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MOTORBIKE ALCOSENSOR

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Abstract: Road traffic accidents have been recognized as one of those adverse elements, which contribute to the suffocation of economic growth in the developing countries, due to the high cost related to them, hence causing social and economic concern, which are key pillars of vision 2030 of the government of Kenya. Previous endeavors to minimize motor cycle accidents has been retarded by recklessness of motor cyclists. This is reflected in an average yearly increase of 6.57 percent in the number of motorcycle accidents from the year 2013 to 2018. However, studies that have been conducted previously indicate that practicing prudent control of motorcycle accidents has led to a decrease in the number of motorcycle accidents. However, these studies never constructed a device that is put in motorists' helmets in order to sense the alcohol ingested by the motorists and alert policemen hence necessitating arrests of drunk motorists in case a motorist has; to exceed the recommended level of alcohol. Therefore this study sought to investigate the effect of the motorbike Alco sensor on minimizing motorbike accidents. The specific objectives of this study were to reduce number of accidents due to drunk riding; to make the use of helmet compulsory and to reduce cases of riding without it and to reduce cases of head injuries during a traffic accident. The data was collected from Ogembo Omoringamu road, in Gucha town, Kisii County, Kenya. This study analyzed data using descriptive and regression analysis. Where the work of other authors was used, due acknowledgement was done. The researcher obtained a research permit from St Angela Sengera Girls' High school and Kenya Science and Engineering Fair in order to enable collection of data. It was concluded that riding motor cycles while drunk increases the chances of motorcycle accidents. The study also concludes that riding motor cycles without helmets increases the chances of motorcycle accidents. The study finally concludes that riding motor cycles without helmets increases the chances of head injuries. This study recommends that NTSA introduces this helmet in the trending bodaboda industry and make its use compulsory. This study also recommends that NTSA introduce a color code on the motor cycle helmets in order to differentiate the helmet for the passenger from the one won by the rider. This is necessary to prevent drunk riders from handing over their Alco sensor helmets to passengers and using their passengers' helmets instead.

Index Terms – Road Accident Prevention, Efficient Emergency Message Broadcasting.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

A motorbike is a road vehicle with two wheels driven by an engine with one seat for the driver and often a seat for the passenger. Motorbikes locally known as bodaboda in Kenya and Tanzania or okada in Nigeria are set to become a significant mode of transportation in Africa in the next five years (Asingo, 2004). Its business has eased transportation problem connecting rural and urban areas in Kenya, it originated in the early 1990s from Uganda through Busia town in western Kenya, and it spread to adjacent towns (Duperrex, Roberts, & Bunn, 2017). World health organization (WHO) in 2006 revealed that motorcycles has increasingly become a popular means of transport in low and middle-income countries. In Iran where motorcycles are manufactured there has been an increase in production from 5,099 to 8,334,552 in 1996. In 1996, a report on the prevalence of motorbike in Malaysia was that about 50.6% of all registered vehicles were motorbikes (Dawood & Wang, 2013).

Motorbikes have the second highest number of head on collisions after saloon cars and were involved in more than a quarter of head on collision that occurred between 2015-2017 (Lozano, Barba, Igartua and Campo, 2013). In Tanzania 181 lives were claimed due to motorbike accidents during the first quarter of 2010 (Dawood & Wang, 2013). Motorbike accidents have drawn great attention from the Tanzanian government authorities. For example, in 2010 road safety week had a theme of “discourage high speed; cyclists wear helmets; accidents kill injure”.

Fig 1.1 Motorbike accidents

An alcohol sensor detects the attentiveness of alcohol gas in the air and an analog voltage output reading. The sensor can activate at temperatures ranging from-10-50 degrees Celsius. An Alco sensor is one among the four types of breathalyzers (Gokulakrishnan and Ganeshkumar, 2015) they are preferred because of their preciseness in the detection of alcohol and alcoholic substances (Odero & Kibosia, 2015). An Alco sensor similarly borrows the idea of cells in that its electrolyte is a porous acidic electrolyte sandwiched between two platinum metallic electrodes (Asingo, 2004).

