UNIVERSITY OF EDUCATION, WINNEBA

A STUDY ON THE USE OF HELMETS BY MOTORCYCLE RIDERS IN THE NSAWKAW DISTRICT IN THE BRONG AHAFO REGION

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A Dissertation in the Department of MECHANICAL TECHNOLOGY EDUCATION, Faculty OF TECHNICAL EDUCATION, submitted to the School of Graduate Studies, University of Education, Winneba in partial fulfillment of the requirements for award of the Master of Technology (Mechanical) degree.

DECEMBER 2014.

DECLARATION

CANDIDATE'S DECLARATION

I,GYEDU ROBERT, declare that this Dissertation, with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

Signature.....

Date.....

SUPERVISOR'S DECLARATION

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of Dissertation as laid down by the University of Education, Winneba.

Name Prof.' Nicholas Kyei-Baffour

Signature.....

Date.....

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Finally, I would like to thank my classmates especially my friend John Mensah.

DEDICATION

This dissertation is dedicated to my late wife, Mrs. Regina Gyedu and all my children.

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ABSTRACT

The use of motorcycles is on the increase all over Ghana especially in the Nsawkaw District, even now as a means of public commercial transport. Wearing of helmets is one way of preventing head injuries but the practice is low in developing countries. This study investigated the use of motorcycle helmets by motorcyclists in the Nsawkaw District in the Brong Ahafo Region. Data was collected from 95 motorcyclist using the convenience sampling technique. The results indicated that most of the motorcycle riders were not licensed nor were the motorcycles properly registered. Even though cyclists were aware that helmets could save their lives in times of accident, the use of crash helmets were not regular and the laws on the use of helmets is not enforced to the letter. Young men and very experienced cyclists mostly avoid the use of helmets attributing it to impeding vision and hearing, neck injury and loss of hair and the fact that helmets have their limits in saving life most especially when there are fake helmets in the Ghanaian market. It is recommended that educational campaigns and safe cycling courses be targeted at adolescents and the less educated with the educational content focused on graphic, realistic consequences of motorcycle crashes and the effectiveness of helmets in preventing head injuries. Mandatory helmet legislation as a strategy to increase helmet use and promote motorcyclists safety in Brong Ahafo Region is clearly warranted whilst law enforcing agencies especially the police ensure that riders put on crash helmets, carry valid licenses and that the motorcycles are registered and insured. Non-Governmental Organisations and traditional authorities should help increase road safety awareness, especially on the use of crash helmets, since they could help with dissemination of information at the grass root leve

CHAPTER ONE

INTRODUCTION

This chapter serves as an introduction to the subject under study and the motivation for this study. The chapter also presents the research questions that provided the focal point of this research, as well as the scope and the disposition of the dissertation.

1.1 Background of the Study

Motorcycles are small light-weight performance oriented vehicles that have become a popular means of transportation in the world including African countries. They are affordable, easy to manoeuvre and consume less fuel. They also have shorter acceleration and transit time, reduced passenger capacity, high power to weight ratio and intuitive steering. According to Lee (2007), they provide freedom in a traffic stream and cause some characteristic behaviour patterns in mixed traffic flow. From the view of Gbadamosi (2006), motorcycles generally present more complex behaviour than passenger cars do; exhibit more erratic and chaotic trajectories when making progress and do not always follow the lane disciplines strictly. This problem has also been observed among motorcycle users in Ghana.

The small size and lack of available safety equipment such as seat belts and air bags make them less conspicuous to automobile drivers and dangerous to riders. According to David (2004), statistics show that motorcycle riders have more serious accidents than people who drive cars. Also, in the event of crash or accidents, motorcyclists are much more likely to come into direct contact with the many hard and abrasive surfaces in the road environment than most other road users (Wishart, 2009). This is the reason why manufacturers and researchers have made

motorcycle helmets, traffic laws and regulations and other safety policies to control the use of motorcycles and provide the best protection against fatalities.

Many cities/towns in the world are facing the problem of a rapidly rising number of people injured or killed while riding motorcycles without the use of helmets. A large proportion of the deaths result from severe head injuries. The wearing of standard helmets are effective in reducing the likelihood of head injuries as well as their severity (Kraus, MacArthur and Willians, 1994).

About 100 % motorcyclists who were required to wear helmets, only 50 % wore helmets when there was no law or a law applied to only some riders. According to Schuler (1982), 96 % of motorcyclists observed in the United State of American with helmet laws were wearing helmets. Roth and Cooper (1987) suggested that education alone would not be as beneficial in increasing helmet use as a universal helmet law.

Actions by medical bodies and governments to encourage or compel motorcycle owners or riders to wear helmets have greatly increased the use of them over 20 years. Motorcycle helmets have a hard shell of polystyrene foam which is intended to protect the skull from fracture and the brain from injury, together with a lining of polystyrene foam which is intended to protect the brain by reducing the force that an impact to the helmet transmits to it.

Since the 1980s, many public authorities in the world have acted, with the support of medical bodies, to encourage motorcyclists to wear helmets for protection from head injury, and others

have compelled it. Millions of motorcyclists have been compelled and most people in countries especially Ghana .

Motorcycle helmet use provides the best protection from head injury for motorcyclists involved in traffic crashes. The passage of helmet use laws governing all motorcycle riders were the most effective method of increasing helmet use. The National Highway Traffic Safety Administration in USA (NHTSA) encourages states to enact legislation that requires all motorcycle riders to wear helmets. NHTSA in USA estimated that motorcycle helmet use saved ($19.5 billion) in economic costs from 1984 to 2002. An additional $I4.8 billion would have been saved if all motorcyclists had worn helmets at the same period. The National Public Services Research Institute in USA (1994) concluded that wearing of motorcycle helmets did not restrict motorcycle owners or the riders' ability to see or hear a vehicle in an adjacent lane.

According to Murray and Lopez (1996), with the rapid increase in motor vehicle usage in low and middle-income countries, road traffic related deaths and injuries are increasing sharply. Harvard School of Public Health made projections on behalf of the World Health Organization and World Bank which showed that from 2000 to 2020, road traffic deaths will decline by about 30% in high-income countries but will increase substantially in low and middle-income countries.

In Ghana, especially in the Brong Ahafo Region, the number of motorcycles on the roads have increased rapidly and accidents have become so rampant that there is not a single day without accidents being recorded. Some people are tempted to believe that apart from malaria the second

killer is the motorcycle (Akufaar, 2009). It is sad to believe that professionals including teachers, artisans and security personnel who might be the heads of their families and contribute to national development lose their lives, or are deformed in one way or the other through motorcycle accidents.

Motorcycle accidents are one of the most serious accidents of all motor vehicle accidents. These accidents occur as a result of mechanical faults, bad roads, bad weather conditions, mistakes from pedestrians, crossing animals, over-loading, inexperienced and drunker riding, unnecessary over-taking, speeding and so on. It is upon this background that the researcher wanted to determine whether the use of motorcycle helmet has made a significant impact on the use of motorcycles in Nsawkaw.

1.2 Statement of the Problem

Many cities/towns in the world are facing the problem of a rapidly rising number of people injured or killed while riding motorcycles without the use of helmets. In the Brong Ahafo Region of Ghana, however, motorcycle helmet use is not strictly enforced. Most of the motorcycle riders (young and old) are not licensed and do not wear standard protective apparels. A large proportion of the deaths result from severe head injuries. The wearing of standard helmets are effective in reducing the likelihood of head injuries as well as their severity. Some of the riders also ride under the influence of alcohol and drugs and do not use the headlamp during the day. These bad behaviours have resulted in many motorcycle crashes in the Brong Ahafo. Indeed motorcyclists are more prone to crash injuries than car occupants because motorcycles are unenclosed, leaving

riders vulnerable to contact with hard road surfaces, other vehicles and fixed objects such as trees.

Motorcycles are a small subset of all motor vehicles which, are greatly over- represented in fatal motor vehicle accidents. The death rate per registered motorcycle is approximately three times the death rate per registered passenger car (Preusser *et al*, *1995*).Though many research studies and policy enforcements had been carried out on the use of motorcycle helmets for the purpose of preventing injuries and deaths, by virtue of the present circumstances surrounding motorcycle usage and the insurgence and the proliferation commercialization of motorcycle usage, the use of motorcycle helmets need to be critically examined.

1.3 Purpose of the Study

The main aim of the study was to investigate the use of motorcycle helmets by motorcyclists in Nsawkaw.

1.4 Specific Objectives

The specific objectives were to:

- Assess the use of motorcycle helmets by owners or riders in Nsawkaw.
- Determine the factors that enhances the use of the motorcycle helmet and
- Analyze how motorcycle helmets affect the use of motorcycles.

1.5 Research Questions

In order to find a solution to the research problem, the following research questions were formulated:

- How is the motorcycle helmet used by owners or riders?
- What are the factors that enhance the use of the motorcycle helmets?
- How does motorcycle helmet use affect the use of motorcycles?

Significance of the Study

The study serves as a basis for further research by either manufacturers or automobile engineers on the need to develop standard helmets for motorcycle owners or riders to reduce the high rate of head and traumatic brain injuries. The findings of this study will help the DVLA to strengthen their internal structures in issuing licenses to qualified motorcycle owners or riders and compel the people and other law enforcement agencies to strictly enforce the national traffic rules and regulations all over the country. Based on this study, motorcycle owners or riders can take advantage of the benefit of the motorcycle helmet to save lives, income and properties.

1.7 Limitations of the Study

Financial constraints disabled the researcher from conducting the experiments with many other Districts in order to compare results. There is no doubt that this research demands quite a considerable amount of time. A good number of participants were employed in the study and the researcher needed to spend some quality time with each participant, especially the motorcycle mechanics, motorcycle owners or riders to get the kind of responses needed for the kind of results appropriate for each research question. Also human behaviour varies among individuals

even if they live in the same geographical area and so the issue of subjectivity cannot be ruled out. Other limitations included unwillingness of respondents to give accurate responses owing to the fact that the study might expose their attitudes towards the use of motorcycle helmet, especially where the attitude was contrary to expectations.

1.8 Organization of the Study

Chapter One is an introduction of the research of the study which comprises background of the study, statement of the problem, purpose of the study, research questions, significance of the study, limitations of the study and organization of the study. Chapter Two reviews the use of the motorcycle helmet and how they are applied. Literature on previous research studies attempting to identify factors affecting the use of the motorcycle helmet is reviewed. The review of the literature continues with the use of the motorcycle helmet. Chapter Three discusses the sources of primary and secondary data and statistical methodology used in this study. Chapter Four presents the analysis and discussion of the results of the research. Finally, Chapter 5 presents the summary of funding, conclusions and recommendations of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents of review of related literature in line with the usage of crash helmets by motorcyclists and passengers alike.

2.2 Theoretical Framework

Every enterprise marked with some level of risk comes with associated safety precautions and practices and so it is in the use of motorcycles where crash helmets are one of the key safety tools. In developing countries such as Ghana, motorcycle use is very common and is even being used as commercial taxis in Niger, Togo, Nigeria and Benin and its penetration in the streets of Ghana is becoming very common. This is because it has some strong advantages such as its easy manoeuvrability, superior fuel economy and time saving over the commercial car taxis. It was observed by the researchers (Odero, Garner, & Zwi, 1997; Oluwadiyaet al., 2004; Orsia*et al*., 2012) that the number of motorcycles involved in accidents is on the ascendancy and involves both male and female. Most of these accidents witnessed involved victims without helmets.

A number of the research areas that are pursued abroad, especially in North America, are not directly applicable to Ghana as appropriate domestic programmes may not have already been instituted. According to Nairm (1993) compulsory use of helmets, rider training schemes and structured license requirements are programmes meet or exceed the standards being recommended for implementation.

The Federal Office of Road Safety in USA (CR 84, 1989) estimated that motorcycle riders are 19 times as likely to be killed per kilometre travelled as car drivers. At Nsawkaw from 2010-2013, the estimated number of motorcycles admitted to hospital accounted for 15 % (police records) to 20 % (hospital records) of all road injury admissions.

