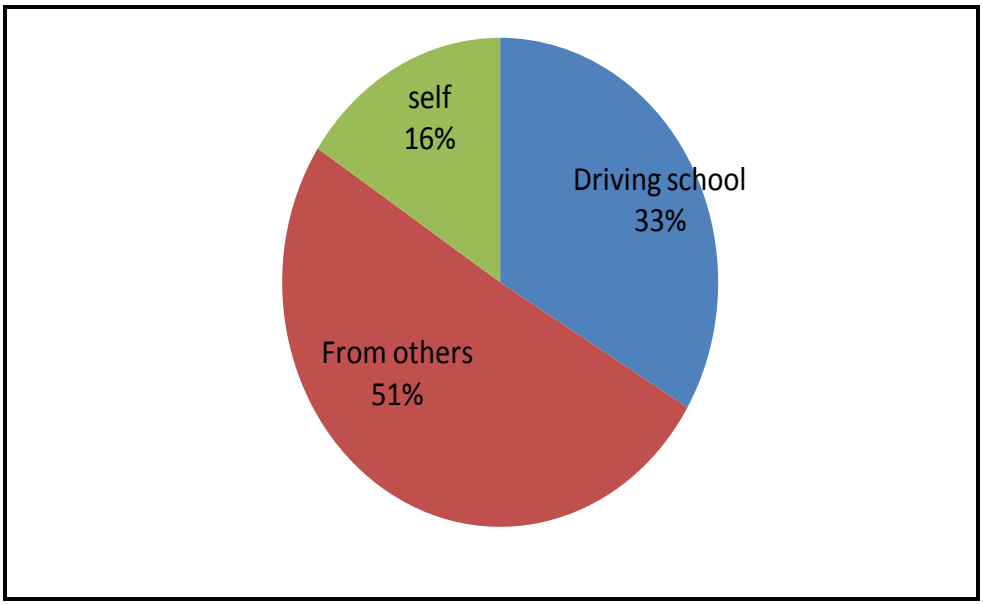

Figure 4.8: Mode of training

It came out that most of the *boda boda* operators (respondents) were trained through apprenticeship (51%). The *boda boda* operators who attended driving school were 33%; while operators who learned how to ride by their own initiative were 16% of the respondents. The findings indicate that majority of *boda boda* operators mainly received informal training. A study carried by Wilson et al shows that over 90% of the motorcycle riders involved in an accident do not have formal training instead rely on family, friends or being self-taught. Occupational Health and Safety Act, 2007 states all plants, machinery and equipment whether fixed or mobile for use either at the workplace or as a workplace, shall only be operated by a competent person (OSHA, 2007).

The study shows that majority of the motorcycle operators were aware of this clause of the law but chose to ignore the requirement and ferry passengers above the permissible limits. They probably did not care for the potential consequences of overloading. It was also clear that a good number of operators had the wrong interpretation of the law and thought that they could ferry more than one passenger

while a few were totally ignorant about the existence of passenger limit laws for motor cycles.

There is need for awareness creation for the *boda boda* operators in order to ensure they are conversant with the traffic regulations with regard to how many people they are licensed to carry at a given time and potential consequences of ignoring the law.

4.3.3 Training versus passengers being carried

The research appreciated the means through which *boda boda* operators acquired their training to carry out the business. Considering the training undertaken by the riders, the sampled respondents were probed on the maximum number of passengers they carry when opportunity occurs. The response was as indicated in figure 4.9 below:

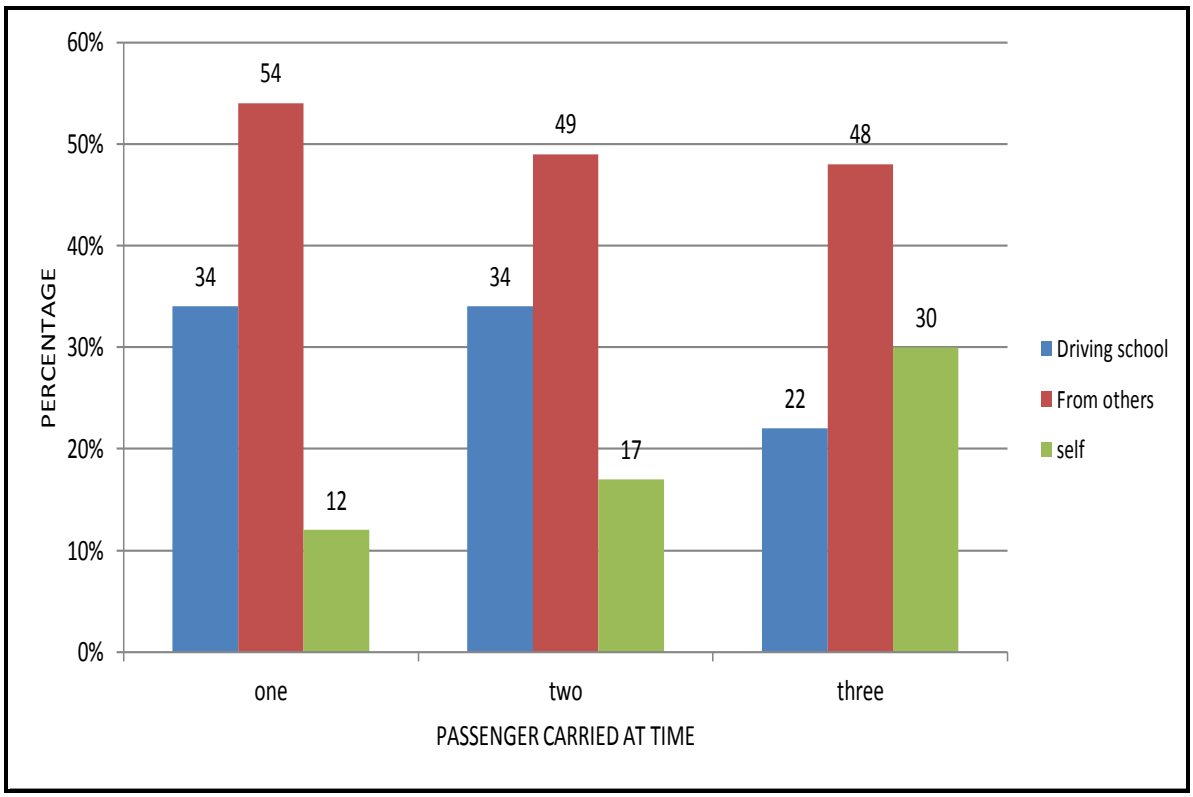

Figure 4.9: Training versus passengers being carried at a time

Among those who were trained in driving schools, about 34% carry one passenger per trip, another 34% carry two passengers per trip and about 22% carry three passengers per trip. Among those who were trained by other *boda boda* operators, about 54% ferry one passenger per trip, 49% ferry two passengers per trip and about 48% ferry three passengers per trip. It also came out that among those who trained themselves, about 12% ferried one passenger per trip, 17% ferried two while 30% ferried three passengers per trip.

Most of the *boda boda* operators who went through training do not practice what they were taught considering their lack of adherence to certain traffic rules. A statistical significance relationship demonstrating the training mode for *boda boda* operators and the number of passengers they were permitted to ferry per trip (χ^2 = 6.368, df = 4, p > 0.05) showed lack of relationship. Training needs programmes are therefore presented as important gaps to be filled in order to ensure all *boda boda* operators understand the number of passengers they need to ferry per trip.

4.3.4 Road safety training against accidents

It was necessary for the study to indicate how many of the bodaboda operators had undertaken road safety trainings and the relationship between those trainings and prevalence's of accidents. The graph below shows outcomes of the indications.

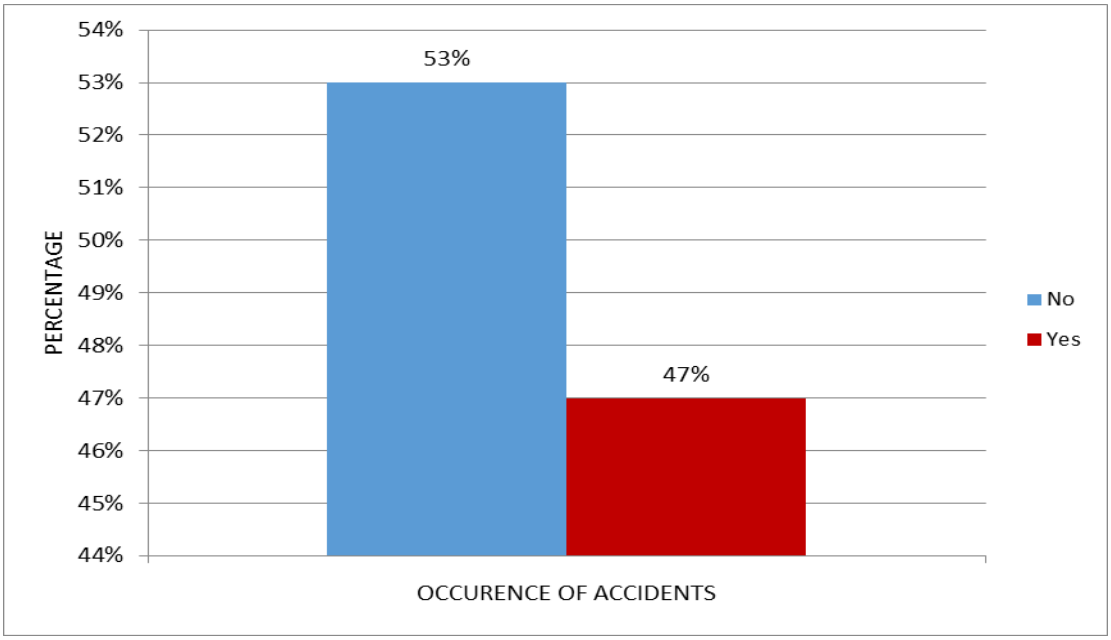

Figure 4.10: Road safety training against

The study shows that 53% of *boda boda* operators had not undertaken safety training while 47% had. The statistical relationship between the operators who had training and accidents (χ^2=4.744,df=1,p<0.05) was significant.