The platinum oxidizes alcohol molecules in exhaled air flowing past one side of the fuel producing acetic acid, protons and electrons. Two free electrons and two free protons are released from the ethanol molecule when it is oxidized to acetic acid. The two electrons then flow through a wire connected to the platinum electrode of the sensor into an electrical current meter and then to the platinum electrode to the other side of

the cell. The platinum the move through the lower portion of the fuel cell and combine with oxygen and above electrons forming water. The electrical current produced depend on the number of free electrons, which in turn depends on the number of breath alcohol oxidized (Allen & Singh, 2019).

1.2 Statement of the problem

Road traffic accidents have been recognized as one of those adverse elements, which contribute to the suffocation of economic growth in the developing countries, due to the high cost related to them, hence causing social and economic concern (Towner & Mytton, 2009). One of the major challenges faced today is the improvement of the quality of service in both urban and rural transportation systems in order to make them efficient and safe. Safe roads are key to protecting our investment in the road network, reducing the cost in the network; reducing the cost of doing business in the Kenyan economy; improving the welfare of households and retaining productive personnel in institutions and enterprises. In this regard, accurate and objective road safety data is key (Odero & Kibosia, 2015) observe that Kenya, with an average of 7 deaths from the 35 crashes that occur each day, has one of the highest road fatality rates in relation to vehicle ownership in the world. The majority of injuries suffered following road traffic crushes are of orthopedic concern (Asingo, 2004).

1.3 Objectives of the study

1.3.1 General Objective of the study

To construct a motorbike Alco sensor that is able to detect a drunk motorist and send a message to the nearest police station in case the motorist has consumed more than a given percentage level of alcohol.

1.3.2 Specific Objectives of the study

i. To reduce number of accidents due to drunk riding.

ii. To make the use of helmet compulsory and to reduce cases of riding without it, hence reducing motor cycle accidents.

iii. To reduce cases of head injuries during motor cycle accidents.

1.4 Research Hypothesis

i. The motor bicycle Alco sensor reduces number of motorcycle accidents.

ii. Making the use of helmet compulsory reduces cases of riding without it, hence reducing motor cycle accidents.

iii. Head injuries have been reduced during motor cycle accidents.

1.5 Research question

i. Has the motor bicycle Alco sensor reduced the number of motorcycle accidents?

ii. Has the making the use of helmet compulsory reduced cases of riding without it hence reducing motor cycle accidents?

iii. Have head injuries been reduced during motor cycle accidents?

1.6 Variables of the study

The dependent variable in this study are number of accidents while the independent variable is drunk riding. Another dependent variable in this study are number of head injuries while the independent variable is motorcycle accidents. Another dependent variable in this study are number of motor cycle accidents while the independent variable is bodaboda riders without helmets. Merits of the study

1.7 Scope of the Study

This study investigated the effect of the motor bicycle Alco sensor on minimizing motorcycle accidents. The study was carried out from the month of May to December 2022 a period of seven months. The study concentrated on the Ogembo Sengera road in Gucha sub county, Kisii County, Kenya.

1.8 Organization of the study

The study is divided into five chapters. Chapter one brings out the introduction to this study. This chapter will include the background of the study, the statement of the problem, the research objectives, the hypothesis, the significance, the scope and the limitations of the study. Chapter two will entail the Literature review of the study while Chapter three of the study will have the research methodology of this study. Chapter 4 will include the Data analysis and discussion while chapter 5 will entail the conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter is divided into three parts, which include the introduction, the empirical literature review, and a summary of the empirical literature review. A critical review of previous literature contributions by other scholars is also presented through the empirical literature review. A summary of the empirical literature reviewed is presented in tabular form in order for the research gaps to be unfolded, hence providing a knowledge gap for the current study.

2.2 Empirical Literature Review

Gokulakrishnan and Ganeshkumar (2015) proposed an accident avoidance routing scheme named Road Accident Prevention (RAP). This scheme introduced the Early Warning (EW) message in order to make essential decisions—selecting alternate routes, slowing down the vehicle, and changing lanes. Furthermore, the Road Side Unit (RSU) detects any unusual activity in the highway scenario and broadcasts an Early Warning (EW) message to all the vehicles in the range of the RSU. In this way, the EW message must be sent at the exact time to prevent the road accident. The authors introduced different types of risk zone, namely, high, average, and low risk zones. The high-risk zone comprises those vehicles that are nearest to vehicles that are involved in road accidents. The routing scheme successfully achieved less delay. However, the limitation of the proposed scheme was the high network processing overhead due to the extra warning message transmitted, the EW message and identification of the risk zone. Therefore, the current study will investigate the construction of a motorbike Alco sensor that is able to detect a drunk motorist and send a message to the nearest police station in case the motorist has consumed more than a given percentage level of alcohol.