Since 2000, many public authorities around the world have acted with the support of medical bodies, to encourage motorcyclist to wear helmets for protection from head injury, and some have complied. In Ghana, thousands of motorcyclists have complied and some people in the country especially in the Brong Ahafo Region wear helmets which is regarded as a safety equipment.

The literature shows that the basic use of helmets have an effects on safety and welfare with increased wearing of helmets by motorcyclists and riders in the Brong Ahafo Region. As a contribution to resolve these issues in the interest of public policy on safety in motorcycling, this chapter examines motives for wearing helmets, scientific knowledge that bears on their efficacy and official encouragement of their use.

Although Ghana continues to maintain a high standard of motorcycle safety, significant scope exist for the implementation of various counter-measures designed to either prevent crashes or reduce riders and pillion passenger injuries in motorcycle crash. Wearing reflective clothing and daytime use of running lights and headlights can increase motorcycle conspicuous. The arguments raised against mandatory use of daytime lighting were also noted. Increased usage of

motorcycles, due to road over crowd and an escalating need for cheaper transport, therefore brings a disproportionate increase in total road casualties (Watson, 1990)

2.3 Motorcycle Helmet and How it is Used

The most effective intervention available to reduce motorcyclist injuries is the use of motorcycle helmet. According to Nairm (1993), the introduction of compulsory wearing of motorcycle helmets in Australia had a decline in serious head injuries sustained by motorcyclist. According to Chainer and Evans (1987), the majority of those serious situations, focus on USA states which weakened their mandatory helmet wearing laws, leading to a 40-50% decrease in helmet wearing rates and increase in the frequency of serious head injuries.

American researchers found that the probability of sustaining an injury when riding motorcycle with a helmet is 15.1 % compared to 22.8 % not wearing helmet (Kraus *et.la.,* 1975). The average injury severity score for crash victims wearing helmets is 9.0 % compared to a score of 11.5 % for those not wearing helmets when riding motorcycle (May and Morabito, 1989).The average hospital stay was 5 days for helmeted riders and 15 days for non–helmeted riders (Mcswain and Belles, 1990). A helmeted rider is one sixth as likely to die of head injury as a non-helmeted rider (Carr *et al.,*1981*).*Non-helmeted riders were six times more likely to suffer severe brain damage compared to helmeted riders (Bachudes *et al.,*1988 cited in Nairm, 1993).Fatalities increase by 25–26 % as a result of the reduction in helmet usage (Chenier and Evans, 1987).In Nsawkaw, 32 % of motorcycle operators and 41 % of motorcycle passengers who died in 2013 were not wearing a helmet. Motorcycle operators who do not wear helmets are more likely to be killed in a crash. Helmets are estimated to reduce the likelihood of death in a

motorcycle crash by 37 %. The National Highway Traffic Safety Administration in America (NHTSA) estimates that from 1984-2006, helmets saved the lives of 19,230 motorcycle riders. Traumatic brain injury is a leading cause of motorcycle crash death.

As compared with cars, motorcycles are more dangerous form of travel. According to NHTSA (2011) they estimated that per mile travelled, the number of deaths on motorcycles were more than 30 times the number in cars. Motorcyclists are more prone to crash injuries than car occupants because motorcycles are unenclosed, leaving riders vulnerable to contact with hard road surfaces, other vehicles and fixed objects such as trees.

Nearly all deaths and permanent disablement from head injury are attributed to damage to the brain. There was public concern about the risk of these dire consequences to motorcyclist, and strengthening expectation that helmets were the remedy. It refers to the dreadful consequences of death or permanent incapacity from head injury and describes helmets as a life saving measure for riders or owners. The publicity emphasized these dire consequences of brain injury, but it demonstrated a lack of understanding of its main mechanism of occurrence according to the relevant science.

In the USA, the Federal Government issued leaflets in 1998 which promoted the use of motorcycle helmets. Most deaths from motorcycle falls and collisions involve head injuries and this means that wearing a helmet can save lives. The brain injury is the leading cause of death and disability among people under the age of 24 and 80 % of deaths in motorcycle crashes result from it. The research showed that helmet use while motorcycling can reduce the chance of

sustaining a brain injury by 80 %. The main motive for motorcyclists wearing helmets and governments promoting it is to reduce serious injury to the brain.

2.4 The Effectiveness of Motorcycle Helmet

Motorcycle helmet design and materials have significant advances. The new helmets afford a much greater degree of protection against potentially fatal head injuries. Upon technological improvements, NHTSA is still using the 29 % helmet effectiveness calculation from observed fatality data.

Data are provided from the Fatality Analysis Reporting System (FARS) of the USA to update the estimated protective value of motorcycle helmets in the prevention of fatal head injuries and to estimate the total number of lives saved by helmets. An "effectiveness" of 29 % means that the use of a proper helmet can improve a riders chances of surviving a potentially crash. Motorcyclist fatalities represent about 9% of all passenger vehicle occupant deaths.

Since 1974, motorcycle helmets are required to meet or exceed the Department of Transpiration's Federal Motor Vehicle Safety Standard (FMVSS) No. 218. The requirements of FMRSS 218, together with changes in design and materials used in manufacturing helmets, are the driving force behind the improved effectiveness of helmets. The use of materials such as Kevlar, expanded polypropylene, and carbon fibre in the manufacture of helmet shells and protective linings have introduced significant innovation in manufacture of motorcycle helmets. There is effectiveness of motorcycle helmets in reducing the risk of death in fatal motorcycle crashes and

types of injuries suffered by riders. Also helmets are effective in preventing fatalities in crash and fatal head injuries.

A number of studies have shown helmets to be an important factor in preventing death or serious injury in motorcycle crashes. Braddock and Schwartz (1992) found that unhelmeted motorcyclists were 3-4 times more likely to die than were helmeted riders. A study by Kelly and Samson (1991) found that injured non-helmeted riders had higher injury severity scores and sustained more head and neck injuries.

Motorcycle helmets comprise a hard shell to protect the skull from fracture and the brain from injury, together with a lining of polystyrene foam which is intended to protect the brain by reducing the force of impact to the helmet.

2.5 Laws on the Use of Helmets

According to the Motorcycles Protective Helmets Regulations of 1998 and the Motorcycles Protective Helmets Amendment Regulations of 2000 in Britain, anyone driving or riding on a 2-wheeled motorcycle on a road must wear a helmet, although passengers in a car don't have to wear helmets.

In Ghana, police officers require helmet use for all motorcycle operators. In the Brong Ahafo Region, security officers enforce motorcycle riders to wear helmets. There has been much studies written on the effect of helmet law in the USA. The Helmet law had reduced motorcycle accidents even though motorcycle registrations increased by 6 % during the period. The helmet

use rate increased from 50-65 % in the Brong Ahafo. The Brong Ahafo Region of Ghana has helmet use laws that govern all motorcycle occupants. In California, there was a 35 % reduction in motorcycle fatalities the year after its helmet law was enacted.

Motorcycle helmets provide the best protection from head injury for motorcyclist involved in traffic crashes. The passage of helmet use laws governing all motorcycle riders is the most effective method of ensuring helmet use. The NHTSA encourages states to enact legislation that require all motorcycle riders to wear helmets. Additionally, NHTSA strongly supports comprehensive motorcycle safety programmes that include motorcycle helmet usage, rider education, motorcycle operator licensing and responsible use of alcohol. An unhelmeted motorcyclists is 40 % more likely to suffer a fatal head injury and 15 % more likely to suffer a non-fatal injury as compared to helmeted motorcyclists when involved in a crash. Head injury is a leading cause of death in motorcycle crashes.

All motorcycle helmets sold in the United States are required to meet Federal Motor Vehicle Safety Standard 218, which established the minimum level protection helmets must afford each user. Helmet use laws governing all motorcycle riders significantly increase helmet use and are easily enforced due to the riders' high visibility.

2.6 Motorcycle Protective Clothing

Protective clothing for motorcyclist is designed to serve a number of different purpose. These include the following to:

1. Reduce the risk of fatigues

2. Protect from the elements–wind, rain, cold and heat

3. Prevent or minimize injury in the case of a crash

4. Draw the attention of other motorists and

5. make a desired fashion statement or be appropriate for general wear.

Various studies have contributed to the injury reduction benefits of motorcycles protective clothing for the past 37 years (FeldKamp *et al.,*1976; Zetas, 1979; Hurt, Quelled and Wager, 1981;Schuler, 1982 and 1966;Otte and Middlehauve, 1987; Lob, 1993; Otto e*t al.,*2002*;*ACEM, 2004; de Rome, 2006). For example, De Rome (2006) reported that there is now evidence that perhaps half of all motorcycle injuries are relatively minor soft tissue injury which could be reduced or prevented by the use of effective protective clothing. Protective clothing has also been effective in preventing or reducing injuries such as cuts and abrasions, exhaust pipe burns and friction burns. It is also effective in reducing the risk of infection from wound contamination and consequence complications in the healing of severe injuries (Schuler *et al.,*1986,Pegg and Marze, 1983, Otto and Middlehauve, 1987, Hell and Rob, 1993).

Protective clothing include: gloves, eye protection, jackets, rain gears and trousers, this study will discuss more about helmet use because they are mandatory in Ghana and usage is not widely accepted. In the Brong Ahafo Region for example, motorcycle riders are the most offenders due to their failure to wear crash helmets (Salifu, 2011).

2.6.1 Gloves

Gloves should be worn at all times to prevent an injury to hands or fingers.

2.6.2 Eye Protection

Wear a helmet with a shield, a pair of goggles, or shatter proof glasses, make sure the eye protecting gear is cleaned and unscratched, if the lenses are tainted for riding only in the sun, be sure to take some, that are clear in darkness.

2.6.3 Jackets

Jackets should be made of sturdy material such as denim, nylon, corduroy, or leather. There should be zipped vents to allow breeze to flow through, making the jackets comfortable to wear year–round even in warm and windy conditions. Good-quality rain suits designed for motorcycles riding resist tearing apart or ballooning up at high speed (Dickinson. 2006).

2.6.4 Rain Gear

Wear rain gear to make riding in the rain easier.

2.6.5 Over–The Ankle Boot (OTAB)

Wear over–the ankle made of strong leather to protect the ankles. Also, make sure boots bought are with rubber soles and a good thread design for easy gripping

2.6.6 Foam Plugs

Protect the ears and hearing, disposable foam plugs or reusable custom moulded - devices should be worn.

2.6.7 High Visibility Gear

Wear brightly coloured clothing, for night time riding, wear clothing that reflects, light or put reflective strips on the helmets and backs of the boots.

2.6.8 Trousers

Trousers should be made of thick material such as leather to resist abrasion.

2.6.9 Motorcycle Helmets

Motorcyclist must wear the approved safety helmet that is securely fastened to the person's head. There are three types of helmets that provide different levels of coverage.

2.6.10 The Full Coverage (full face)

This types provide the best protection, has a visor for eyes protection, has the greatest structural integrity, provides the greater protection from weather, protects the ears and base of the skull, and protects the lower face and brain.

2.6.11 The Three–Quarter Coverage (open face)

This types provide good head protection, accepts a visor for protection from weather and for eyes, and protects the ears and base of skull

2.6.12 Half-Head Helmets

These helmets provide protection by means of a hard outer shell and crushable inner liner. They do not offer protection for the chin or jaw area and are rarely equipped with visors. The half-head helmet may or may not have ear flaps attached to the retention system.

2.7 Helmet Standards

An approved helmet will have a sticker to show that this meets convert safety standards:

1. A safety helmet intended for the use of an operation or a passenger of a motorcycle must meet one or more of the standards for motorcycle safety adopted under subsection (3) in effect on the date on which it was manufactured.