4.4 Examine the trends of accident

This section analyses various parameters characterising trends of *boda boda* accidents. The sub sections have detailed out the following:

i. accident causes,
ii. most common *boda boda* accidents,
iii. proficiency in terms of years of operation against occurrence of accidents,
iv. responses on special motorcycle medical wards,
v. fatalities over the past five years from health facilities and
vi. fatalities over the past five years from law enforcement facilities.

Other parameters defined in this section include causes of *boda boda* accidents by traffic police records, ways of dealing with *boda boda* offenders by law enforcers, causes of accidents against where or how they learned riding and licensing status against accident frequency. These are detailed in the following sections.

4.4.1 Causes of accidents

During the interview session, *boda boda* riders were tasked to provide the causes of road accidents affecting their operation. The responses provided were in accordance to their individual perceptions. The causes were distributed in percentage according to figure 4.11 below:

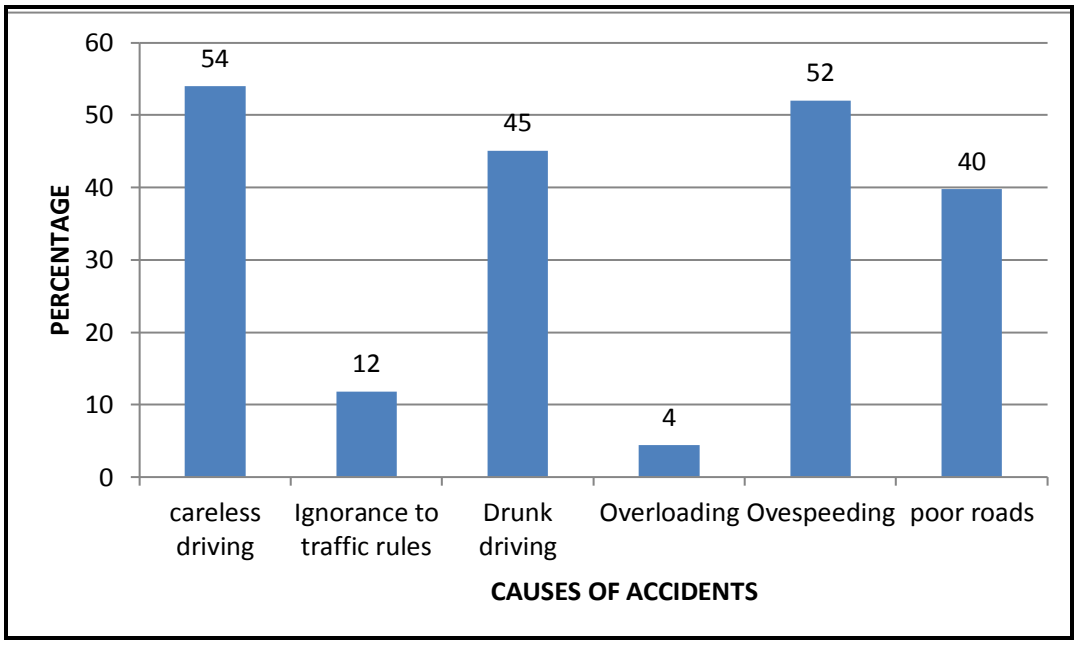

Figure 4.11: Causes of accidents

From the findings indicated in figure 4.11, the main cause of accidents is careless riding by the operators at 54%. According to the respondents. Over speeding has also contributed to increase in number of accidents, standing at 52%. Other reasons for over speeding by operators was attributed to the need for making quick extra money, as well as operation of boda bodas by young aged riders who want to experiment with the machine. Operating boda bodas under influence of intoxicants also contributed to increase of accidents in the county.

Poor roads in the county have also contributed to accidents 40% have suffered due to the bad state of the roads. Traffic rules and regulations not being followed has also contributed to accidents (12%) while overloading (4%) have also contributed to accidents on the road.

Therefore careless driving is attributed to *boda boda* operators not undertaking the required training, thus not understanding hazards and risks involved, as well as control measures needed in order to avoid accidents.

4.4.2 Common motorcycle accidents

In the survey, respondents provided information on the most common accidents in the *boda boda* industry. Figure 4.12 below shows the common accidents distributed

according to percentage occurrence. Self-caused accidents are those purely caused and associated with the operator without involving the other named parameters.

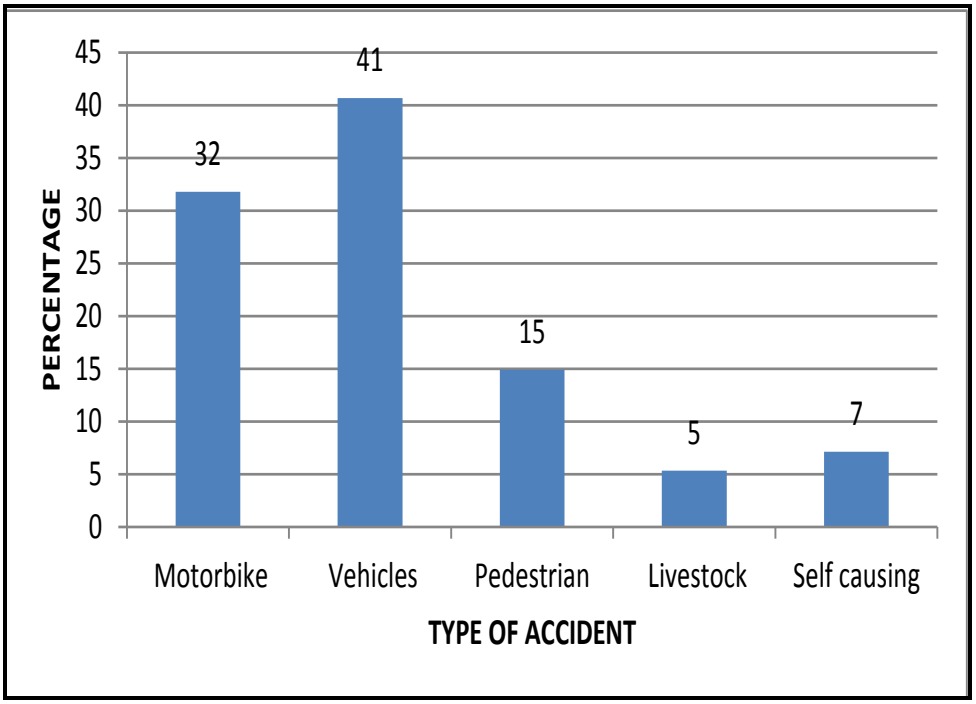

Figure 4.12: Common motorbike accidents

According to Figure 4.12 most causes of accidents were between the *boda boda* operators and vehicles which accounts for 41%; followed by accidents caused between motorcycles 32%. Motorcycles knocking down pedestrians were at 15%, while motorcycle knocking livestock accounts for (5%). Self-initiated accidents were at 7%. Oluwadiya *et al*, (2004) explains that there is a clear demonstration showing that motorcycles - vehicles and motorcycles - pedestrians collisions are common because the majority of the riders often ignore safety measures,. Oluwadiya further highlights the absence of pedestrian walkways in most roads in Kenya as a factor increasing the vulnerability of pedestrians to all motorized vehicles.

4.4.3 Years of operation against accidents

In view of the perception that experience is gained over time, the respondents were asked if they had had an accident associated with their business. Table 4.1 below

Table 4.1 Years of operation against accidents

Number of years operating *boda boda*	Frequency	
	Not had an accident	Had an accident
Under one year	42	13
1-5 years	271	104
6-10 years	7	6
Over 10years	6	1
Total	326	124

The number of years of operation was seen to influence the accident rate. The more years the *boda boda* had operated the less the number of accidents reported. According to Table 4.2, 83.9% of the *boda boda* operators who had accidents had operated the motorcycle between 1-5 years .This can be attributed to overconfidence and higher risk taking in their jobs; 10.4% of the respondents who reported accidents had operated the *boda boda* for less than a year. This can be attributed to inexperience; unfamiliarity with the machine or roads and ignorance of the associated risks. 4.8% of the respondents is a lesser percentage owing to the fact these were the elder and mature riders who had operated motorbikes for a longer period and expressed no excitement over operating motorbikes. Those over 10 years in the business have the experience and are cautious in how they operate. From this group, 0.8% had an accident.

There was a significant statistical relationship between the number of years in operation of the *boda boda* and involvement in an accident (χ^2= 3.299, df= 3, $p < 0.05$). The significant statistical relationship observed in *boda boda* operators involved in accidents and number of years in operation may be related to:

a) The experience and caution the *boda boda* operators gain as they ride.

b) The more experienced one gets, the more confident he/she becomes.