Lozano, Barba, Igartua and Campo (2013) proposed the warning message scheme to avoid traffic accidents between vehicles by sending a warning message to alert drivers about the condition of the current accident. The proposed scheme used the distance-based flooding scheme. The author calculated the time of the vehicle's reaction after the occurrence of the accident in order to prevent further traffic accidents. The proposed routing scheme achieved the best high and low priority message dissemination in drastic weather conditions such as rain, and sun. However, the limitation of this routing scheme is that it does not work in a highly dense vehicular

environment. Therefore, the current study will investigate the construction of a motorbike Alco sensor that is able to detect a drunk motorist and send a message to the nearest police station in case the motorist has consumed more than a given percentage level of alcohol.

Dawood and Wang (2013) proposed an accident avoidance scheme named the Efficient Emergency Message Broadcasting (EEMB) routing scheme. The objective of the proposed scheme was to reduce traffic bottlenecks and prevent multiple road accidents by broadcasting emergency messages with low overheads at high velocity. After an accident has occurred between two vehicles, the affected vehicle will select the best forwarder and broadcast the emergency message until the emergency message covers the whole risk zone. The forwarding scheme achieved the minimal overhead caused by the beacon message by using the method of the early prediction system. However, this motorbike Alco sensor failed to overcome the problem of network fragmentation by using the mechanisms of store-carry and forward. Therefore, the current study will investigate the construction of a motorbike Alco sensor that is able to detect a drunk motorist and send a message to the nearest police station in case the motorist has consumed more than a given percentage level of alcohol.

CHAPTER THREE

METHODOLOGY

3.1 Materials

- Power supply
- Alcohol sensor
- GPS module
- Buzzer
- LCD
- RGB LED
- Jumper wires
- Arduino-Uno microcontroller board