2. The following are adopted and apply to safety helmet in accordance with subsection (1).

a) CSA standard CAN3-D230 -M85;

b) USA Federal Motor vehicle safety standard FMRSS 218 Motorcycle Helmet 2000 OCT;

3. A safety helmet must have the mark or label CSA, DOT or BSI or the mark or label of the organization in subsection (2) indicating that the safety helmet met one or more of the specifications required on the date on which it was manufactured. No person shall buy sell or offer for sale for a safety helmet intended for use of operator or passenger of motorcycles unless it complies with subsections (1) to (3).

2.8 Factors Affecting the Use of Motorcycle

2.8.1 The Behaviour of Motorcyclists

The behaviour of motorcyclists also affect the use of motorcyclist helmet, skilful riding, proper maintenance and wearing of standard protective apparels are the main responsibilities of every motorcyclists, but these things are not strictly adhered to by some motorcyclists.

Most people are only interested in riding as a fashion but forget that motorcycling goes with additional responsibilities. This behaviour has contributed to the occurrence of many accidents and health problems in many countries. Most motorcycle accidents can also be caused by aggressive driving, alcohol and risk taking behaviour of motorcyclists. Harswill and Helman (2001) that found the motorcyclist prefer faster speeds than the car, drivers overtake more, and can pull into smaller gaps in traffic, but do not go closer to the vehicle in front.

The risk taking behaviour of motorcyclists is also affected by demographic factors. For example Sharma *et al*. (2007) observed that hazardous traffic behaviour was found to be significantly greater among males and young riders. Chesham *et al.*(2003) found that young motorcyclists with crash experience had higher risk taking levers than those without previous crash experience. According to David (2004), emotions such as frustration, anger, impatience can interfere with the motorcyclists' ability to operate a motorcycle and may contribute to road rage.

To lessen the chance of a crash occurrence the rider should do the following:

Wear proper protective clothing, use head light, ride in the best lane position to see and be seen, use the proper signals, brake lights and mirrors, maintain an adequate space cushion, Identify and

separate multiple hazards, and remain alert and know how to carryout proper crash-avoidance skills (Dickinson, 2006).

2.8.2 Alcohol

Alcohol is one of the factors affecting the use of the motorcycle helmets, contributing to motorcycle related crashes and injuries. Alcohol is a major risk factor in all types of motor vehicle crashes. According to NHTSA (1998) alcohol weigh more heavily in motorcycle crashes than in crashes of other vehicles. Alcohol is known to disrupt the effect of neurotransmitters and impair various psychomotor skills (Creaser, Ward, Rakauskas, Boer, Shank and Nardi, 2007). Alcohol beverages are the most cause of motorcycle crashes. Public information programmes and training inform on the dangers of alcohol on motorcycle riding. From MSF (1974) the number of skills needed to operate a motorcycle is higher than other motor vehicles.

NHTSA(2003) reported that motorcycle operators in total crashes had Blood Alcohol Concentration (BAC) levels higher than any other type of motor vehicle operators. The crash facts report also noted that almost half or 44 % of the 1,501 motorcycle operators who died in single-vehicle crashes in 2003 had BAC levels of 0.08 or higher and almost two-thirds or 65 % of those killed in single-vehicle crashes on weekend nights had that same level or higher (NHTSA, 2003 cited in Dickinson 2006). It was also found that the probability of death increased from 2.1 % to 11.30 % when the riders' Blood Alcohol level increases from 0.0 to 0.1 from sober to legally intoxicate in most states(Goldstein, 1986).

A study conducted in 1998 found that drunk driving might be a major accident factor in Ghana (NRSC, 2011 pp.17) .One result of this study was that drunken riding was more common among illiterates and among most middle-aged drivers. According to Dickinson (2006) alcohol and drugs as negative factors affect a motorcyclist's ability to balance a motorcycle and reduce coordination, vision, mental and physical skills for safe riding. Removing alcohol as a factor helps to inform dangers of reduced motorcycle crashes and save lives and properties. It is therefore important for the National Road Safety Commission (NRSC) and law enforcement agencies to better understand motorcyclists' alcohol abuse behaviour and to work closely with each other to enforce the laws.

2.8.3 Fatigue

Even though alcohol and illegal drugs contribute a large percentage of all motorcycle accidents, prescription drugs and fatigue can also impair the riders ability to operate a motorcycle. Before a motorcycle is operated, the mind and body of the motorcyclist should be working properly. The feeling of abnormal weakness, tiredness, stiffness or pain or worry may affect riding. Nodding the head, closing the eyes for one or two seconds, or yawning may indicate that the rider needs to sleep for rest. According to Dickinson (2006) riding a motorcycle is more tiring than driving a car.

Riders should avoid drinking and the use of drugs. Artificial stimulants often result in extreme fatigue or depression when they start to wear off. With this, riders are unable to concentrate on the task at hand. This can be managed by the following; Limiting the distance of riding within 2-

8 hours a day, Taking frequent rest at every two hours and Protecting against, wind, cold and rain.

2.8.4 Mechanical Problems

There are many mechanical problems that can affect motorcycling. They are tyre failure, stuck throttle, wobbling, chain problems and engine seizure.

2.8.4.1 Tyre Failure

When a motorcycle tyre loses air, riding becomes very difficult and dangerous. In this condition, the rider should be able to notice the way the motorcycle reacts and quickly keep the motorcycle in a balanced position. A front flat tyre makes steering heavy and flat rear tyre causes jerking or swaying at the back of the motorcycle. In managing the situation, the following should be done: Holding the handle grips firmly and braking gradually in the tyre that is not flat.

2.8.4.2 Stacked Throttle

When the throttle cable is stacked, it affects the movement of the motorcycle. This can be managed by operating the engine cut-off switch, pulling in the clutch at the same time and stopping. This will remove power from the rear wheel, even though engine noise may not immediately decline. After stopping the throttle cable should be checked carefully to find the source of the problem and correction should be made before starting to ride again.

2.8.4.3 Wobble

Wobble when the front wheel and handle bars suddenly start to shake from side to side at any speed making motorcycling uncomfortable. This can be traced to improper loading, unsuitable accessories or incorrect tyre pressure. Wobbling can be solved by sticking to the following: Steering system should be properly adjusted and aligned by qualified professionals. Spring pre-load, air shocks and dampers should be set properly at the setting recommended by the manufacturer for that much weight. Heavy load should be well lightened and centred on the motorcycle. Loosed wheel bearings or spokes should be corrected by a qualified professional andtyres should be properly inflated. When riding, the following should be done: Griping the handle bars firmly, Closing the throttle gradually to slow down and Moving the weight as far forward and down as possible.

2.8.4.4 Chain problems

A chain that slips or breaks while riding could lock the rear wheel and cause the motorcycle to skid. Chain slippage or breakage can be avoided by proper maintenance.

2.8.4.5 Engine seizure

Engine seizure ‘locks’ or ‘freezes’ it is usually low in oil. The engine moving parts cannot move smoothly against each other and the engine overheats. The first sign may be a loss of engine power or change in the engine sound. When this happens, oil should be added as soon as possible to the recommended level (Dickinson, 2006).

2.8.5 Road Environment

The road environment also affects riding and performance of the motorcycle. According to Huang and Preston (2004), due to the nature of motorcycle, motorcyclist are more susceptible to difficulties and hazards created by the design, construction, maintenance and surface condition of roads.

They are particularly vulnerable to change in the level of friction of road surfaces, pot holes, uneven surfaces, poor repairs to the surface, spillages, drain covers and road markings. Other road surface hazards include leaves, which can appear dry but may be soggy underneath, tram tracks, gravel, melted tar in hot weather which may reduce tyre grip or roads that became greasy and slippery in summer during rainstorm (ROSPA, 2001 cited in Huang and Preston, 2004).

According to Huang and Preston (2001) raised road markings can also cause problems for motorcyclists, either by affecting their stability or by retaining water on the surface, which results in a loss of adhesion between the tyres and the road surface. The use of bitumen for repairs can lead to difficulties, especially when the road surface is wet, as it leads to reduced friction and skid resistance. Furthermore, some calming features can cause additional hazards to motorcyclist.

2.8.6 Problem of Motorcycle Detection

Motorcycle crash studies provide ample evidence that motorcyclists are not easily seen by drivers of other vehicles, particularly when traffic is heavy and the visual field is complex. A common claim of motor–vehicle drivers involved in crash is that they did not see the

motorcycles and their riders at all, or did not see them in time to avoid the crash. About a half of cases in which motor–vehicle drivers failed to detect a motorcycle in time to avoid a crash, other obstacles were present to interfere with the driver's line of sight (Hurt *et al.,* 1981; Bednar *et al.,*2000). Motorcycles are less conspicuous than passenger cars or trucks, they are more difficult to detect and approaching speed is more difficult to determine, and this contributes to the high accident rate of motorcycles (Thomson, 1980, Wu *et al.,* 1989;RSC 1992).

Hancock (1990) described the factors that lead to drivers failing to detect motorcyclist as sensory and cognitive conspicuous. Indeed motorcycles have poor sensory and poor cognitive conspicuous.

2.8.6.1 Size of Motorcycles

According to RSC (1992), size of motorcycle is one of the important factors influencing sconspicuous. Under the daytime light conditions, motorcycles are big enough to be seen from far away to allow execution of avoidance manoeuvres when they are in a drivers view. The small size of motorcycles increase the likelihood of motorcycles that will be obscured by traffic and their detection may being seen a long distance away.

The high capacity motorcycles are potentially more dangerous for novices, many jurisdictions have implemented restrictions on the maximum engine capacity for novice motorcyclists (Haworth, 1994). According to Fabre and Nairm (1993), they found that there appears to be little evidence that a restriction on the size of a motorcycle that can be ridden by a novice affects crash

rates. Nairm (1993) argues this is especially relevant considering changed motorcycle characteristics in recent years.

Moreover, people identify objects on the basis of their size, shape, colour and motion. At a distance, motorcycles are similar to pedestrians or bicycles except their speed. Size is related to judgment of speed and distance so that the speed difference between motorcycles and other road users may not be enough for drivers to discriminate between them at long distance.

Harswill and Helman (2001) found that people waiting to pull out at a junction have problems detecting when a motorcycle will reach them. People judge an oncoming motorcycle would reach them later than an oncoming car, despite the actual time to arrival being exactly the same. Due to the smaller size of motorcycles, the increase in the size as they approach, their rate of looming is less easy to detect.

2.8.6.2 Lower Frequency of Motorcycles on the Road

The lower frequency of motorcycles on the road is another factor that causes drivers of other vehicles to overlook motorcyclist and subsequently violate their right of way. Many drivers do not anticipate routine encounters with motorcyclists in traffic (NHTSD and MSF, 2000). Hurt *et al.,* (1981*)* found that drivers involved in crashes with motorcycles were more like to be unfamiliar with motorcycles. Brook and Grumpy (1990) shows that drivers who also ride motorcycles with family members or close friends are more likely to observe motorcyclists. This indicates that drivers see motorcyclists, but they overlook them.

Some experts adduced an “expectancy phenomenon". They follow research on vigilance on the road users conditioned to respond more to the visual cues provided by other vehicles than those motorcycles because of their greater size and frequency on the road.

2.8.6.3 Visual Limitation of Drivers

The visual problem is compounded by a variety of visual limitations confronting drivers (RSC, 1992, NHTSD and MSF, 2003).

The typical factors are the physiology of the human eye influence on the drivers’ ability to see the motorcyclists, blink frequency, direction of eye sight, eye movement, masking and glare are all factors affecting the drivers’ ability to detect the motorcycle in various light and manoeuvre, automobiles have obstructions and blind spots that can obscure or hide a motorcycle rider. These include door pillars, passengers’ heads, and areas not visible in the mirrors, other conditions affecting the vehicle such as precipitation, glare, and cargo can further impair a driver’s view and obscure motorcycle, and objects and environment factors beyond the vehicle including other vehicles road side traffic.