4.4.4 Special wards

The researcher probed on which of the sampled level 4 and 5 as well as private hospitals had separate wards for bodaboda casualties. The purpose for making this inquiry was to exploit on the frequency and extent of the impact of motorcycle accident levels. The following was observed.

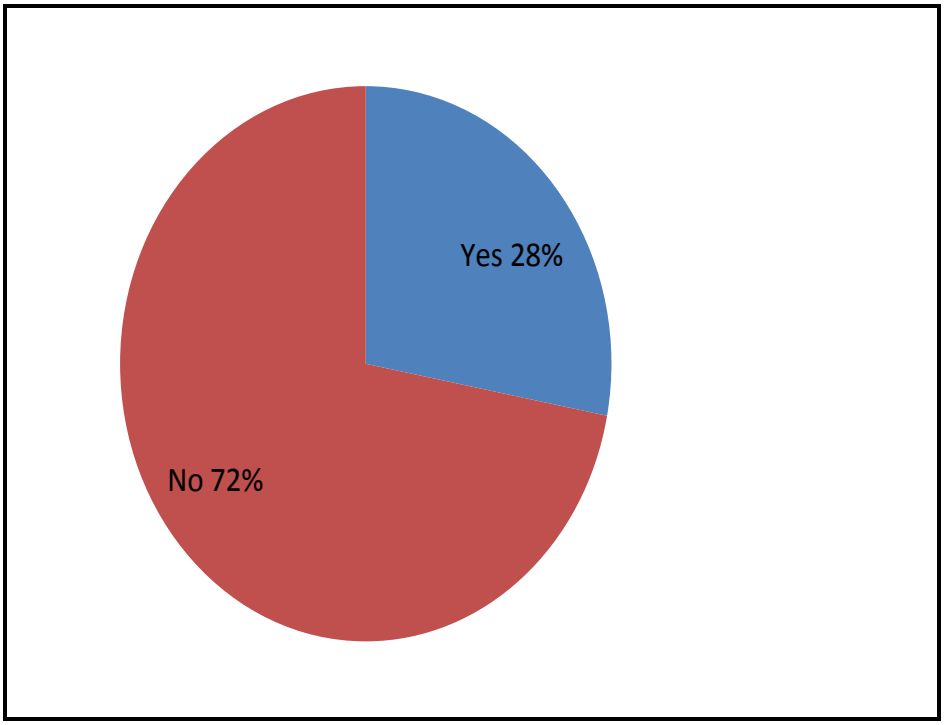

Figure 4.13: Hospital special wards

From the study, it was found that most of the hospitals did not have special wards for *boda boda* accident victims. Only 28% had special wards for victims. From the study the victims were placed in general wards. However, these results indicate that more than a quarter of the involved hospitals in the study area considered the need for treating motorcycle accident victims with special attention. This fraction exposes the chronic aspect of the situation.

4.4.5 Trend of fatalities past five years from health facilities

From the study, fatalities in the five years rose from the year 2005 to 2010 and then dropped in 2011. This may be attributed to the government's push for strict measures in road traffic injuries, more so, the *boda boda* operators. From the data analysed,

there was an increase of 5%, which can be attributed to factors like riders not trained and licensed. By offering cheaper fares and faster transport times, many riders were willing to take the risk. The rider and passengers not wearing a helmet, overloading motorcycles and riding under the influence of alcohol have led to many fatalities. This is attributed by majority of the riders being untrained.

Lack of proper maintenance has seen the operators use faulty motorbikes. The data had a decrease in motorcycle fatalities by 7% from the year 2010 to 2011. This can be attributed to various safety campaigns that have been put in place by various institutions and the government. Non-governmental organizations like Usalama Watch Initiatives have been involved in education and awareness campaigns which are aimed at educating motorcycle users and Sacco's in increasing awareness in road traffic safety. Use of helmets by *boda boda* riders and passengers, will reduce the severity of injuries sustained by the rider and passenger on the head by reducing the impact of force or collision. Use of reflective jackets by the *boda boda* riders will make them more visible to other road users. Lack of visibility is one of the major causes of motorcycle crashes thus making it important for riders to wear bright coloured reflective jackets to enable visibility with other road users.

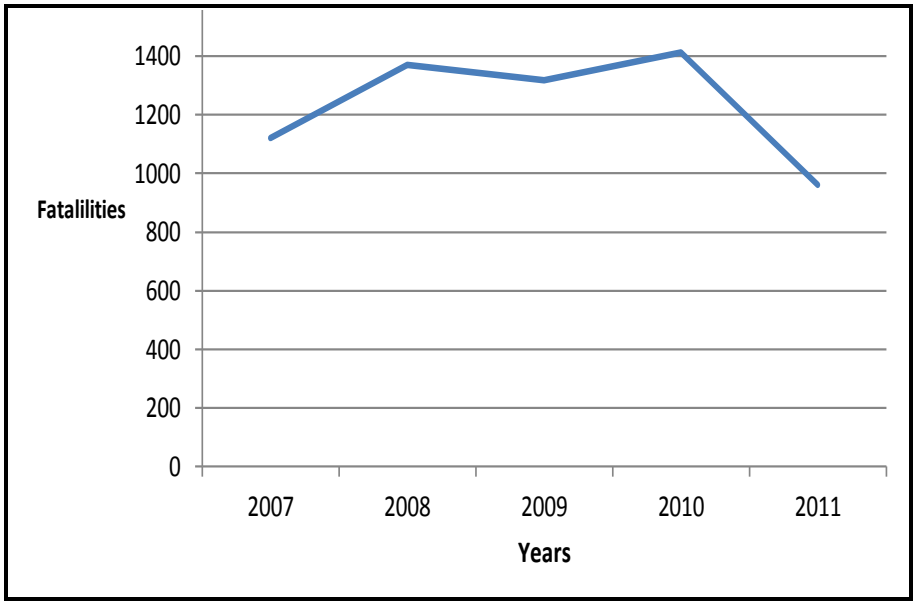

Figure 4.14: Fatalities in the past five years

4.4.6 Five year trend analysis of fatalities by law enforcement

A five year motorcycle fatality trends analysis generated using data collected from various traffic police departments within the study area is as presented in figure 4.15 below:

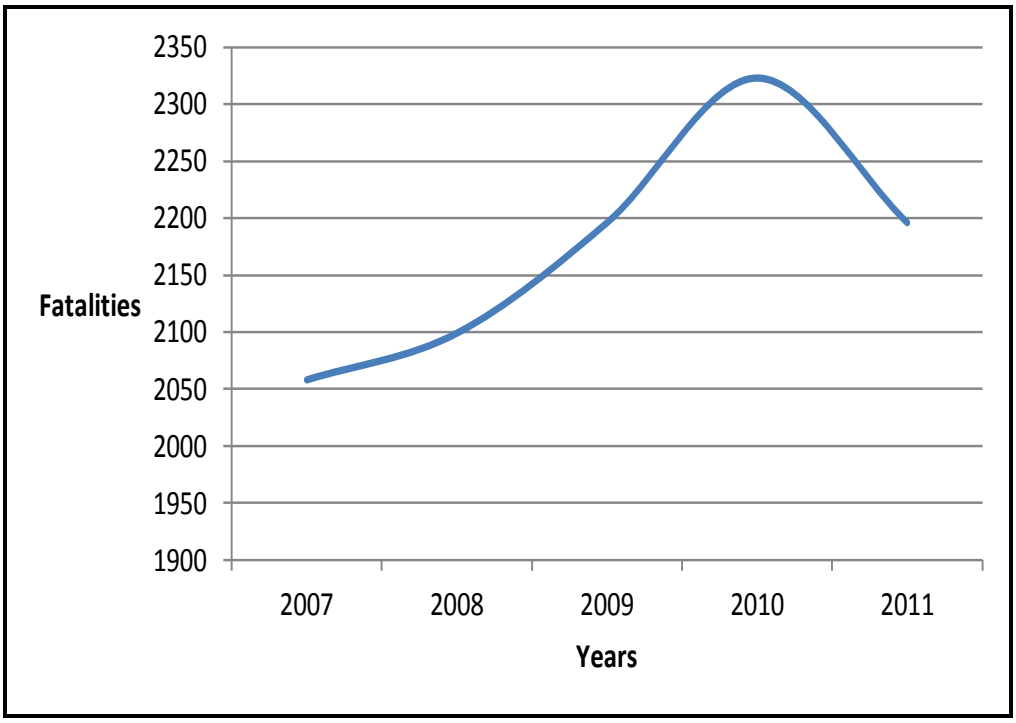

Figure 4.15: Fatalities in the past five years

Police records indicate a 2% increase of fatalities. This can be due to the *boda boda* operators not complying with the traffic rules and regulations. A reduction in fatalities by 1% from 2010 to 2011 may be attributed to police crackdowns on the following:-

i. Un-road worthy motorcycles
ii. The riders operating without valid driving licenses
iii. Reckless or over speeding
iv. Riders without helmets and reflective jackets

The presidential directive for stiffer penalties on traffic offences is with the motivation to have all motor cycles insured, riders trained and licensed. This has reduced the fatality rate in the industry (East Africa Standard, 2010).