3.2 Parts of the Technology

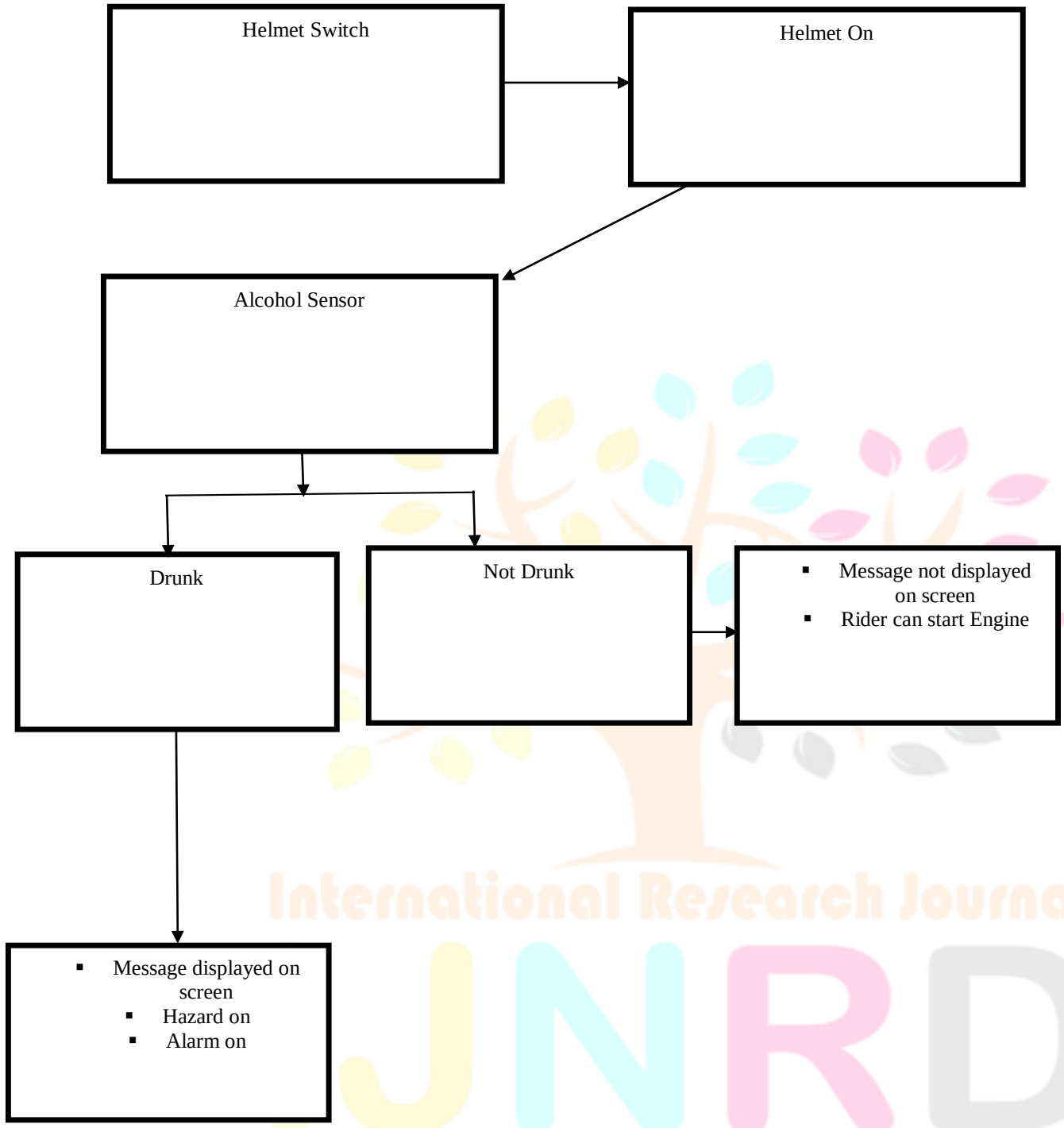
3.2.1 Transducer

In this case, the helmet is the transducer, which transmits signals to the control of the motorbike. It is made up of an alcohol sensor and a head switch connected to a controller circuit.

3.2.2 Receiver

The controller that receives signals from the transducer, and then gives an input mechanism needed to control the motorcycle. This is normally connected to the ignition part.

Fig 3.1 Mechanism

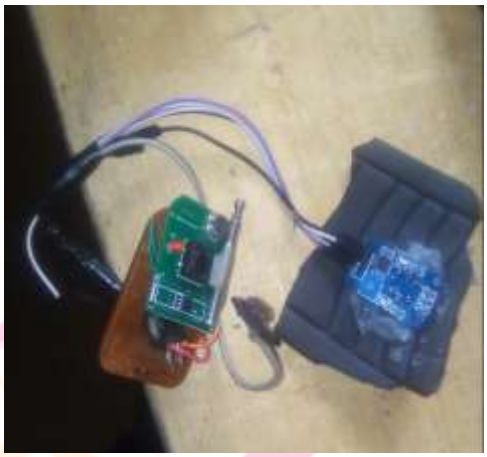


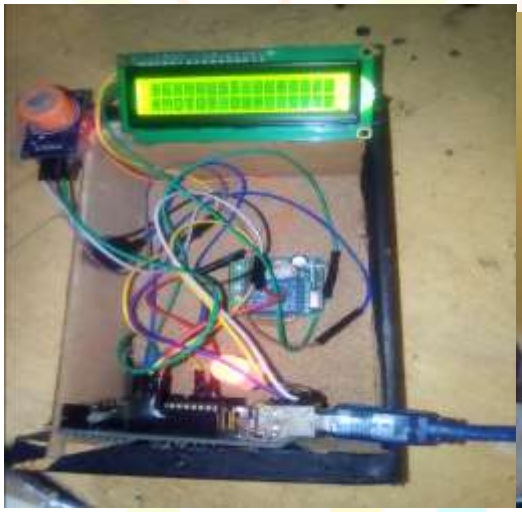
3.3 Procedure

i. The rider must first put on the helmet.

ii. If the rider is drunk, the receiver gets the signals and a beep is produced from the buzzer as a message is sent to the nearest police station informing that the rider of a given motorbike with registration details provided is drunk.

iii. The engine shuts down completely indicating that the rider is drunk.