2.8.7 Education, Training and Licensing

Education and training for motorcycle riders provides an opportunity for novice riders to learn the basic skills necessary to operate a motorcycle safety and for experienced riders need and refine their techniques. In both cases, learners are required to pass both theoretical and practical test in order to prove their competency in riding before they are given valid driving licenses.

Despite the disappointing history of training of novice car drivers, motorcycle training is encouraged by other countries including Australia. According to Lordford (2003) many believe that the unique handling characteristic of the motorcycle and the rider's vulnerability to perceptual, aerodynamic and roadway distance require the acquisition of high level of skills through formal training.

In Ghana, formal education and training on motorcycling has been neglected, making that human error (70-93 %) is the most contributory factor underlying the occurrence of road traffic crashes in Ghana (NRSC,2006).

The number of motorcycles licensed was fifteen thousand (15000) at the end of 2013, which accounted for 15 % of the total vehicles registered in the Brong Ahafo Region. The total number of licensed motorcycles has gradually increased since 2010 and also new motorcycle registration increased for 2008.

In the USA other researches have shown that more than 90 % of all riders involved in crashes were just self-taught or trained by friends and about 27 % of motorcyclists that were involved in fatal crashes in 2001 were not properly licensed (Zetkin, 2001).

2.8.8 Motorcyclists Hazard Perception Skills

A significant element of safe road use is the ability to perceive actual or potential danger in order to avoid it. According to Hawort and Symmons (2002), a set of stimuli to represent real or potential danger is termed 'hazard perception' and must be accomplished quickly and efficiently

so that an individual can decide whether their safety is in jeopardy, and enact avoidance behaviour to escape a potential crash. Car drivers and motorcyclists are not facing the same hazards. Indeed it is likely that motorcyclists face the same hazards as compared to car drivers. Additionally, the consequences of undertaking any avoidance of manoeuvres, the harm associated with hazard is likely to be greater for motorcyclists which give their lower degree of protection.

According to Armsby *et al.,*(1989), the types of hazards reported by motorcyclists differed from those reported by other motorists. Over 70 % of the hazards mentioned by car drivers were caused by inexperience of motorcycle riders. Car drivers who also rode motorcycles, however, were able to identify specific features of the road, and specific actions of other road users as hazards to motorcyclists.

2.8.9 Weather Conditions and Motorcycling

The weather condition at a particular time or place also affects the use of motorcycle helmet. Drivers and passengers of motor vehicles can get out of the weather but on the motorcycle, the rider and passenger cannot escape the weather. De Rome (2006) reported about the effects of the following climatic conditions on motorcycling and how they can be prevented.

2.8.9.1 Cold Stress

Feeling cold affects motorcycling in three crucial ways. The most obvious is a loss of feeling in the hands and feet that affects the rider's ability to operate the controls. Feeling very cold or uncomfortable is also stressful and tiring, which may place the rider more at risk of crashing. There is evidence that a rider's lower core temperature may affect decision making and increase

emotional responses such as anxiety, irritability aggressiveness or detachment (Woods,1986 cited in De Rome, 2006). Cold stress can also result from wind chill when wearing damped clothes.

2.8.9.2 Wet Stress

Apart from being uncomfortable, wet clothing can rapidly chill a rider because it draws heat away from the body. Water conduct heat much faster than air, which means a rider will get cold, much quicker if humidity is high. Wet weather gear is essential, but riders also need to be aware, that rain is not the only source of wet stress (De Rome, 2006).

2.8.9.3 Heat Stress

Many riders are not wearing protective clothing in hot weather because it can be hot and uncomfortable. Uncovered riders skin which is more likely to sustain severe injury during crashes, can also absorb heat directly from the sun causing dehydration leading to fatigue as well as sun burn (De Rome, 2006). In order to reduce crashes in hot, cold, wet and windy weather conditions the following should be followed: Completing any turn before acceleration, using engine braking for corners and junctions to reduce the risk of skidding, watching out for the following obstacles when riding; Slick concrete surface. Manhole tracks. Potholes. Oil spills and Puddles. Taking a lot of water, to stay hydrated, soda caffeinated and sugary drinks are not encouraged. They cause dehydration. Dressing appropriately for the purpose of comfort in cold weathers is needed.

2.9 Riding Skills

Starting of Motorcycle and Controlling

Before the engine of a motorcycle is started, the motorcycle should be in neutral position and the clutch pulled in. Once the engine is running and the motorcycle is in first gear, the clutch should be released slowly until it reaches the friction zone to make the motorcycle roll forward for some few centimetresbefore the clutch is pulled in again to stop the motorcycle. This will help the rider to know the fault on the motorcycle.

All motorcycles are not handled the same way. Riders need to know what the gearshift pattern is and the kind of brakes the motorcycle has before riding (David, 2004). Before riding in traffic, the rider should get a feel for the way the clutch, throttle, brakes, gearshifts level and steering respond.

To stop at low speed, the clutch is disengaged to prevent stalling and the rear brake is applied to make the motorcycle stop. When moving forward at a low speed and the clutch is engaged with the throttle opened, the motorcycle may lunge forward or stall. To prevent this problem, the clutch should be disengaged before applying the front brake. Opening the throttle while the clutch is disengaged will not cause stalling (David, 2004).

On the part of higher speeds, covering and slipping the clutch to control speed or avoid stalling is no longer necessary and the clutch is used mainly for shifting gears. Even through the rider can change gears without using the clutch, this method should not be used unless in a situation where the clutch cable brakes while riding in heavy traffic.

When the engine is running within the rpm range that produces power and rpm the clutch is not pulled in, opening the throttle will cause acceleration and closing the throttle will cause deceleration. If the rpm is below the power band, the engine may start to strain and the rider may not be able to get strong acceleration without up shifting at least one gear (David, 2004).

The weight distribution between the front and rear wheel can affect how much brake pressure it takes to lock the rear wheel. When a motorcycle is moving at a steady speed, the weight distribution between the front and rear wheel is about equal and the risk of locking the rear wheel is relatively small unless extremely hard pressure is applied on the rear brake pedal. After braking, more weight is transferred forward to the front wheel and it takes less pressure to lock the rear wheel. To compensate for the transfer of weight, more pressure should be applied to the rear brake than the front brake at the time of stopping (David, 2004). Some riders prefer anti-lock brakes because there is less risk of locking a wheel when riding on a slippery surface. If both wheels have anti-lock brakes and there is the need to stop quickly, keeping constant pressure on both brakes before stopping should not cause either wheel to lock. This is the reason why motorcycle Antilock Braking Systems are incorporated in modern motorcycle braking systems.

2.10 The Leading Cause of Death and Disability is Head Injuries

Injuries to the head and neck are the main cause of death, severe injury and disability among users of motorcycles. In European countries, head injuries contribute to around 75 % of deaths among motorcycle users. In some low-income and middle-income countries head injuries are estimated to account for up to 88 % of such fatalities (WHO *et al.*, 2006). The social costs of head injuries for survivors, their families and communities are high, in part because they frequently require

specialized or long term care. Head injuries also result in much higher medical costs than any other type of injuries (WHO *et al.,* 2006). These injuries exert a high toll on a country's health care costs and its economy. Globally, there is an upward trend in the number and use of motorcycles for transport and recreational purposes. Indeed, most of the growth in the number of vehicles on the World's roads comes from an increasing use of motorcycles. This rapid growth in the use of motorcycles in many low-income and middle-income countries is already being accompanied by a considerable increase in the number of head injuries and fatalities that will only continue to increase if present trends continue.

In Ghana, Road Traffic Act 2004, Act 683 ensures the mandatory use of standard helmet, the sale of standard protective helmet and the extensive education campaign on helmet use by the National Road Safety Commission. Thus the National Road Safety Commission's Campaign lays emphasis on the wearing of helmet and despite the documented effectiveness of helmets, many motorcycle riders choose not to wear them. It has been observed that when enforcement by the police is strong, some motorcyclists wear helmets and some go to the extent of improvising just to avert the attention of the police. Studies show that countries where the use of helmet is not mandatory or if this rule was repealed the number of fatal injuries or death due to motorcycle crashes increased many fold. In Pakistan, the use of helmet is mandatory for motorcycle riders, however, poor compliance is a major problem and failure to enforce on the part of the traffic police.

2.11 The Use of Helmet in the Reduction of Hospital Costs

Researchers in Austria and USA studied the impact of motorcycle helmet use on patient outcomes and cost of hospitalization. Despite Australia mandatory helmet law, 24 % of the 315 patients included in the study were not using helmets when they crashed, allowing the researchers to compare costs among helmeted and unhelmeted riders. On average, helmet use led to average hospital costs that were about 30 %, or US $6500, less than costs for those who did not wear helmets. For patients who were treated on an inpatient rehabilitation floor after leaving the trauma unit, average costs for unhelmeted motorcycle riders were nearly twice those of helmeted riders, in part due to the fact they were kept in hospital longer. The results also confirmed that riders without helmets were younger, suffered more head and neck injuries, and had higher overall injury severity scores. Failure to wear a helmet adds to the financial burden created by motorcycle-related injuries. The authors concluded that individuals who do not wear helmets should be required to pay higher insurance premiums (Brandt *et al.,* 2002).

2.12 Impact Reduction of Motorcycle Related Injuries

Some measures reduce the severity of accidents and injuries. Peltzman (1975) suggests that such measures might increase the frequency of risk accidents. These measures are normally engineering based related to the design of motorcycles, motorcycle helmets and other protective equipment.

2.12.1 Motorcycle Design

Motorcycle aerodynamic design have seen major innovations, liquid cooling, engine counter-balances, and antilock, linked braking, full adjustable suspension systems, and advanced disc

braking systems. Both handling and tyre technology are the safe and efficient use of the motorcycle. Manufacturers have been conducting research concepts, including automatic transmissions, fully enclosed rider capsules and radical chassis designs. The improved shaft designs and aerodynamic forms can expected to increase rider comfort and stability. According to Bednar *et al.,* (2000) improvements of motorcycle features such as fuel injection, braking systems, and engine load mapping will continue to be introduced in the selection of motorcycles. Three aspects of motorcycle protection design are brakes, airbags and leg protection.

2.12.2 Braking Systems

In wet weather conditions, motorcycle brakes collect water on brake discs, pads and linings which affect braking system and increase stopping distances. In 1986, members of the Transportation Research Board's Committee on Motorcycles and Mopeds in USA reviewed that special friction materials were used to design brakes. According to Nairm (1993: pp.24) the materials may improve wet weather brake performance, without compromising performance in the dry season.

Hurt (1987) demonstrated that many motorcyclists involved in crashes failed to use full braking system because they feared that motorcycle brakes will lock and capsize the motorcycle. Moreover, unbalance between the effects of the front and rear brakes can contribute to crash involvement. To ensure effective brake system, anti-lock brakes must be developed.

Types of vehicle with inappropriate brake application are not critical under the circumstances. The mistake by the two wheeled motor vehicles rider that leads to over-braking will cause the

machine to skid, be unstable and capsize. The incidence of skidding in personal injury accidents is greater for motorcycles than other vehicles. In Great Britain in 1979, skidding occurred in 28 % of motorcycle involved accidents in the wet compared with 20 % for other vehicles (DETR, 1998).

Anti-lock brakes were designed to prevent wheel lock and provided motorcyclists with the confidence to use the brakes up to the limit of the friction available, without fear of falling to the ground. Anti-lock brake system also reduces stopping distance in wet and icy conditions. A few machines now offer anti-lock brakes (Elliot *et al*., *2003*). NHTSA and MSF (2000) called for more studies of the effectiveness of linked and anti-lock braking system, which formed the basis of deployment of valuable technologies.

Although new technology seems to promise shorter stopping distances and total safer stopping for motorcyclists, assuring that motorcyclists get maximum braking performance requires additional training and education on proper braking and panic-braking techniques.