4.6.7 Causes of *boda boda* accidents – Traffic Police

The responses from various traffic departments distributed causes of bodaboda accidents according to the clusters indicated in figure 4.16 below:

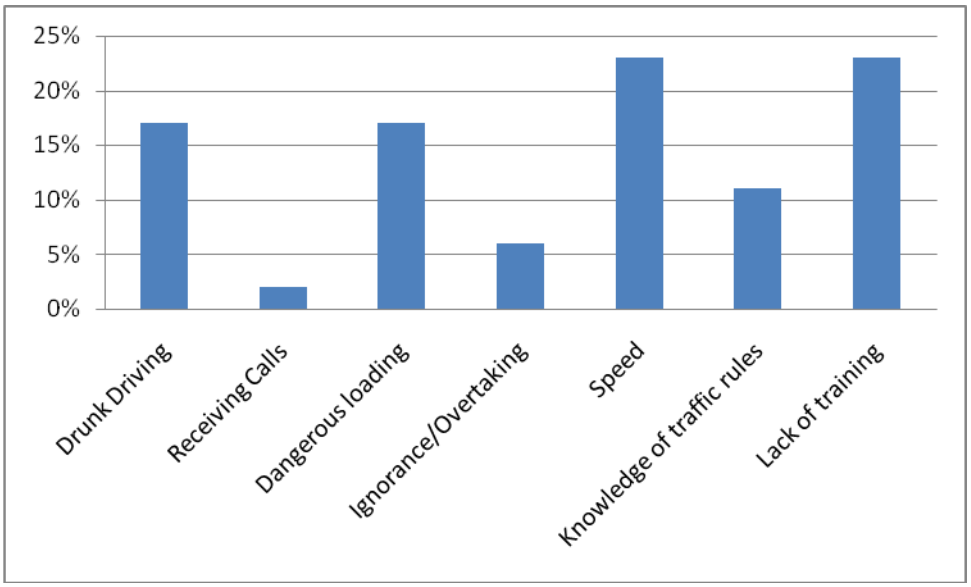

Figure 4.16: Causes of *Boda boda* accidents

From the study showing the causes of accidents that were booked in the police station within the county, majority of the accidents were due to speed and lack of training. This was noted in the 23% police stations within the county,17% of the police stations noted that drunk riding and overloading/dangerous loading were also a contributor to the causes of accidents, 6% of the stations noted that ignorance and overtaking also contributed to accidents while 2% was because of receiving a call while riding.

From the study we can deduce that accidents recorded in the police station had a majority of the operators lacking training from the driving schools. Overspeeding is also a cause of accidents.

Training is vital in equipping the operators of a machine with the necessary skills to operate it effectively. The *boda boda* operators need to go through the driving school to be trained on traffic rules and road safety before being licensed. The driving school issues of speed, road signs, PPE will be made aware to the operator. The training will have the operator in charge of the *boda boda* when riding by taking utmost precautions into consideration.

4.6.8 *Boda boda* offenders dealt with

The legal process takes various courses of services relating to dealing with traffic offences caused by *boda boda* operators. The options include taking law breakers to court or imposing fines on clear cut cases. However, some opt to settle disputes without necessarily involving the police. With this regard, the following measures in percent distribution were recorded following traffic offences by *boda boda* operators:

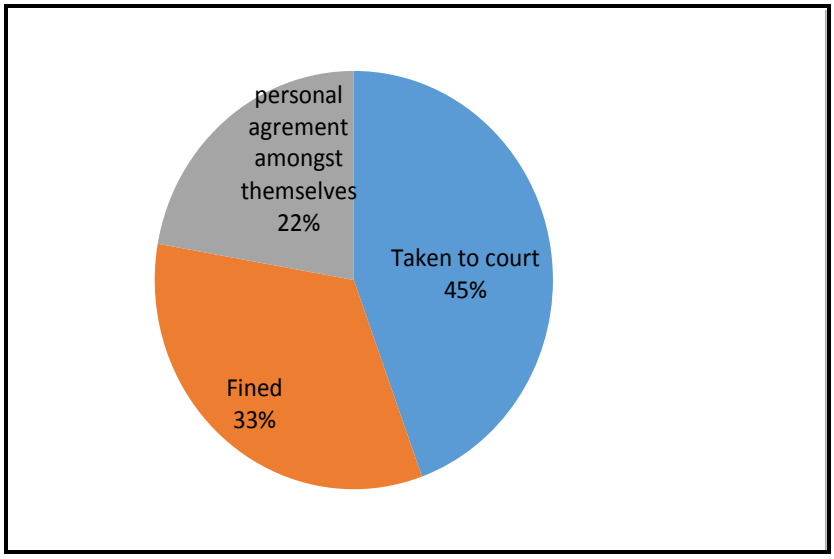

Figure 4.17: *Boda boda* offenders dealt with

The study shows that 45% of traffic rules offenders were taken to court to face relevant charges. 32% of the offenders were fined by the courts while 23% of the offenders preferred to agree with the offended at personal levels in order to deal with issues related to accidents. The operators agree on whom to repair or to pay damages according to the investigations of the incident. According to The Traffic Act, most of

the traffic offenders are taken to court and are fined or imprisonment for a given number of years depending on the offence.

4.6.9 Causes of accidents against where learned riding

Causes of accidents were compared to the mode of driving undertaken by *boda boda* operators in order to determine causes against the various modes identified and the result is represented in figure 4.18 below.

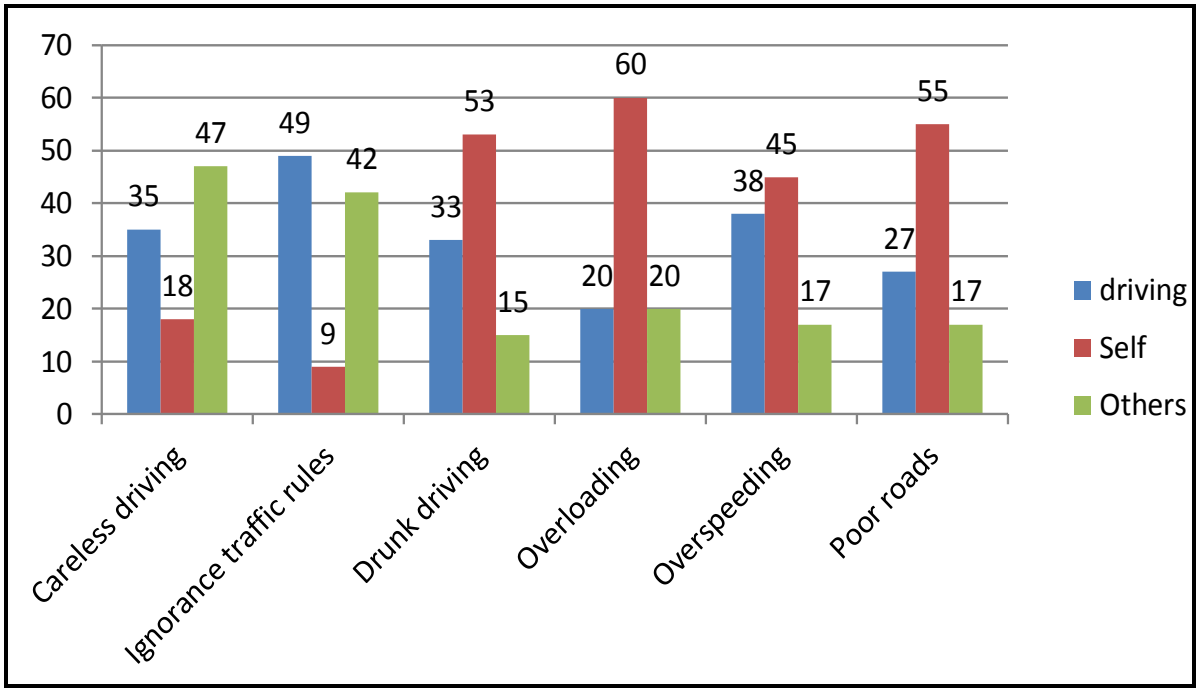

Figure 4.18: Causes of accidents against where they learned riding

From the figure above, there is relationship between the place where the bodaboda operators trained and causes of accidents. Careless driving was majorly caused by those who trained from other people (47%) while those who trained from driving school recorded 35%. Self-trained drivers recorded 18%. An analysis of ignorance to traffic rules found that majority of law breakers were operators who had gone to driving school at 49% while those trained by others stood at 42%. Those who trained themselves recorded 9%. This could possibly have been contributed to the fact that there are no existing refresher courses or courses designed for the *boda boda* operators who knew how to ride before training. As a result, most of them tend to

ignore or forget their learned instructions during driving lessons. Most attend driving courses with the objective of obtaining a license for operating the *boda boda*. Drunk driving, overloading, over speeding and poor roads have also contributed to road accidents.