3.4 Precautions

i. Ensure that the transducer is not faulty to enable it to control the receiver.

ii. The rider of the motorcycle must be the only one to use the helmet to ensure efficiency must use the helmet.

3.5 Limitations and constraints

- The limitation of this technology is when the rider decides to give the helmet to the passenger to wear. The motorcycle will just start up even if the rider is drunk.

- Measures can be put in place to ensure that there is a structural difference between the riders' helmet and the passenger's helmet, especially by using different colours codes for the two helmets, so that drunk riders cannot take advantage and wear the passengers' helmet.

3.6 Merits of the study

Highway and Road Authority commission stand to benefit a lot from this study in regards to the managing of the roads. They could be able to consider an incorporation of findings obtained from this study to minimize road accidents by making the use of helmet compulsory and hence reducing the cases of drunk riding. Since this device uses wireless technology, then the commission and the traffic police force can fast track offenders. This study will also provide a very great input to the researchers. The results and recommendations from this study will be a revelation to various researchers to venture into road transport and hence achieve the Big 4 Agenda and vision 2030. The findings of the study will be beneficial to policy makers by enabling them to make road policies that will shape the bodaboda business, which is on the rise while many Kenyans are losing their lives while others ending the hospital.

3.7 Demerits of the study

Some mechanical engineers can easily tamper with this device.

3.8 Effects of change on parameters

The alcohol sensor is designed to sense only levels of alcohol that are recommended by the NTSA (National Transport and safety Authority). In case low concentrations are sensed, no message will be sent to the police officers or the NTSA.

CHAPTER FOUR

DATA AND DATA DISCUSSION

4.1 Data collection

This chapter discusses the methods that were used in the data collection process. This involved a case study of 10 riders of whom five were drunk while five were not drunk. This study also involved a case study of 10 riders of whom five wore helmets while five did not use helmets. This study used questionnaires to collect data from bodaboda operators in order to establish the number of head injuries during motorbike accidents. The bodaboda operators were chosen because most of them are youths near a local wine and spirits shop and some of them had previously been observed not to be using helmets.