2.12.3 Airbags

Air bags and restraint systems seek to reduce head and chest injury after ejection of the rider on impacts. Fitting an airbag to the top of the fuel tank has been a method of preventing injuries by reducing the impact speed. Airbags are one of the restraint systems that do not obstruct the rider during normal riding. Airbags has been found to be most effective prevention of collisions with a stationary car. The rider sliding around the side of the bag and little change in speed result in collisions with moving car (Finnia, 1990; Outlet, 1990).

2.12.4 Lower Limb Protection

Research conducted on injuries particularly fractures which are common to the lower limbs protectors were designed to prevent intrusion into the spaces normally occupied by the rider's legs. From a study conducted by Watson (1990), counter measures designed to increase lower limb protection for motorcyclists have been the subject of considerable controversy. Tom (1990) comments that much of the research work in this area has been fuelled by product liability legislation, rather than the needs of motorcyclists.

According to Craig, Sleet and Wood (1983) crash bars were fitted to 21 % of patients motorcyclists and "appeared to offer no protection to lower limbs". According to the authors, to reduce the incidence of severe lower limb injuries it might help to provide some form of shell surrounding the legs to protect them against impacts from other vehicles which are most likely to strike the outer side of the lower leg. From the authors, they said that form of device offers being thrown from the machine would result in lower limb injuries but less severe. Special boots with knee protectors made from an impact-absorbent material could help to reduce the injuries if all motorcyclists would wear those racing leathers to give some protection.

According to Peg and Mayze (1980), they noted the need for a standard to ensure the strength of crash bars. They argued that many of the fitted crash bars were too flimsy to be design effective. Nairm (1993, pp.26) said leg space preservation is not strongly related to the occurrence of serious leg injuries in motorcycle accidents, because legs do not remain in the leg space during the collision. The usual expectations of crash bar performance and leg injury mechanisms are not supported by the in-depth analysis of actual accidents.

Quellet (1983) stated that leg protection device may have the ability to affect favourably serious leg injuries which result from direct crashing of the rider's leg against the side of the motorcycle during impact. Fuel tanks can also sometimes cause damage to a rider's knees or legs (Peg and Mayze, 1980). Bothwell (1971; 1975; cited in Nairm, 1993) recommended that to improve motorcycle collision performance, the rider's ejection path should be smoothed and cleared of obstacles or obstacles should be designed to make them less injurious. The research conducted showed that many of less severe injuries can be prevented or reduced by the use of preventive clothing. Furthermore, Nairm (1993) contended that the severity of leg injuries would be reduced in approximately 50 % of the crashes which involved serious leg injuries if leg protection were to be fitted.

2.13 The Use of Motorcycle Helmet on Accident Mortality Rate

A motorcycle accident is actually a very complex event involving the interaction or many complicated human, vehicular and environmental factors. Hurt *et al.*(1981) reported that the most common motorcycle accident involving another vehicle causing the collision of violating the right-of-way of the motorcycle at an intersection, usually by turning left in front of the oncoming motorcycle because the car driver did not see the motorcycle. They continued that motorcycle riders involved in accidents are usually inconspicuous in traffic, inexperienced, untrained, uninsured, unlicensed and unprotected and does not employ skilful and traffic strategies to avoid collision.

A study conducted by Radian (1998) on the impact of running day time headlight on motorcycling revealed that day time headlight reduce conspicuous, related motorcycle crashes by

29 %. Protective clothing, brakes, traffic indicators including brake lights mirrors and horns are the most important safety features on any motorcycle. These features in general help to avoid rear end and front collisions. Despite the use of these safety features including brake lights, the incidence of rear-end and front collision remain relatively high among motorcycles (Potentstorm, 1999).

Many statistical data on national motorcycle accidents showed that motorcyclists are a particularly vulnerable group of road users. For example, a study conducted in Great Britain in 2002 showed that the number of people killed or seriously injured (KSI) using motorcycle was 147 per 100 million vehicle kilometres. The study also reported that the comparable casualty rate for motor car users was 50 per 100 million vehicle kilometers. The injury casualty rate for motorcycles was 556 per 100million vehicle kilometres compared to 50 per 100 million, vehicle kilometers for cars users (Huang and Preston, 2004).

A report from the National Highway Traffic Safety Administration (NHTSA, 2001) noted that fatality rate for riders over 40years of age increased 38% from 1992 to 1999.This implies that people riding motorcycle daily tend to be older and are experiencing more accidents than ever before. Helmet riders have been shown s70 % reduction in injury severity and 4% reduction in mortality compared to unhelmeted riders in collisions. This is associated with the reduction in health care cost and beneficial to the society (Cradon *et al*., 2009*)*.

In 2002, researchers conducted 25 studies in California reviewed the cost of injuries from motorcycle crashes, reported that helmet use reduced the cost of medical treatment, length of

hospital stay and probability of long term disability for riders injured in a crash. For example, California introduced universal helmet use law in 1992, health care costs associated with head-injured motorcyclist reduced. The rate of motorcyclist hospitalized for head injuries decreased by 48 % in 1993 compared with 1991, and total cost for patients with head injuries decreased by $ 20.50 million during this period.

2.14 What is a Motorcycle Helmet?

A motorcycle helmet is a type of protective headgear used by motorcycle riders. The main aim of a motorcycle helmet is motorcycle safety- to protect the rider's head during impact, thus preventing or reducing head injury or reducing head injury or saving the rider's life. Some helmets provide additional conveniences, such as ear protection, face shields, ventilation, intercom etc. (Wikipedia, 2010).

2.15 How a Motorcycle Helmet Works

A motorcycle helmet aims to reduce the risk of serious head and brain injuries by reducing the impact of a force or collision to the head. A motorcycle helmet works in three ways;

- It prevents direct contact between the skull and the impacting object by acting as a mechanical barrier between the head and the object.
- It spreads the forces of the impact over a greater surface area so that they are not concentrated on particular areas of the skull.
- It reduces the deceleration of the skull, and hence the brain movement, by managing the impact. The soft material incorporated in the helmet absorbs some of the impact and therefore the head comes to a halt more slowly. This means that the brain does not hit the

skull with such great force. These three functions are achieved by combining the properties of four basic components of the helmet;

2.15.1 The Shell

This is the strong outer surface of the helmet that distributes the impact over a large surface area, and therefore lessens the force before it reaches the head. Although the shell is tough, it is designed to compress when it hits anything hard. It provides protection against penetration by small, sharp and high speed objects and it also protects the padding inside the helmet from abrasions and knocks during daily use. These requirements mean that the shell must be hard, usually with a small exterior finish.

2.15.2 The Impact-Absorbing Liner

This is made of a soft, crushable padded material-usually expanded polystyrene, commonly called "Styrofoam". This dense layer cushions and absorbs the shock as the helmet stops and the head tries to continue moving.

2.15.3 The Comfort Padding

This is the soft foam-and-cloth layer that sits next to the head. It helps keep the head comfortable and the helmet fitting snugly.

2.15.4 The Retention System / Chin Strap

This is the mechanism that keeps the helmet on the head in a crash. A strap is connected to each side of the shell. Chin and neck straps, which are specifically designed to keep the helmet on during an impact, must be correctly used for the helmet to function as it is designed to. A study in USA examined the compliance on helmet use in a typical USA town. About 3000 motorcyclists studied, only 51 % used helmets properly, 23 % used them improperly and 26 % did not wear them at all (May,1989). Young people, men and those with less formal education were more likely to not wear helmets properly. Many helmet users do not secure their helmets properly-and sometimes not at all-thereby rendering the helmet of little-if any-value in the event of a collision.

2.16 Design of Motorcycle Helmet

In addition to meeting the previously described functions and conforming to standards, a helmet needs to be designed to suit the local weather and traffic conditions. The following are some of the considerations usually addressed by helmet designers;

- Materials used in the construction of a helmet should not degrade over time, or through exposure to weather, nor should they be toxic or cause allergic reactions. Currently, the plastic material commonly used are Expanded Poly-Styrene (EPS), Acrylonitrile Butadiene Styrene (ABS), Poly Carbon (PC) and Poly Propylene (PP). While the material of the helmet shell generally contains PC, PVC, ABS or fibre glass, the crushable liner inside the shell is often made out of EPS-a material that can absorb shock and impact and is relatively inexpensive. However, helmets with EPS liners should be

discarded after a crash, and in any case users should replace such helmets after 3-5 years of use.

- Standards often set the minimum coverage of a helmet. Half-head helmets offer minimal coverage. Full-face helmets should ensure that the user's peripheral vision and hearing are not compromised.
- To ensure that a helmet can absorb the shock of a crash, the crushable liner should be between 15 cm and 3.0 cm in thickness.

2.17 Effective Use of Helmet, Reducing Head Injuries

Using a helmet is the single most effective way of reducing head injuries and fatalities resulting from motorcycle crashes. Motorcyclists who do not use helmets are at a much higher risk of sustaining head injuries and from dying from these injuries. In addition, riders who do not wear helmets place additional costs on hospitals, while the disability that results from these head injuries in ours costs at an individual, family and societal level.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the methods and procedure used in carrying out the study. Specifically, it emphasizes on the research design, population and sampling with related techniques, data collection, data analysis and ethical issues.

3.2 Area of Study

Nsawkaw is the capital of the Tain District in the Brong Ahafo Region of Ghana. It lies on the Wenchi-Sampa road, approximately (80-km) from Wenchi. The inhabitants are predominantly Brongs. As a district capital, different models of motorcycles are used like Yamaha, Honda, Kawasaki, Suzuki, Hadrian, Aphonic, and so on. The people use these different models of motorcycles on the road for the purpose of riding to their work places, funerals, going to clubs, sending their wards to school and outdooring for socialization and so on. The road network is good but lots of shoulders and walk ways for bicycles and pedestrians are not available. Due to the emerging technological trends and serious injuries and deaths among motorcycle owners or riders, there is the need to study this particular transportation segment as part of management engineering of the sector.

3.3 Research Design

The research design used in this study was the descriptive method. With the descriptive method as reported by Creswell (1994), it intends to present facts about the nature and status of a situation as it exist at the time of the study. Again, it concerns the relationship and a practice that exist, beliefs and processes that are ongoing, effects that are being felt or trends that are

developing (Best,1970). It is therefore used in describing the current situation based on the knowledge and behavioural attitudes of the respondents of the studies. A cross section approach where the characteristics of the respondents were studied one point in time was used instead of a longitudinal approach.

3.4 Population and Sampling

The target population of the study was the motorcyclists in the Nsawkaw traditional area in the Brong Ahafo Region of Ghana. A total of 100 respondents were sampled using convenience sampling technique. After the identification and the clear definition of the study population, convenience non probability sampling method was adopted. Convenience sampling is also referred to as accidental or haphazard sampling which includes participants who are readily available and agree to participate in a study (Fink, 1995; Frey*et al*., 2000). This choice of sampling became necessary because it allowed the collection data from population members who are conveniently available to participate in a study, information rich and are willing to provide the needed information. This approach is not only relatively cost and time effective by enabling a researcher to achieve the sample size needed in a relatively fast and inexpensive way but it helped in gathering useful data and information that would not have been possible using probability sampling techniques, which require more formal access to lists of populations a case quiet impossible among a population of motorcyclists with no definite area of operation.

3.5 Instrumentation

Both primary and secondary data were use for the study. Questionnaire was the preferred primary data collecting instrument whilst records from the DVLA were used as a secondary data.

Structured questionnaire with closed ended items were administered to the respondents. This was very useful in collecting data from a large number of respondents in a very cost and time effective manner. The structured nature allowed the use of standardized items across the respondents and aid in statistical manipulation of the data. The secondary data from the DVLA supplemented the primary data in providing evidence less likely to be given by the respondents.

3.6 Data Collection

A cross sectional survey was used in the data collection process. Where the population was studied one point in time. The instrument was personality administered with support to the less educated respondents

3.7 Validity and Reliability

In order to obtain a valid and reliable data, the questionnaire was subject to scrutiny by a third party to help eliminate ambiguous items and reorder that in a more coherent manner. The instrument was pre-tested in the Techiman Municipality prior to the mass administration. The rationale behind this exercise was to ascertain the level of understanding of the items in the questionnaire. Also, it was to find out whether the replies provided the type of information needed or whether the respondents were misinterpreting any of the questions. After this exercise, some of the items in the questionnaire were deleted and others were improved upon.