4.6.10 Licensing status against accident frequency

Accident frequency was blanket considering those who had acquired licenses and those who had not acquired licences, but at notably varying levels among the two parameters. This is as reflected in the chart below (figure 4.19):

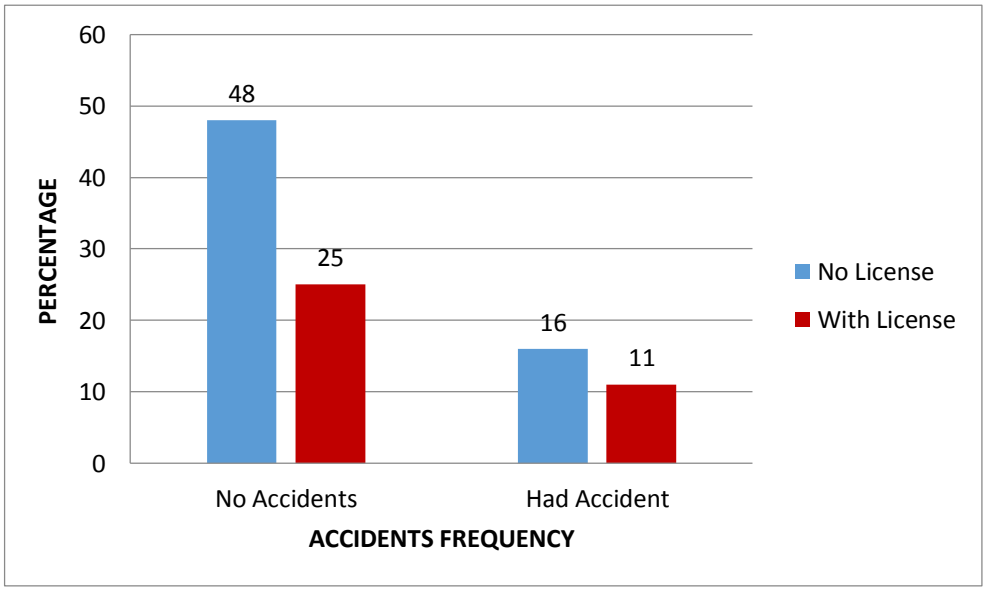

Figure 4.19: Licensed against had an accident

From the figure above it can be seen that most of the *boda boda* operators who have had accidents did not have driving licenses (16%) compared to 11% of the operators who were licensed. The figure also indicates that 48% of the operators involved in accidents and operated *boda boda*s without licenses while 25% of the operators who had licenses did not cause any accidents.

There was significant statistical difference between the *boda boda* operators who are licensed and if they had been involved in an accident (χ^2 = 1.172.; df = 1 p < 0.05).The licensed and trained operators were aware of the risks and hazards

involved with riding the *boda boda* hence being more careful when operating the *boda boda*. The ones who have not undergone the training take more risks because they are not aware of the hazards involved with the riding of the motorcycle.

4.5 Evaluate the safety measures in place

The safety measures evaluated in the study are described in the subsections below. They include the use of headlong, number of passengers carried at a time (during a single trip) and the understanding by *boda boda* operators of the number of passengers licensed to be carried.

4.5.1 Use of headlong

According to statutory provisions by the Traffic Act (2009), motorcycles must have their headlong on during all sessions of operation. A headlong is the front main light (head lamp) mounted to provide vision to the rider and on-coming road user. When asked if they ride their motorcycles with head-longs on, the responses in figure 4.20 below were recorded.

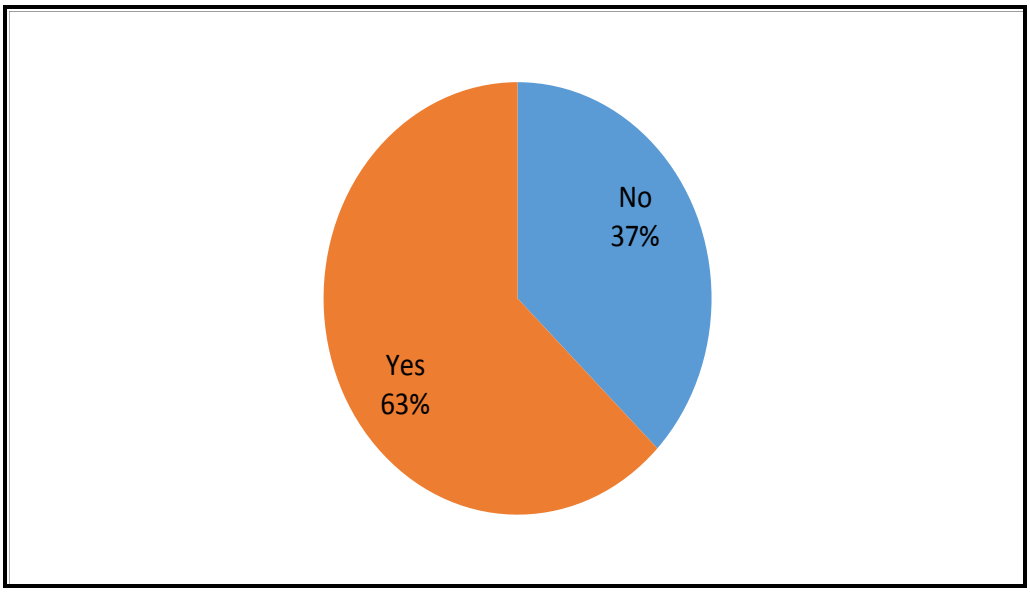

Figure 4.20: Use of headlong

The findings of the study in the figure 4.20 above show that majority of the *boda boda* operators (63%) had it on when riding as per the traffic requirement while 37%

did not. Ensuring the headlong is on is a safety measure to alert incoming vehicles on the presence of a motorcycle.

4.5.2 Passenger carried at particular time

It is common practice for *boda boda* operators to carry multiple passengers without observing requisite limitations provided by the law. When asked how many passengers respondent operators carry at a go, the responses were as represented in figure 4.21 below:

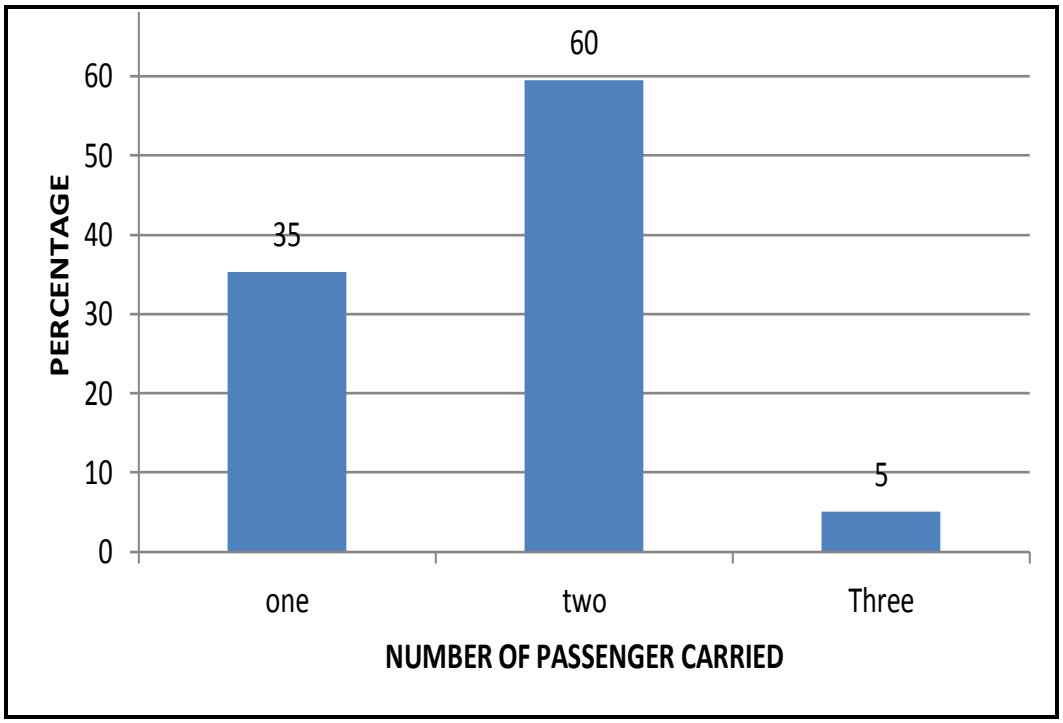

Figure 4.21: Passenger carried at one time

From the study it was evident that most of the operators (60%) ferry two passengers per trip while 35% comply with traffic rules. 5% of the operators ferry three passengers per trip. Ferrying more than one passenger easily compromises the stability of the motorcycle and renders those aboard vulnerable to accident situations. The traffic Act demands operators to ferry only one passenger per trip.