4.2 Data analysis

Table 4.1 Number of accidents caused by riders based on Drinking Behavior

RIDERS	NUMBER OF ACCIDENTS
Drunk	4
Not drunk	1

Table 4.2 Number of accidents caused by riders based on Helmet

RIDERS	NUMBER OF ACCIDENTS
With Helmet	1
Without Helmet	3

Table 4.3 Number of head injuries arising

RIDERS	NUMBER OF HEAD INJURIES
With Helmet	0
Without Helmet	2

Fig 4.1 Number of accidents caused by riders based on Drinking Behavior

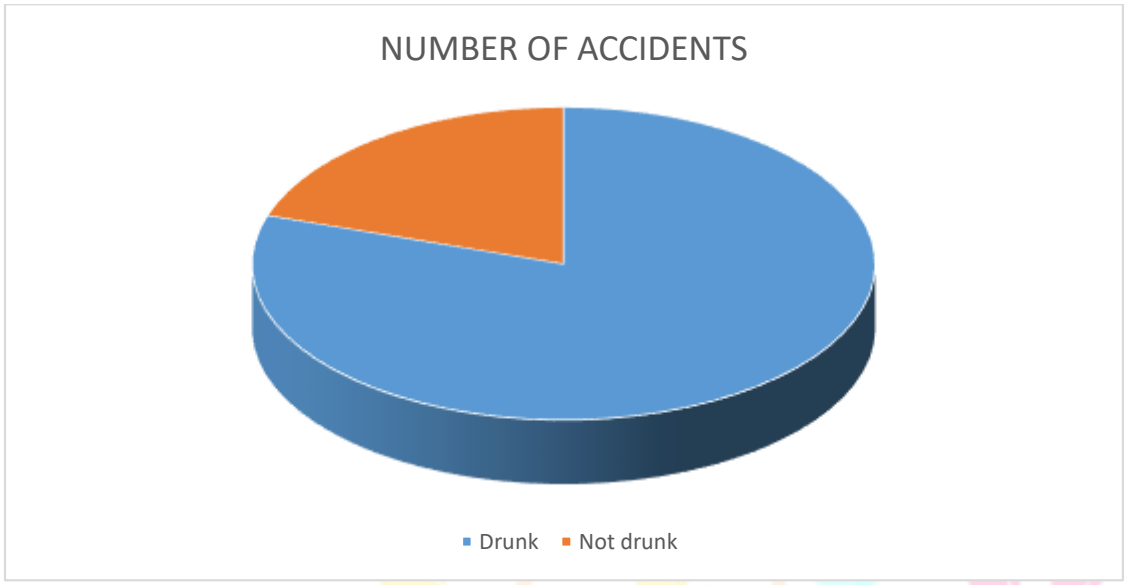


Fig 4.2 Number of accidents caused by riders based on Helmet

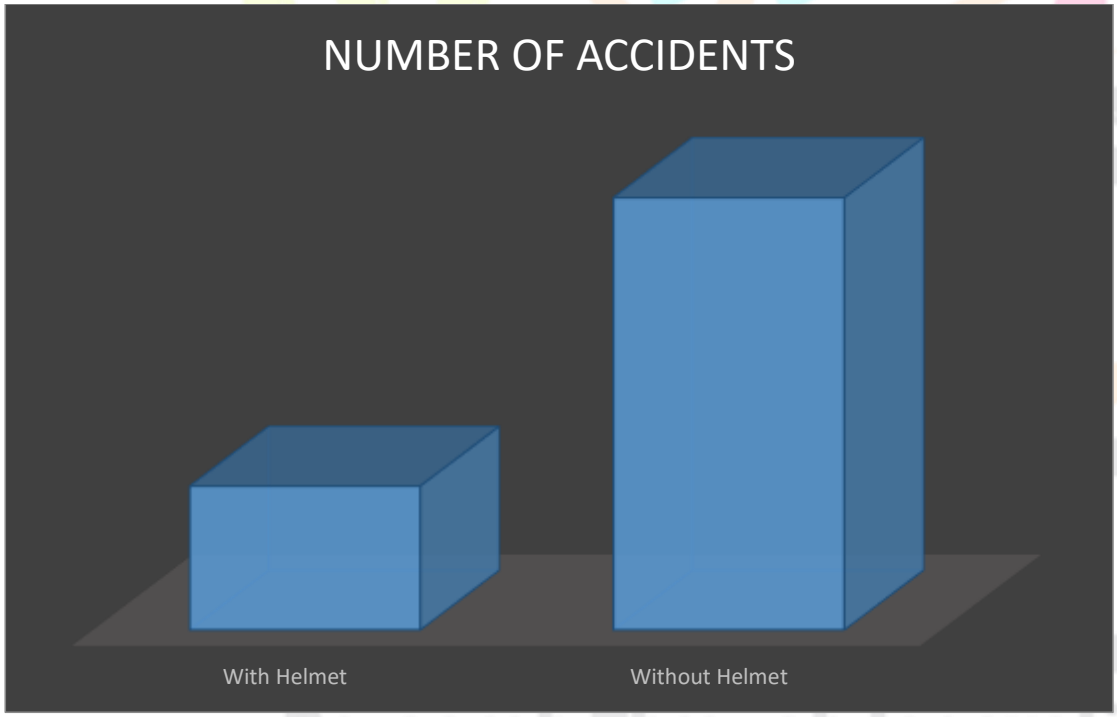
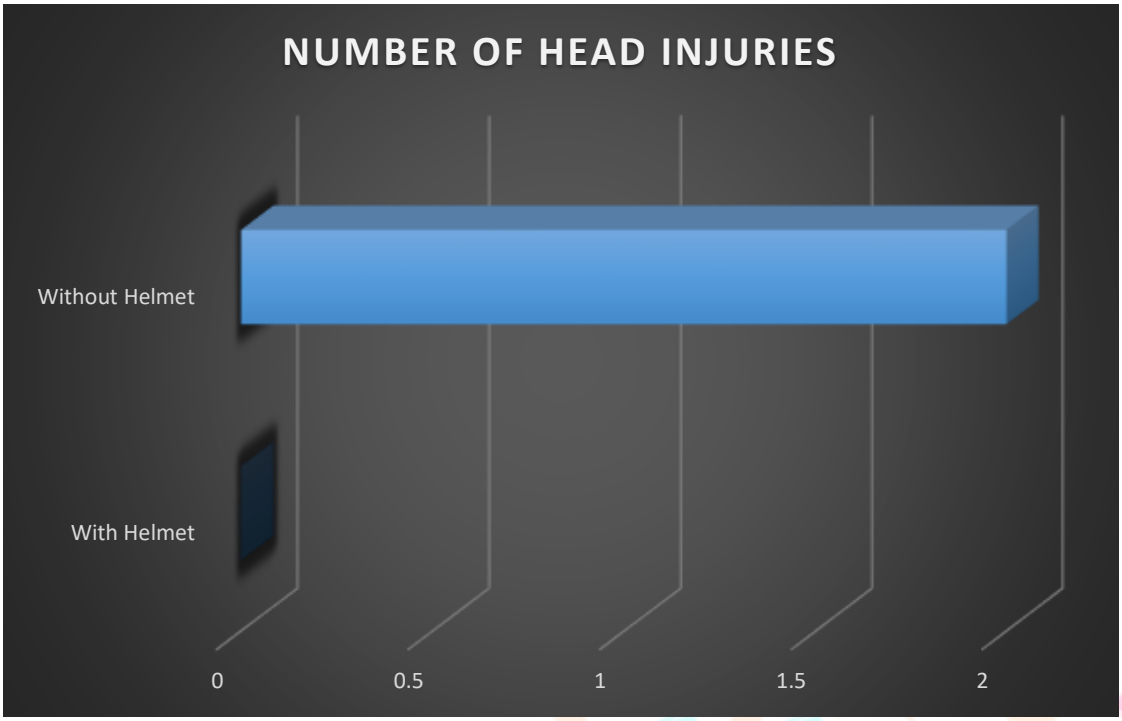