3.8 Ethical Consideration

Ethical issues were taken into consideration by informing participants of the purpose of the study and assured them of confidentiality. No form of identification what so ever about the respondents

was taken and the sources where vital information was derived for the study duly acknowledged to avoid any kind of plagiarism. Permission was also sought from the high hierarchy of the DVLA.

3.9 Data Handling and Analysis

Completed respondent from the field were edited and coded appropriately to make meaning out of them. Editing was done to correct errors, check for non-responses, accuracy and corrects answers. Coding was done to facilitate a comprehensive analysis of the data. To arrive at the intended analyses, the participants' responses were keyed into SPSS vs 16.0 and several sets of statistical analyses were performed based on the research questions. The results were presented using tables and charts.

CHAPTER FOUR

PRESENTATION AND DISCUSSION OF RESULTS

4.1 Introduction

The chapter concentrates on the presentation of the results and discussion. Statistical Package for Social Sciences (SPSS) vs 16.0 was employed in analyzing the data collected. Cronbach's alpha was used to test the reliability of the instruments recording an alpha of 0.806 measured over a 5-point Likert scale.

4.2 Demographic Characteristics of Respondents

A total of 95motorcyclists in six (6) communities in the Nsawkaw traditional area were involved in the study with males forming the majority (70.5 %). Only about 8 % of the motorcyclist were older than 40 years whilst about one-fifth (20.0 %) were younger than 20 years, 38.9% were between 21 and 30 years and 32.6 % were between 31 and 40 years. This made the responding groups a youthful one with as high as 71.5 % of the motorcyclist aged between 21 and 40 years. The respondents were predominantly Christians (85.3 %). All the respondents had some level of education with about one-third (33.7 %) with only basic education and close to half (46.3 %) with tertiary education. Students (32.6 %) and business men and women (52.6 %) were the most users of motorcycles in the study area. Majority, however, had less than 5 years riding experience with only about 7 % of the responding motorcyclists with 10 or more years of riding experience.[Table 4.1].

Table 4.1 Demographic Characteristics of Responding Motorcyclists

Variables	**Categories**	**Frequency (N)**	**Percentage (%)**
Area of Operation	Seikwa	69	72.6
	Nsawkaw	2	2.1
	Tainso	8	8.4
	Kyekyewere	4	4.2
	Atomfoso	11	11.6
	Tiadenne	1	1.1
Gender	Male	67	70.5
	Female	28	29.5
Age	Below 21	19	20.0
	21-30	37	38.9
	31-40	31	32.6
	Above 40	8	8.4
Marital status	Married	52	54.7
	Single	35	36.8
	Divorced	5	5.3
	Separated	2	2.1
	Widowed	1	1.1
Religious affiliation	Christian	81	85.3
	Muslim	8	8.4
	Other	6	6.3
Education background	Basic	32	33.7
	Secondary/Technical	17	17.9
	Tertiary	44	46.3
	Other(s)	2	2.1
Occupation	Student	31	32.6
	Businessman	50	52.6
	Technician/artisan	2	2.1
	Reverend minister	4	4.2
	Public/civil servant	6	6.3
	Other(s)	2	2.1
Experience	Less than 1 year	39	41.1
	1-4	31	32.6
	5-10	18	18.9
	Above 10 years	7	7.4

N=95

4.3 Licensing and Insurance of Motorcycles

Motorcycles just like other motor vehicles need to be duly licensed, tested and insured to be able to operate effectively be it for private or commercial use. There are institutions mandated for such exercises carried out in accordance with the laws governing their operation. In Figure 4.1, the percentage of motorcycles and motorcyclists who have due riding license, had their motorcycles tested and properly insured or otherwise is presented.

About two-thirds (62.1 %) of all the motorcyclists who responded to the questionnaire items do not have licenses to ride motorcycles. Even though almost all the motorcycles were registered, less than half (45.3 %) of the responding motorcyclists had their motorcycles duly tested and only about a quarter (25.3 %) have some insurance cover for their motorcycles

A lot of people are advocating for the operation of motorcycle taxis in the villages and rural areas where access roads are in a deplorable state especially during the rainy season. They believe this would reduce their plight of trekking so many kilometres before coming to the urban centres or locations where they could access cars. The insurgence of these commercial motorcycles have increase related accidents and therefore have increased the need for the enforcement of helmet usage laws. The northern sector including the Brong Ahafo Region according to the DVLA, 2011, have continuously saw increase in the registration of motorcycles as compared to the southern sector and equally recorded a higher rate of unregister motorcycles. This seems to indicate that, the use of motorcycles in the northern sector of the country is becoming increasingly uncontrollable and the earlier the laws on the use of helmets are enforced, the safer it will be for the riders, passengers and other road users [Figure 4.1].

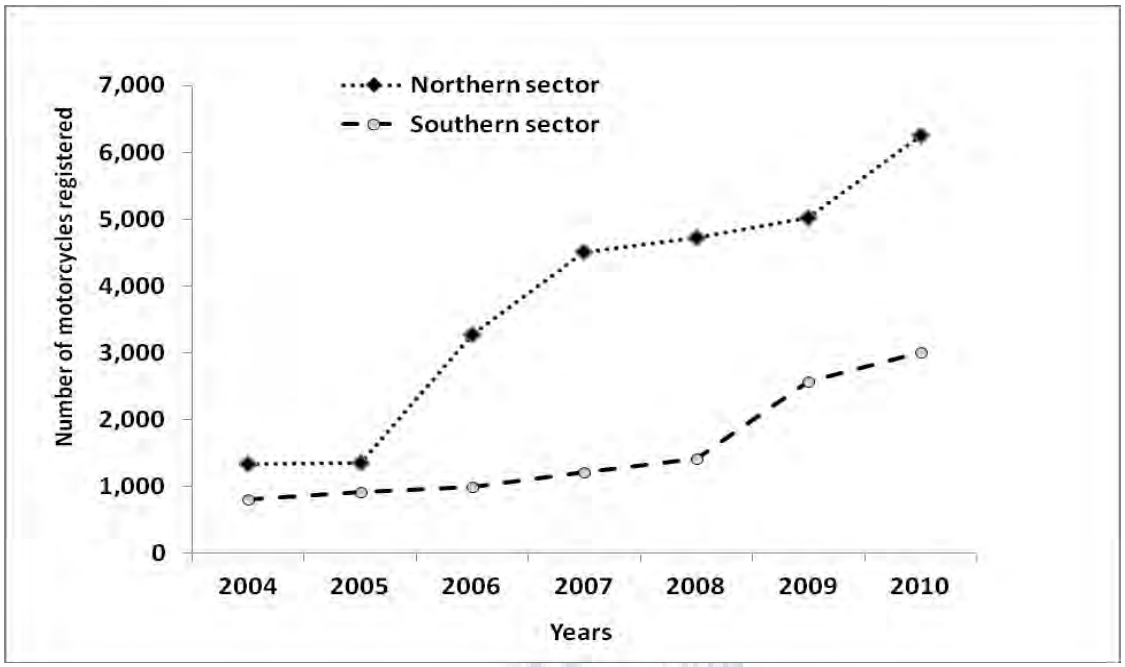

Figure 4.1 The trend of registration of motorcycles in Ghana (DVLA, 2011).

4.4 Causes of Motorcycle Accidents

There are varied reasons why accidents occur. Most of these reasons, however, are normally preventable since they occur out of individual or collective actions or inactions. In Figure 4.2, the mean ratings of the causes of accidents involving motorcycles are presented as measured on a 5-point scale. Alcohol abuse was noted as the highest contributor (M=4.56) to accidents involving motorcycles in the communities understudy. Negative riding behaviours(M= 4.5) such as leaving steers whist riding, fatigue (M= 4.22) and lack of education and training (M=4.02) were noted as the most contributing factors towards accidents involving motorcycles. However, supernatural forces was noted to have a negligible (M= 1.24) influence on the causes of motorcycle accidents. Similarly, human and vehicular traffics (M=2.02), and the nature of the road (M=2.86) equally have very insignificant contribution to motorcycle accidents.

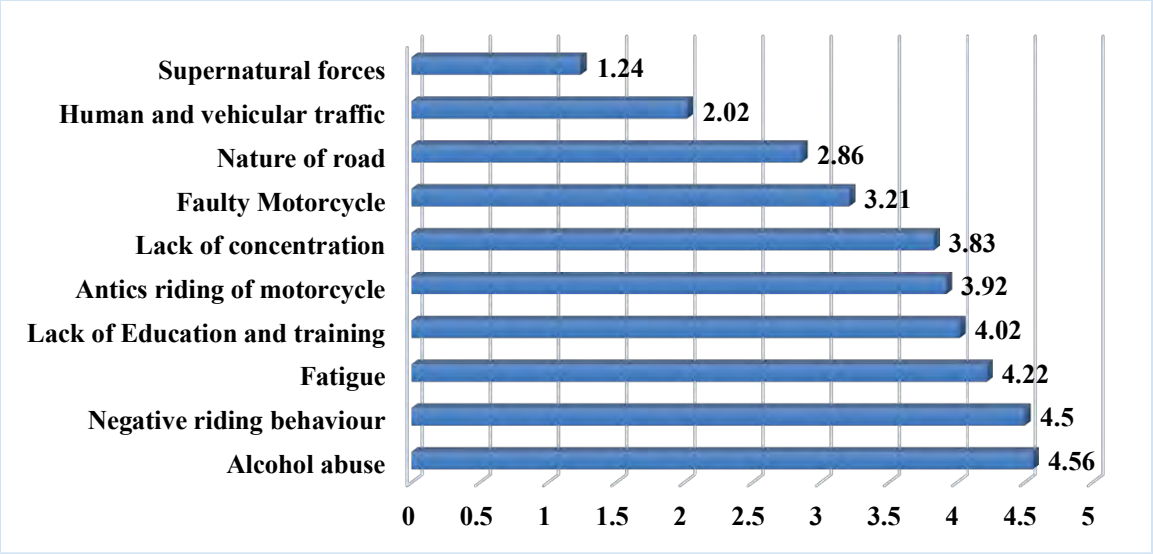

Figure 4.2 Causes of Motorcycle Accidents

4.5 Perception and Knowledge on the Use of Motorcycle Helmets

In Table 4.2, the perception and knowledge of motorcyclists on the use of helmets is presented. Generally, the perception and knowledge background of people affects the level of importance attached to different phenomena and such it was in the use of motorcycle helmets. In Table 4.2, it was noted that, responding motorcyclists were aware that, *riding without wearing helmet is dangerous* (M= 4.65, SD=0.158, $\chi 2$= 36.10, $p<0.001$). Despite the fact that motor riders were aware of the risk in riding without helmets, most still believed *there is no need to wear helmets when riding slowly* (M=4.52, SD=0.303, $\chi 2$=25.60, sig<0.001). A great number of the responding motorcyclists so much believed in their riding skills and felt they have enough *control over the motorcycle without helmets* (M=3.89, 0.525, $\chi 2$= 27.95, $p<0.001$). It was noted from the results that *when in hurry, most riders do not use helmets* (M= 3.80, SD= 0.678, $\chi 2<0.001$). There were some motorcyclists who were reluctant to use helmets because they asserted it impeded their hearing and vision (M=3.65, SD=0.714, $\chi 2$=46.00, $p<0.001$) and

equally believed that it is enough for the passengers alone to wear helmets (M=3.57, SD= 0.871, $\chi 2$= 16.80, p<0.001). It was obvious most motorcyclists do not use helmets regularly, (M=2.63, SD=1.238, $\chi 2$=31.0, p<0.001). Because most motorcyclist do not use helmets regularly, only very few will have the wearing of helmet in riding a motorcycle be legally enforced (M= 2.30, SD=1.476, $\chi 2$=45.75, p<0.001).