4.5.3 Passenger licensed to carry

When asked if motorcycle operators were aware of the number of passengers they were permitted by the law to ferry at a given trip, responses were registered as shown in the figure 4.22 below:

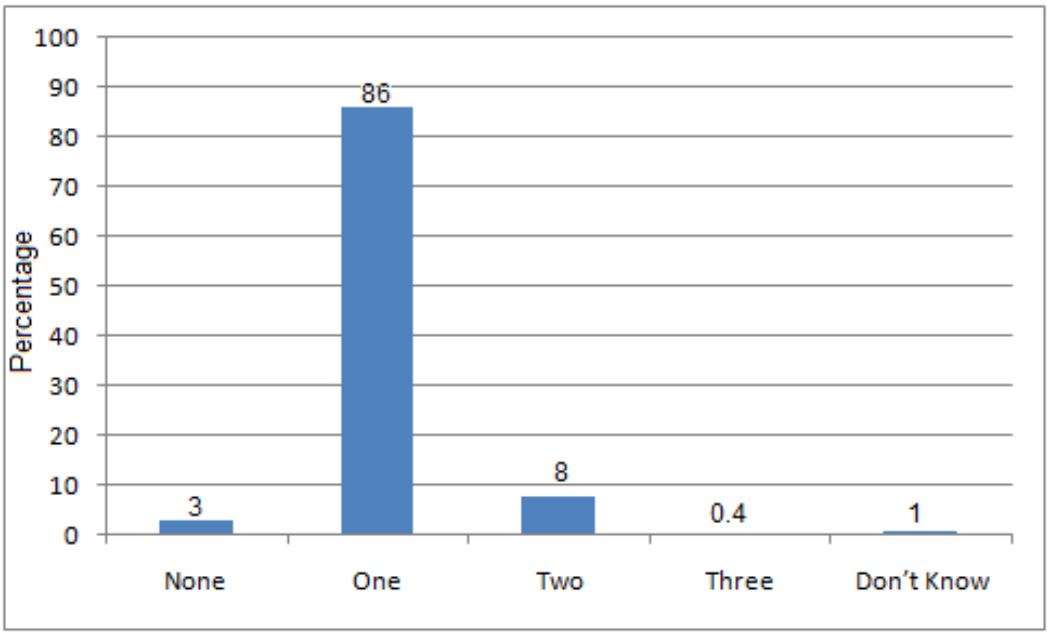

Figure 4.22: Passenger licensed to carry

The study shows that most of the *boda boda* operators (86%) were aware that they were required to ferry only one passenger per trip as required by the Traffic Act, 2009, 8% assumed that the law permitted them to ferry two passengers per given trip while 3% thought that the traffic act did not permit them to ferry passengers at all. 0.4% of the *boda boda* operators knew that the law permitted them to ferry a maximum of three passengers while 1% of the operators were not aware of the provisions for passenger limits permitted for motorcycles per trip by the Traffic Act.

4.6 Investigate the awareness level

4.6.1 Topics covered

To effectively understand formal training undertaken by the operators, sampled respondents were probed. As an output, table 4.2 below was generated to show the topics covered and what percentage of the sample covered them:

Table 4.2: Topics covered by operators

TOPICS COVERED	PERCENTAGE
Road Safety	37.8
Road signs	31.8
Traffic rules/Highway Code	5.3
Safety of Customers	1.1
Control	0.4
Introduction to motorcycling	0.4
Changing lanes	0.4
Obstacles	0.7
Observing road users	0.7
Driving on different Kinds of roads	0.4
First aid	10.6
Traffic Lights	0.4
Defensive Driving	3.9
Speeding	0.7
Causes of Accidents	1.8
Avoiding accidents	0.4
Use of Protective devices	3.5
TOTAL	**100.0**

From the findings, different topics covered by the operators indicate that majority were taken through units covering road safety, road signs and traffic rules/highways codes at 37.8%, 31.8% and 5.3% respectively.3.9% had done units on defensive driving, 3.5% use of PPE devices, 1.8% causes of accidents while 1.1% had done safety of customers. Lesser proportions of 0.7% had gone through over speeding, obstacles and observing road users and 0.4% covered avoiding of accidents; traffic lights, control, introduction to motorcycling, changing lanes and driving in different roads. From the study findings it can be concluded that majority of the trained operators had gone through road safety which is key in ensuring safe driving of their

boda boda. A significant number had gone through road signs which help them in ensuring that they observe traffic rules and regulations.

A number of the driving schools that were sampled to get the topics covered in motor cycle riding course were found not to have any formal and unified curriculum. Basing on the brochure course contents collected within the study area, a bias was observed to favour light and heavy vehicles. Motorcycle classes were not presented.

A publication by the Motor Cycle Foundation (MSF, 2014) illustrates how research based "Rider Education and Training System" was developed for U.S manufacturers and distributors of Suzuki, Yamaha, Honda, Piaggio and Kawasaki among other models. The research recommends conceptualization of a system of training requiring an acknowledgement of a continuum of riders. Riders to be registered for training were classified within the following categories (not limited to):

i. Pre-novice, pre permit
ii. Ready to be a novice with limited experience,
iii. Novice with limited experience,
iv. Intermediate,
v. Experienced,
vi. Long term enthusiast, highly skilled,
vii. Off, highway, trail rider,
viii. Experienced, problem.

Within the same research outputs, basic motorcycle training programme elements included but were not limited to the following:

i. Awareness (classroom activities)
ii. Awareness (on-cycle activities)
iii. Familiarization,
iv. Balance,
v. Control,
vi. Straight line riding,
vii. Turning,

viii. Breaking,
ix. Shifting,
x. Cornering,
xi. Street riding, on-road experience,
xii. Emergencies,
xiii. Skills refresher,
xiv. Advanced cornering,
xv. Rider improvement
xvi. Off-highway, trail riding,
xvii. Other speciality courses.

Comparisons of the research and training curriculum proposed for the U.S based manufacturer and distributor, riders are encouraged to participate in training by virtue of their pre-classification. In the research area context, riders who felt that they could operate a motorcycle without necessarily attending basic courses were simply pre-tested before joining advanced levels. That way it encourages the non-licenced/trained riders to confidently go in for formal trainings. Secondly, the curriculum is more advanced in terms of contents and practical applications and takes detailed consideration of diverse aspects. Other unique features of the training includes mode of trainer-rider interaction, trainee follow-up and widened scope of training terrains during practical units.

4.6.2 Riding under influence of drugs and illegal substances

The study probed *boda boda* operators on safety issues related to the use of drugs and illegal substances such as cannabis sativa and khat. Out of the total sampled respondents, 173 operators did not provide feed-back when asked about use of drugs and illegal substances. The remaining respondents were distributed as follows:

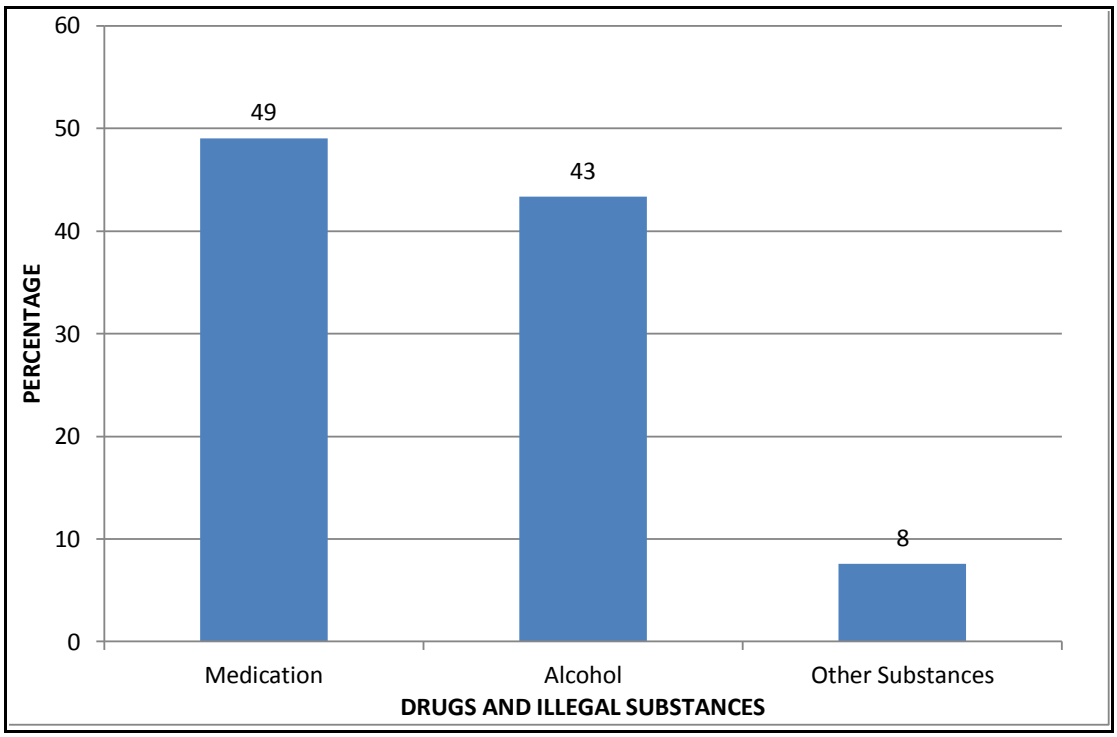

Figure 4.23: Operators riding under influence

From the study, 49% of the respondents were found to be riding their motorcycles after consuming some form of medication. 44% of the operators were riding under influence of alcohol, while 8% were under influence of other drugs like cannabis sativa “Bhang”, khat “Miraa”.

The Traffic Act states section 44. (1) that any person who,when driving or attempting to drive, or while incharge of a motor vehicle, is under the influence of a drink or a drug to the extent as to be incapable of having proper control of the vehicle shall be of an offence and liable to a fine. While section 45 (1) states that any person who, when driving or in charge of, or during any period of duty in connection with the driving of, a public service vehicle, drinks any intoxicating liquor shall be guilty of an offence and liable to a fine not exceeding fifteen thousand shillings or imprisonment for a term not exceeding two years or both (The Traffic Act Cap 403, 2009).