Fig 4.3 Number of head injuries arising



4.3 Data Discussion

From the results obtained in Table 4.1 and Fig 4.1, the number of accidents caused by drunk riders is 80 percent while the number of accidents caused by riders who are not drunk is 20 percent. These results indicate that riding motor cycles while drunk increases the chances of motorcycle accidents.

From the results obtained in Table 4.2 and Fig 4.2, the number of accidents caused by riders not wearing helmets is 75 percent while the number of accidents caused by riders who are wearing helmets is 25 percent. These results indicate that riding motor cycles without helmets increases the chances of motorcycle accidents.

From the results obtained in Table 4.3 and Fig 4.3, the number of head injuries caused by riders not wearing helmets is 100 percent while the number of head injuries caused by riders who are wearing helmets is 0 percent. These results indicate that riding motor cycles without helmets increases the chances of head injuries.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

From the results observed in chapter IV above, riding motor cycles while drunk increases the chances of motorcycle accidents. The study also concludes that riding motor cycles without helmets increases the chances of motorcycle accidents. The study finally concludes that riding motor cycles without helmets increases the chances of head injuries.

With this data, the study has proved the hypothesis, answered all the research questions and achieved all the specific objectives.

5.2 Recommendations

This study recommends that NTSA introduces this helmet in the trending bodaboda industry and make its use compulsory. This study also recommends that NTSA introduce a color code on the motor cycle helmets in order to differentiate the helmet for the passenger from the one won by the rider. This is necessary to prevent drunk riders from handing over their Alco sensor helmets to passengers and using their passengers' helmets instead.

5.2 Future directions

The study will in future include technology that locks the engine when the driver is detected by the Alco sensor to be drunk and hence the driver cannot start the engine.

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APPENDICES

APPENDIX I: LETTER TO THE RESPONDENT

Dear Respondent,

I am currently a teacher at St Angela Sengera Girls' High School, Kenya. My Science club students are currently carrying out a research study on a project whose topic is:

"MOTORBIKE ALCOSENSOR".

I therefore request for your information and cooperation in this exercise. All information will be treated with confidentiality.

Yours with regard

DR. DENNIS OSORO MARANGA

PhD (FINANCE)

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