Table 4.2 Perception and Knowledge on Use of Motorcycle Helmets

	Variables	Mean	SD	Chi-Sqr	Sig.
1.	Riding without wearing helmet is dangerous	4.65	.158	36.10	.000
2.	There is no need to wear a helmet when riding slowly	4.52	.303	25.60	.000
3.	Some people ridicule motorcyclists who wear helmet	4.26	.334	22.50	.000
4.	I have much control over the motorcycle without a helmet.	3.89	.525	27.95	.000
5.	When I am in a hurry, I do not use a helmet	3.80	.678	8.15	.017
6.	Helmets impede my hearing when riding	3.65	.714	49.00	.000
7.	Carrying the helmet before and after use is difficult	3.60	.828	.35	.839
8.	It is enough when only the passenger wears the helmet.	3.57	.871	16.80	.001
9.	Helmets do not have a suitable appearance and scent	3.42	.960	18.25	.001
10.	It is easy to store and maintain helmets	3.33	1.036	17.75	.001
11.	I enjoy the use of helmet	2.74	1.176	46.75	.000
12.	I use helmet regularly	2.63	1.238	31.0	.000
13.	In quiet streets there is no need to wear a helmet	2.56	1.432	21.25	.000
14.	It is comfortable to wear the helmet while riding the motorcycle	2.45	1.532	40.50	.000
15.	Wearing helmet in riding a motorcycle must be enforced	2.30	1.476	45.75	.000
16.	I can maintain my balance in an accident so need not wear a helmet	2.01	1.432	21.25	.000

N=95, 1= Strongly Disagree, 2= Disagree, 3=Neutral, 4= Agree, 5= Strongly Agree

In Table 4.3, the correlation between the demographic characteristics of the responding motorcyclists and their attitude towards the use of helmets is presented. From the results, male motorcyclists were statistically more likely to ignore wearing helmets when riding slowly ($r = -0.521$; $p<0.01$). They also believed they were able to exercise much control over the motorcycle in without the use of helmets ($r = -0.405$; $p<0.01$), and are more likely than female riders in ignoring the use of the helmet when in a hurry ($r = -0.468$; $p<0.01$). Similarly, there was a great likelihood for men's refusal to use helmets because they felt helmet impeded their sight and hearing abilities ($r = -0.311$; $p<0.01$), and do not use these helmets regularly($r = 0.273$; $p<0.01$). They wished that the helmets is not enforced ($r = 0.521$; $p<0.01$). This points to the fact that, female motorcyclists tend to use helmets more regularly than their male counterparts and were more likely to understand the safety needs of the use of the motorcycle helmets. Age and the level of education on the other hand have some significant positive associations with the variables understudy. The older rider, the more likely he or she was in finding the need to wear helmets even when riding slowly($r = -0.162$; $p<0.05$)., when in a hurry ($r = -0.311$; $p<0.01$)., and will have the law of wearing helmets enforced ($r = 0.368$; $p<0.05$).

As the motorcyclists progresses academically, the need and the importance of the use of helmets equally increases significantly. More educated motorcyclists tend to use helmets regularly, prefer their passengers' to use the helmets too, will use the helmets no matter the speed at which they rode, and will equally have the law on the use of helmets enforced. The more experienced the motorcyclists, however, the least use of helmets and would want the use of helmets not enforced. This implies that, the more experienced motorcyclists' count on their experiences and believed

they are not accident prone or could have great control over the motorcycles even in times of accidents.

Table 4.3 Motorcyclist Attitude on Helmet use and Background Data

Variables	GD	AG	LE	EXP	RHD	NRS	CWH	HNH	HIH	EPH	EUH	UHR	QNH	WHE
GD	1	.659[a]	-.211[b]	-.521[a]	.473	-.597[b]	-.405[a]	-.468[a]	-.311[a]	-.144[b]	.108[b]	.273[a]	-.058[a]	.560[a]
AG		1	-.068	-.481[a]	.366	-.162[b]	.259[a]	-.311[a]	-.310[a]	-.173[b]	.313[a]	-.176	.046	.368[b]
LE			1	.034	.487[a]	-.334[a]	-.192[b]	.347[a]	.271[a]	.099	.039	.234[b]	.075	.348[b]
EXP				1	.135	.154[b]	.359[a]	-.393[a]	.357[a]	.087	.470	-.245[a]	-.108	.209[b]
RHD					1	.366[a]	-.202[b]	-.139	.254[a]	.426[a]	.243[a]	-.259[a]	-.081	-.577[a]
NRS						1	.307[a]	.325[a]	.577[a]	.254[a]	.252[a]	.202[b]	.019	-.226[b]
CWH							1	.826[a]	.425[a]	-.032	.037	.454[a]	-.021	.569[a]
HNH								1	.571[a]	-.125	-.022	.505[a]	-.076	.445[a]
HIH									1	.301[a]	.087	.220[b]	-.026	.012
EPH										1	.552[a]	-.082	.113	-.310[a]
EUH											1	-.036	.025	-.255[a]
UHR												1	.161	.407[a]
QNH													1	.120
WHE														1

N=95, 1= Strongly Disagree, 2= Disagree, 3=Neutral, 4= Agree, 5= Strongly Agree
a=Correlation is significant at the 0.05 level (2-tailed), b=Correlation is significant at the 0.01 level (2-tailed).

GD	Gender	**HNH**	When I am in a hurry, I do not use a helmet
AG	Age	**HIH**	Helmets impede my hearing when riding
LE	Level of education	**EPH**	It is enough when only the passenger wears the helmet.
EXP	Experience	**EUH**	I enjoy the use of helmet
RHD	Riding without wearing helmet is dangerous	**UHR**	I use helmet regularly
NRS	There is no need to wear a helmet when riding slowly	**QNH**	In quiet streets there is no need to wear a helmet
CWH	I have much control over the motorcycle without a helmet.	**WHE**	Wearing helmet in riding a motorcycle must be enforced

4.6 Factors that Motivate the Use of Motorcycle Helmets

The motivation to get something done can either be extrinsically or intrinsically influenced and different individuals and different instances are motivated in different ways. In Table 4.4, the factors most likely to motivate the use or otherwise of motorcycle helmets are presented. About

two-thirds more of the responding motorcyclists reported that, they were motivated to use helmets during riding because *helmets protect the heads when motorcycle falls* (88.4 %), *wearing of motorcycle helmet reduces motorcyclists' risk of death* (82.1 %), h*elmet could save life* (79.6 %), *the fear to be caught by the police* (77.6 %), *general safety purposes* (76.3 %), e*ncouragement from family* (75.2 %) and *after witnessing the death of a motorcyclist* (65.2 %). However, government directives on the use of helmets, the innate desire for speed, the cost of helmets, media campaigns and advice from other motorcyclists (ordered in descending order of influence) do not really motivates motorcyclists to regularly use helmets.

Table 4.4 Factors that Motivate the Use of Motorcycle Helmet

	Helmet use Motivational Items	Agree (%)	Disagree (%)
1.	Helmet protects head if motorcyclist falls off a motorcycle	88.4	17.6
2.	Wearing of motorcycle helmet reduces motorcyclists' risk of death	82.1	17.9
3.	Helmet could save life	79.6	20.4
4.	The fear to be caught by the police	77.6	22.4
5.	General safety purposes	76.3	23.7
6.	Encouragement from family	75.2	24.8
7.	After witnessing the death of a motorcyclist	65.2	34.8
8.	Government directives on the use of helmets	48.4	51.6
9.	My innate desire for speed makes me wear a helmet	36.7	63.3
10.	Cost of motorcycle helmets	23.7	76.3
11.	After hearing of "Use Helmet" campaign	22.5	77.5
12.	Advice from other motorcyclists	19.7	80.3

N=95, 1= Strongly Disagree, 2= Disagree, 3=Neutral, 4= Agree, 5= Strongly Agree

Agree= (Strongly agree + agree); Disagree= Strongly disagree + disagree

4.7 Factors Preventing the Use of Helmets

To be able to fully address the issues surrounding the use and non-use of helmets among motorcyclists, it was important to understand the challenges motorcyclists face in the use of helmets as indicated in Table 4.5. A lot of motorcyclist attributed their non-use of crash helmets to some conditions and otherwise perceived conditions. The quality of crash helmets are of concern to most motorcyclists warranting as many as 89 % of the responding motorcyclists

reporting it as a blockage to their use of helmets. Helmets were reported to cause limitations in neck and head movements (75.6 %) while about (74 %) reported that, helmets do not actually save life beyond some speed limit. Another militating factor to the use of helmets is the cost. About (72.6 %) of the sampled cyclist reported that, the cost of helmets was the cause of their non-use of helmets with yet about (72 %) reporting that helmets impede vision most especially during rainy and foggy or wet weather conditions which could easily cause accidents. The perceived safety provided by helmets crates in motorcyclists an unconscious over speeding (63.2 %) which is very dangerous. The weight of the helmet (36.7 %) , helmets messing up peoples hair do (33.8 %), the feeling of getting suffocated (32.6 %) and people not able to identify motorcyclists in helmets (29.2 %) were, however, not influential in peoples decision not to use helmets since very few people saw them as impediments.

Table 4.5 Factors Preventing the Use of Helmets

	Variables	Agree (%)	Disagree (%)
1.	There are too many fake helmet in the system	88.9	11.1
2.	It causes limitations in neck and head movement	75.6	24.4
3.	Helmets do not actually save life beyond some speed limits	73.8	26.2
4.	The cost of quality helmet is too high	72.6	27.4
5.	Helmet leads to restriction of vision	72.3	27.7
6.	Wearing helmets cause motorcyclists to overspeed	63.2	36.8
7.	The helmet causes neck pain which causes fatigue	59.2	40.8
8.	Helmets generate too much heart	53.8	46.2
9.	Wearing helmets make motorcyclists reckless in riding	53.4	46.6
10.	The helmet is too heavy	36.7	73.3
11.	Helmet messes my hair	33.8	76.2
12.	I have a feeling of suffocation when wearing the helmet	32.6	77.4
13.	People do not identify me in helmet	29.2	70.8

N=95, 1= Strongly Disagree, 2= Disagree, 3=Neutral, 4= Agree, 5= Strongly Agree

Agree= (Strongly agree + agree); Disagree= Strongly disagree + disagree

4.8 Discussion of the Results

There are lots of well known and scientifically supported evidences of the use of crash helmets on which most countries drew their motivations from to enact laws on the use of helmets among

motorcyclists, car racers, horse riders, boxers and even among children on the field of play among others (USA National Highway Traffic Safety Administration (NHTSA), 2005;Ulmer & Northrup, 2005).

Just as the responding motorcyclists agreed that riding without helmets can be very dangerous and have reported that helmets can save lives in times of crash, scientific evidence supported the fact that, helmets decrease the severity of head injuries, the likelihood of death, and the overall cost of medical care. They are designed to cushion and protect riders' heads from the impact of a crash. Just like safety belts in cars, helmets cannot provide total protection against head injury or death, but they do reduce the incidence of both (Norvell & Cummings, 2002, National Highway Traffic Safety Administration, 2007).

Very few of the cyclists Concurred with the mandatory use of helmets and the enforcement of the use of helmets which was in sharp contrast with a 2000 motor vehicle occupant survey conducted by NHTSA, where (81 %) reported that they favoured mandatory helmet use laws for motorcyclists. However, in line with the current finding in USA, support is more prevalent among females (88 %) than males (72 %) and among non-motorcyclists (83 %) than those who drove motorcycles (51 %) (National Highway Traffic Safety Administration, 2000) and equally among the more educated than the less educated counterparts.