4.6.3 Road safety trainings

Road safety training refers to the relevant training that touch on safety issues related to the ridding of the motorcycles. The figure below shows how many respondents went through the safety training as a way of improving their knowledge on the road.

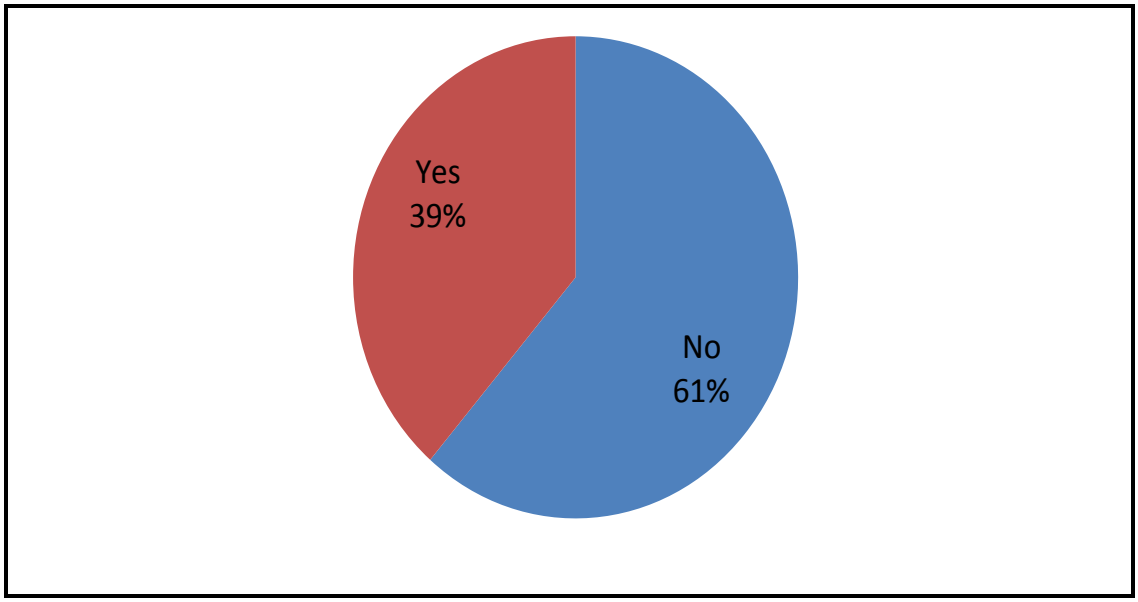

Figure 4.24: *Boda boda* operators' road safety training

From the figure above 39% of the respondents had undergone the road safety awareness training programme while 61% not. The findings indicate that the kind of road safety trainings included road safety campaigns conducted by the *boda boda* welfare association, motorcycle distributors and the National Transport and Safety Authority. These road safety awareness trainings provided the riders with in-depth understanding of their safety needs while on the road.

4.6.4 Personal Protective Equipment used while riding

As a requirement by Occupational Health and safety act (2007) and the Traffic Act (2009), PPE is mandatory for both the rider and the passenger. It is provided that PPE must be suitable for its intended purpose and must be well maintained to serve the purpose. Use of PPEs was distributed among riders as shown in figure 4.25 below.

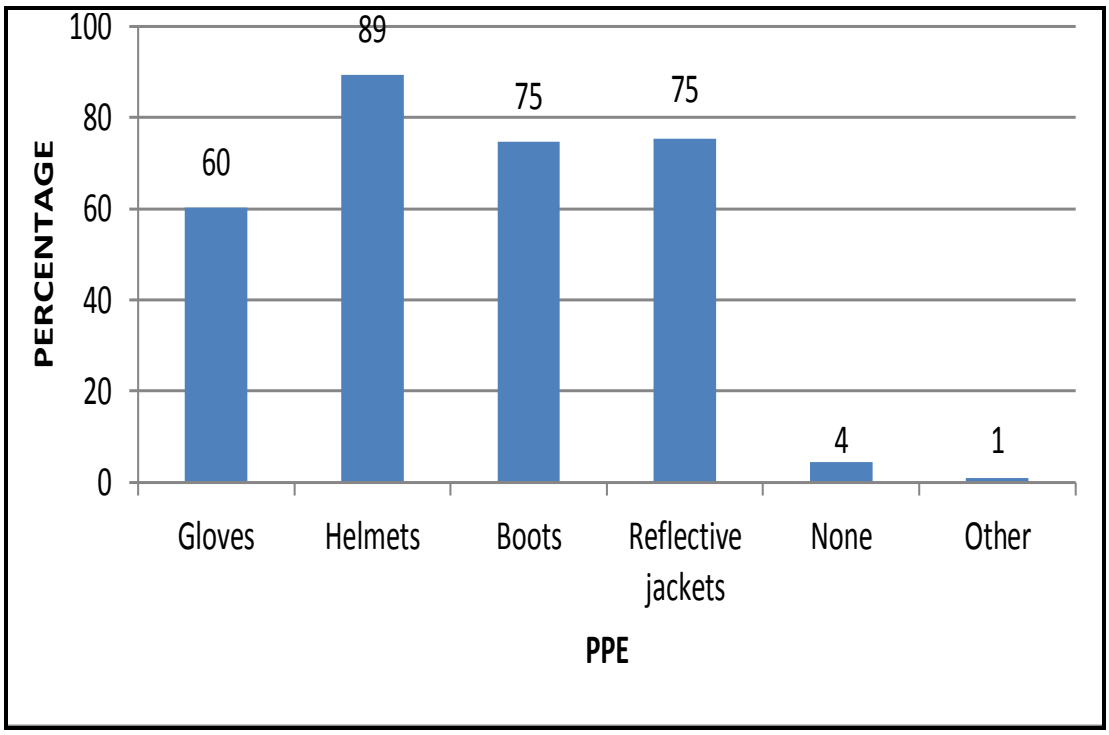

Figure 4.25: PPE used by riders

The study established that most of the operators were aware of the PPE to be used while riding. Majority of the operators 89% had their helmets on while riding, 75 % had their reflective jackets,75% had boots on,60% had their gloves on during riding,4.4% did not have any PPE while they were riding and 0.9% used other safety measures while riding like use of carton boxes to protect their chest from wind. From the study it can be noted that the operators understand the PPE they need to use in their daily activities however they need to be trained on the importance so that they can have all the required PPE rather than having one or two of the required PPE.The Traffic Act Cap 403 states that a person who rides a motor cycle shall provide a helmet and a jacket that has reflectors to be worn by the passenger. Passengers shall wear a helmet and a reflective jacket (The Traffic Act, 2009).

CHAPTER FIVE

SUMMARY OF FINDINGS, RECOMMENDATIONS AND FURTHER RESEARCH

5.1 Summary

The research established that 51% of the interviewed *boda boda* operators were trained through apprenticeship. Operators who attended driving school constituted 33% while those who learned on their own were 16%. Majority of the operators received informal training.

Considering training against passengers being carried, among those who were trained in driving schools, about 34% carry one passenger per trip, another 34% carry two passengers per trip and about 22% carry three passengers per trip. Among those who were trained by other boda boda operators, about 54% ferry one passenger per trip, 49% ferry two passengers per trip and about 48% ferry three passengers per trip. It also came out that among those who trained themselves, about 12% ferried one passenger per trip, 17% ferried two while 30% ferried three passengers. Considering road safety training against accidents it found that the riders who had been trained, 53% of the operators had been involved in accidents had not gone through the road safety training while 47% involved in accidents had gone through safety trainings.

According to respondents, careless riding by the operators contributed to 54% of accidents while over speeding contributed to 52% of accidents. The main reasons for over speeding were attributed to operators rushing make quick extra money and the young age of riders who venture to experiment with the machine. 45% of the operators could ride while intoxicated, a factor that has been proven to influence wrong judgements thus putting riders and other road users in danger. 40% of the accidents can be attributed to the bad state of the roads in the county, while 12% indicated lack of adhering to the traffic rules and regulations stipulated by the Traffic Act. 4% of accidents were found to be caused by overloading.

83.9% of accidents affected those with 1–5 years proficiency. This can be attributed to the operators' overconfidence and taking higher risks while at work. 10.4% of the interviewed *boda boda* operators who were involved in accidents had operated for less than a year. 4.8% of the accidents affected operators who are considered to be mature with over 10 years' experience. Operators with over 10 years were involved

in the least percentage of accidents at 0.8%. At an older age, intensity of accidents appeared to have reduced.

Investigations on the trend of fatalities over a five year period (2005-2010) showed that traffic related accidents rose by 5% mainly due to untrained and unlicensed riders. The government's response to impose strict measures on *boda boda* riders saw a drop by 7% in the year 2011. Interventions included safety campaigns by different institutions, including the government.

From the study, it emerged that there is a relationship between the mode of training by *boda boda* operators and accidents occurrences. Operators who were trained by non-professionals contributed to 47% of accidents while 35% were caused by those who had attended driving school. Self-trained riders contributed to 18% of the accidents. The study further established that majority of the operators (49%) had been to driving school yet were ignorant of traffic rules. Likewise, those trained by other non professionals at 42% and the self-trained at 9% were also ignorant to traffic rules. Another observation by the study is that 16% of the operators who were involved in accidents did not have valid driving licenses compared to 11% who were licensed and had been involved in an accident or more.