Helmet use laws do not only decreases the fatality associated with accidents but may lead to a decline in motorcycle thefts, possibly because some potential thieves do not have helmets, and not wearing a helmet would attract police notice. At the period where Texas enacted its universal

helmet law, motorcycle thefts in 19 Texas cities decreased by 44 % between 1988 and 1990, according to the Texas Department of Public Safety year. Motorcycle thefts dropped dramatically in three European countries after the introduction of laws that fined motorcyclists for failure to wear helmets. In London, motorcycle thefts fell (24 %) after Great Britain enacted a helmet law in 1973. The Netherlands saw a (36 %) drop in thefts in 1975 when its law was enacted. And in former West Germany, where on-the-spot fines were introduced in 1980, motorcycle thefts plummeted (60 %) (Mayhew, Clarke, & Elliott, 1989).

Despite the numerous advantages of laws on the mandatory use of helmets, most of the cyclists indicated several reasons why they do not use helmets regularly. The impeding of hearing and sight, neck injuries and for the fact that, there is a limit to the safety capabilities of helmets most especially where it is evidenced that, majority of the helmets in the Ghanaian markets do not meet required standards. Their stand was in line with claims that have been made that helmets increase the risk of neck injury and reduce peripheral vision and hearing, but there is no credible evidence to support these arguments. A study by Goldstein(1986) often is cited by helmet opponents as evidence that helmets cause neck injuries, allegedly by adding to head mass in a crash but more than a dozen studies have refuted the findings (Orsay, et al., 1994).

Several factors contribute to the occurrence, the frequency, and the fatality of accidents. In the current study, alcohol abuse, negative riding behaviours such as leaving the steer of the motorcycle while riding, fatigue, lack of education and training, faulty motorcycles and lack of concentration were the most common factors leading to accidents involving motorcycles.

Historical research into the causes of crashes suggested that road user errors were the predominant cause. The more recent approach of considering the road/vehicle/user system as a whole focuses more on the interactions between users and the physical elements of the system. Behavioural issues and human choices, however, remain critical, particularly with respect to aspects such as wearing seat belts and helmets, drinking and driving and speed.

In line with the current study, Boateng (2011) indicated that, poor eye sights driver and rider fatigue (dozing behind the steering wheel), drunkenness over-speeding, defective vehicles and motorcycles, overloading, poor roads and the non-existent road markings and signs are the major causes of motor accidents in Ghana. However, the educational and the training levels of cyclists which came up in the current study were not identified in findings of Boateng (2011).

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The final chapter presents the summary of findings based on empirical and analytical evidence from results presented in the previous chapter, draws conclusions and makes recommendations to promote the use of crash helmets among motorcyclists in the Brong Ahafo Region and in particular the Nsawkaw traditional area.

5.2 Summary of Findings

The following key findings emmerged from a careful analysis of the results presented in the previews chapter:

i. Most motorcycles plying the roads in the study area were neither tested by the appropriate authority nor were they insured and the motorcyclists themselves were not licensed riders.

ii. Alcoholism, negative riding behaviours such as leaving the steer of the motorcycle while riding, fatigue, lack of education and training, faulty motorcycles and lack of concentration were the most common factors leading to accidents involving motorcycles.

iii. Supernatural forces and the human and vehicular traffics were not listed among the most frequent causes of motorcycle accidents.

iv. Most motorcyclists exhibited poor knowledge about the rudiments of helmet use even though majority agreed that, riding without helmet can be very dangerous.

v. A high proportion of the motorcyclists believed that, there is no need to wear crash helmets when; riding slowly, when in a hurry or when riding beyond some speed limit which causes most of them not to use helmets regularly.

vi. The more educated and older respondents were most likely to use crash helmet more regularly than the less educated and younger riders. However, the more experienced riders tend to avoid the use of helmets.

vii. Women were found to be much more likely to regularly use helmets than their men counterparts.

viii. The motivation for the very few who use helmets regularly includes, the general safety and the protection helmets provide in times of crash or accidents, the fear to be caught by the police and the encouragement from their immediate families.

ix. Riders do not necessarily advice other riders on the use of helmets nor are there adverts, campaigns or government directives to promote the use of helmets and to prosecute flouters.

x. Peoples' refusal to use helmets is mostly fueled by the fact that, there are many fake helmets in the market whiles helmets were reported to have impediment on hearing and vision especially in times of rain, cause neck pain and loss of hair after prolonged use and generate too much heat that is often unbearable to motorcyclists.

5.3 Conclusions

This study sought to assess the use of motorcycle helmets in Nsawkaw in the Brong Ahafo Region of Ghana and examine the factors that affect the use of the motorcycle helmets.

A descriptive method was employed to examine the relationship between the motorcycle helmets use and a variety of factors affecting its use. The results indicated that the factors significantly contributing to the low usage of motorcycle helmets, include: lack of education and training, bad road and weather conditions, perception of discomforts in the use of motorcycle helmets, motorcyclists negative attitudes, lack of enforcement of the laws on helmet usage, fatigue and speeding with drugs and alcohol.

The study also examined the significant relationship between the motorcycle helmet use and factors such as accident, mortality rate, and economic cost and motorcyclists performance to ascertain whether the motorcycle helmet has made a significant impact on the lives of people in Nsawkaw and its surrounding areas.

5.4 Recommendations

Upon a critical analysis and discussion of the results the following are recommended to curb the challenges in the usage of helmets among motorcyclists in the study area and the country as a whole:

i. Educational campaigns and safe cycling courses should be targeted at adolescents with the educational content focussing on graphic, realistic consequences of motorcycle crashes and the effectiveness of helmets in preventing head injuries.

ii. Mandatory helmet legislation as a strategy to increase helmet use and promote motorcycle safety in the Brong Ahafo Region for al1 cyclists is clearly warranted whilst law enforcing agencies especially the police should ensure that riders put on crash helmets carry valid licenses and that the motorcycles are insured.

iii. A law should be enacted such that every motorcycle that is sold should be sold with at least two helmets, one for the rider and the other for a child pillion rider. It should also be mandatory that every child pillion rider should wear a helmet. The nation must protect children from their parents since they have not fully understood the personal responsibility of riding in front or at the back of a motorcycle without helmets.

iv. Governments at al1 levels have an important role to play in developing policies that encourage people to make healthy decisions but road safety cannot be the responsibility of government alone Non-Governmental Organisations and traditional authorities should help increase road safety awareness, especially on the use of crash helmets, since they could help with dissemination of information at the grass root levels.

v. Further research should be widened to other areas on Ghana and possibly the effect of speed ramps on riding motorcycles.

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APPENDICES

APPENDIX A:

QUESTIONNAIRE

Dear respondent, this questionnaire is designed with the aim of investigating the use of motorcycle helmets by motorcyclists in Nsawkaw. All information you give will be used for only academic purposes. Your identity will never be disclosed.

PLEASE DO NOT WRITE YOUR NAME (Please tick or provide a short answer)

SECTION A: DEMOGRAPHICS

1. Please indicate your gender.

[ ] male [ ] female

2. Please indicate your age range.

[ ] below 15 years [ ] 15 – 25 years [ ] 25-45 years

[ ] above 45 years

3. Educational level

[ ] No formal education [ ] Basic Education

[ ] SHS [ ] Tertiary education

[ ] University education

4. Do you have a valid motor vehicle driver's license?

[ ] Yes [ ] No

5. How long have you been riding with your motorcycle license?

[ ] 0 – 2 years [ ] 3 – 4 years

[ ] over 5 years

SECTION B

Motorcycle Certification, Licensing and Insurance

9. Do you have a license?
   [ ] Yes
   [ ] No

10. Have you passed a practical test on motorcycling by DVLA?
   [ ] Yes
   [ ] No

11. Have you insured your motorcycle?
[ ] Yes
[ ] No

Please thick **only one** option between 1 and 5 for each statement as applicable.

1 - Strongly disagree (SD) 2 – Disagree (D) 3 – Neutral (N) 4 – Agree (A)

5 – Strongly agree (SA)

To what extent do you agree or disagree with the following as causes of motorcycle accidents?

	Causes of motorcycle accidents	**SA**	**A**	**N**	**D**	**SD**
1.	Alcohol abuse	1	2	3	4	5
2.	Fatigue	1	2	3	4	5
3.	Negative riding behaviour	1	2	3	4	5
4.	Lack of education and training	1	2	3	4	5
5.	Antics during riding of motorcycle	1	2	3	4	5
6.	Lack of concentration	1	2	3	4	5
7.	Faulty Motorcycle	1	2	3	4	5
8.	Nature of road	1	2	3	4	5
9.	Unexplained supernatural forces	1	2	3	4	5
10.	Heavy human and vehicular traffic	1	2	3	4	5

SECTION C:

Please thick **only one** option between 1 and 5 for each statement as applicable.

1 - Strongly disagree (SD) 2 – Disagree (D) 3 – Neutral (N) 4 – Agree (A)

5 – Strongly agree (SA)

	VARIABLES	SD	D	N	A	SA
	The Use of Motorcycle Helmets by Owners or Riders in Nsawkaw					
14.	I enjoy the use of helmet	1	2	3	4	5
15.	It is always easy to control myself from riding at a speed that exceeds the speed limit when wearing a helmet.	1	2	3	4	5
16.	It is comfortable to wear the helmet while riding the motorcycle	1	2	3	4	5
17.	Riding without wearing helmet is dangerous	1	2	3	4	5
18.	In my opinion, one ought to wear a helmet when riding a motorcycle	1	2	3	4	5
19.	I have a helmet	1	2	3	4	5
20.	When I am in a hurry, I do not use a helmet	1	2	3	4	5
21.	Carrying the helmet before and after use is difficult	1	2	3	4	5
22.	Some people ridicule motorcyclists who wear helmet	1	2	3	4	5
23.	There is no need to wear a helmet when riding slowly	1	2	3	4	5
24.	If an accident occurs, I can maintain my balance so there is no need to wear a helmet	1	2	3	4	5
25.	Helmets do not have a suitable appearance and	1	2	3	4	5

	scent					
26.	It is easy to store and maintain helmets	1	2	3	4	5
27.	In quiet streets there is no need to wear a helmet	1	2	3	4	5
28.	It is enough when only the passenger wears the helmet.					
Factors that Enhances the Use of the Motorcycle Helmet						
29.	For safety purpose	1	2	3	4	5
30.	Encouragement by parents	1	2	3	4	5
31.	My actual desire speed makes me wear a helmet	1	2	3	4	5
32.	After hearing of "Use Helmet" campaign	1	2	3	4	5
33.	I fear to be caught by police while I ride without using the helmet	1	2	3	4	5
34.	Wearing of motorcycle helmet reduces motorcyclists risk of death	1	2	3	4	5
35.	After witnessing the death of a motorcyclist	1	2	3	4	5
36.	Helmet protects head if biker falls off a bike	1	2	3	4	5
37.	Helmet could save life	1	2	3	4	5
38.	Government directives that all cyclists wear helmets while riding motorcycles	1	2	3	4	5
39.	Cost of motorcycle helmets	1	2	3	4	5
40.	Advice from other cyclist	1	2	3	4	5
Factors Preventing the Use of Helmets						
41.	I have a feeling of suffocation when wearing the helmet	1	2	3	4	5
42.	It causes limitations in neck and head movement	1	2	3	4	5

43.	I feel heat on my head when wearing the helmet	1	2	3	4	5
44.	Wearing of motorcycle helmet reduces fatalities in accidents.	1	2	3	4	5
45.	The helmet causes neck pain which causes fatigue of riders	1	2	3	4	5
46.	The helmet is heavy and I don't use it for this reason	1	2	3	4	5
47.	Helmet messes the hair	1	2	3	4	5
48.	Helmet leads to restriction of vision	1	2	3	4	5
49.	People do not identify me in helmet	1	2	3	4	5
50.	Helmets provide the best protection from head injury for motorcyclist	1	2	3	4	5
51.	Wearing helmets make cyclists reckless in riding	1	2	3	4	5
52.	Wearing helmets enable cyclists speed on roads	1	2	3	4	5

APPENDIX B

TYPES OF CRASH HELMETS

(Source: WHO, 2006)