Considering road safety measures, it was established that 63% of the interviewed operators rode with their headlong on against 37% who did not, the latter being contradictive to the Traffic Act. In terms of number of passengers, 60% of the operators ferried two passengers per trip, 35% complied with traffic rules by ferrying one passenger per trip while 5% ferried three passengers per trip. According to the traffic Act, ferrying more than one passenger is prohibited.

From the study it was observed that 39% of *boda boda* operators had some form of road safety awareness while 61% did not. Out of those who had undertaken some form of road safety training, 37.8% were taken through general road safety trainings, 31.8% through road signs training and 10.6% went through first aid training. 5.3% covered traffic rules/ the Highway Codes, 3.9% defensive driving and 3.5% were taught use of PPE devices. Lesser percentages of 1.8% had gone through causes of

accidents, 1.1% safety of passengers and a paltry 0.7% had gone through over speeding, obstacles and observing road users. Only 0.4% of the operators had trained on avoiding of accidents, traffic lights, control, introduction to motorcycling, changing lanes and driving in different roads. Observations from the study revealed that there was lack of a standardized curriculum for *boda boda* operation training institutions.

A review on drug and substance abuse revealed that 49% of the respondents operated after consuming some form of medication. 44% operated under influence of alcohol, while 8% operated under influence of other drugs such as cannabis sativa "Bhang" or khat "Miraa".

Most operators were aware of PPE requirements for riding their boda bodas. Majority (89%) wore helmets while riding, 75% had reflective jackets, 75% used boots, 60% had gloves on, while 0.9% used improvised (informal) safety measures while riding. 4.4% of the riders did not consider any form of PPE while operating their *boda bodas*.

There is a relationship between training design and accidents occurrences. The Null hypothesis, which states "Lack of training and safety measures has made *boda boda* transportation an unsafe means of transport in Kakamega County" is supported by the study.

5.2 Conclusion

The study has demonstrated that adequate inspection of compliance levels by *boda boda* operators is inadequate. Most accidents which affect *boda boda* operators are characterized by issues such as unlicensed riders, operators having undertaken invalid trainings and careless riding.

The proficiency level of a *boda boda* rider is relative to the type of training undertaken, as well as the number of operational years. Older riders tend to experience less incidents and accidents compared to younger riders. Those trained in formally registered institutions, likewise, experience the least occurrences of accidents when compared to those who trained in informal institutions. It was

established that training modules are not standardized and contents varied across the driving schools. Judging from a perspective of combined curricula offered by the driving schools, it is evident that none offers a full model. Units such as defensive and off road riding (motorbike specific) are not offered in any of the institutions.

There is compromised enforcement of laws pertaining the *boda boda* industry. These include those associated with PPEs requirements, as well as number of persons being carried at a time. A good number of riders were found not to have gone through formal motorbike riding trainings. The researcher found that the levels of awareness interventions by relevant stakeholders were unfrequently carried out, not addressing objected issues and uncoordinated. A minimal number of respondents was aware of awareness interventions.

5.3 Recommendations

In order to improve training and safety status of motorcycle transportation in Kakamega County in Kenya, the following recommendations are advanced:

The government should address laxity by the traffic department of police in enforcement of traffic laws related to the *boda boda* industry in order to ascertain sustainable compliance by operators.

The National Transport Safety Authority (NTSA) should revise and standardize training courses issued to *boda boda* operators in order to ascertain requisite proficiency. Refresher courses should be made mandatory based on recurrent periods and recommendations from the law enforcers affecting traffic law breakers. Measures should be put in place to direct the police to issue certification only to those cleared from regulated driving schools.

To curb the prevailing trends of accidents caused by *boda boda* operators who ride without valid licenses, stringent traffic laws should be put in place to prosecute those involved. The law should further provide strict punitive measures for those found operating unlicensed training institutions, as well as those training without authorised licenses.

To further enhance road safety in the *boda boda* industry, training modules should include defensive driving as well as health and safety modules. To compromise these

trainings, the police in conjunction with NTSA should be directed to prosecute those not observing health and safety requirements while riding.

Awareness campaigns by industry stakeholders should be organized through means of training workshops, road shows, media, printed posters and banners should be enhanced and supported. For efficient management of the industry, the operators should be subjected to register associations such as SACCOs and registered companies.

This study can be used to inform the County Government as an integral part of road safety campaigns. It may be used as an input to policy and/or planning decisions, such as when designing effective interventions programmes and control strategies or evaluating compliance with regulatory standards.

5.5 Further research

Based on this study:

i. Further research should be carried out to determine the modules within safety training courses suitable for the motorcycle transporters in Kenya.
ii. Research should to be carried out in collaboration with the *boda boda* operators to understand and foster attitude change towards use of the PPE used by this mode of transport.
iii. Research identifying the risk reduction strategies and approach in the *boda boda* industry should be carried out.

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APPENDICES

APPENDIX 1: QUESTIONNAIRE

SECTION A

PERSONAL DETAILS.

1. Name……(Optional)

Tel. ……. centre. ……..

2. Male. ☐ . Female. ☐ .

3. Age. ……

4. Level of education. Primary. ☐ . Secondary. ☐ . Tertiary. ☐

5. Marital status Married Not married……..

6. Hours of operation…….Day…….Night……..Both

EXPERIENCE.

1. Do you have a valid driving license? Yes ☐ No ☐ .

2. How long have you been operating the *Boda boda*?

.....years……..months.

3. Since you started riding, is there any period you have not had access or chosen not to ride? Yes. ☐ No. . If yes what was the duration?

.....Month(s). ……..Years.

4. Approximately how many kilometers do you ride in a day? ……

5. How many days do you work in a week?.....

6. Do you own the motorcycle? yes ☐ No ☐

7. How Much Do you Earn in a day?

TRAINING.

1. Do you have any motorcycle training? ……

2. Where did you go for training? Driving school. ☐ . From others. ☐ . ☐ Self. .

3. Have you undergone any road safety training……Yes…☐…No. ☐

if yes, where……

4. What topics are covered in motorcycle training?.....

.....

.....

.....

5. Any comments

……

……

……

SAFETY.

1. What do you think are the main causes of motorcycle accidents? give three.

……

……

……

……

2. Do you use reflector jacket while riding? Yes ☐ No. ☐

3. Do you, at all times, have your headlong on? Yes ☐ No ☐

4. Which of the following protective equipment do you use while riding? ☐

Gloves Helmets ☐ Boots ☐ Reflective Jacket ☐ None ☐

Other

5. On what occasion do you ride your bike?

Medication……..Alcohol…….Other substances

6. Have you had an accident while carrying a passenger? …….

Briefly describe what happened

……

……

……

……

……

7. What are the common motorcycle accidents here? Motorcycle Vs motorcycle. ☐ . Motorcycle vs Vehicles. ☐ Motorcycle vs pedestrian. ☐ . .Motorcycle vs ☐ livestock ☐ Self causing

8. Do you carry luggage Yes ☐ No. ☐

9. How many passengers can you carry at a time one ☐ Two ☐ Three ☐

10. When riding do you receive a call? Yes ☐ No ☐

11. How many passengers are you licensed to carry? None ☐ One ☐ Two ☐ Three ☐ Don't know ☐

SECTION B

HEALTH FACILITIES

1. Do you have special wards for accidents caused by Cyclist?

Yes……No…….

2. On average how many casualties do you register in a month……...year…….

3. On average how many fatalities does your facility register in month…… year……..

4. What is the bed capacity for the accidents victims your institution?.....

5. How many fatalities and Casualties have been recorded for the past five years……
…….

SECTION C

LAW ENFORCEMENT

1. On average how many casualties do you register in month……...year……

2. On average how many fatalities does the station register in month……year…….

3. What is the ratio of licensed to unlicensed riders in the recorded accidents?.....
.....
.....

4. What are the main causes of the *boda boda* accidents?
.....
.....
.....
.....
.....

5. How many fatalities have been recorded for the past five years?
……
……
…..

6. How many casualties have been recorded for the past five years?
……
……
……

7. How have the offenders been dealt with in the past?
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8. Any comments

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APPENDIX 2: INFORMED CONSENT

My name is Theobald Musungu Luchidio, Postgraduate student (M.Sc. Occupational Safety & Health) at the Institute for Energy and Environmental Technology, Jomo Kenyatta University of Agriculture & Technology.

I am conducting a research study on "Assessing the Training and safety status of motorcycle transportation in Kakamega County". I would greatly appreciate your participation in this research. If you agree to participate in this survey, I would like you to answer a few questions about the *Boda boda* (Motorcycle) transportation within the county, in relation to fatalities and casualties in the *Boda boda* industry within the county. Your views will help me to determine the specific training and safety measures that need to be put in place to ensure that this mode of transportation is safe to all users, hence reduce the number of accidents caused by this mode of transport with a view to offering recommendations that will contribute to the development of standards and guidelines for this mode of transport in the county.

Participation in this survey is voluntary. If you agree to participate, please signify your acceptance by signing in the space given below.

The questionnaire typically takes 20 minutes to complete. Whatever information you provide will be kept strictly confidential and used only for academic purpose.

Please answer the questionnaire honestly and, to the best of your knowledge and ability, because the subsequent analysis and interpretation of the findings will be based solely on your answers.

Thank you for your willingness to participate in this study.

_____

Signature of Researcher Signature of Respondent

APPENDIX 3: PICTURES