MOTORCYCLE CRASH: INJURIES PATTERN AND ASSOCIATED FACTORS AMONG PATIENTS TREATED AT MUHIMBILI ORTHOPAEDIC INSTITUTE (MOI).

Bryson Mcharo MD (Dar)

A dissertation submitted in partial fulfillment of the requirements for the award of the degree of Master of Medicine (Orthopaedic and Traumatology) of Muhimbili University of Health and Allied Sciences

Muhimbili University of Health and Allied Sciences

September, 2012

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CERTIFICATION

The under signed certifies that he has read and hereby recommend for acceptance by Muhimbili University of Health and Allied sciences a dissertation entitled:

Motorcycle Crash: Injuries pattern and associated factors among patients treated at Muhimbili Orthopaedic Institute (MOI) from March to September 2011. This is in partial fulfillment of the requirements for the degree of Master of Medicine (Orthopaedic and Traumatology) at Muhimbili University of Health and Allied Sciences.

……

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(Supervisor)

Date ……

DECLARATION AND COPYRIGHT

I, **Bryson Mcharo,** declare that this dissertation is my own original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award.

Signature ……

Date ……

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Last but not least, I thank my wife, Magreth (Dr), who showed her love and dedication by maintaining good quality of the house and caring for our two children Olympia and Ryan. Her presence made a happy life during some tiring moments during the preparation of this dissertation. Our children always made me laugh during the moments when I felt low and exhausted. I furthermore thank Almighty God for giving me good health throughout my study period and enabling me to complete this task.

DEDICATION

This dissertation is dedicated to my dear wife, Magreth and lovely children, Olympia and Ryan Bryson Mcharo for their love and currish. It is also dedicated to my parents, who always inspired me since my childhood to study medicine.

ABSTRACT

Road Traffic injuries are of major health problem. In recent years there has been an increase in motorcycling as means of transport in Dar es Salaam and Tanzania as whole. It is believed that motorcycle is also a source of employment and income to young people. This increase in motorcycling has been accompanied by an increase of motorcycle crash injuries. Despite the alarming increase of motorcycle crash injuries, little is known about the pattern of injuries and associated factors of motorcycle crash in the local setting. This study sought to identify the pattern and factors associated with motorcycle crash injuries among the victims treated at Muhimbili Orthopaedic Institute.

This was a descriptive cross sectional study involving motorcycle crash injury victims treated at the emergency department of MOI from 15th March, 2011 to 15th September, 2011. A structured questionnaire was used to collect the information from the study participants in a face to face interview. Data on demographic factors, injury patterns, use of helmet and license possession were recorded. The injuries were grouped according to anatomical location. Data were entered into the statistical package for social studies (SPSS) program (version 15) for clearing, coding and statistical analysis. P-value of 0.05 was considered significant.

In the period of six months a total of 2429 road traffic injury victims were treated at the emergency department of MOI out of who 886(36.5%) were motorcycle crash injury victims.

The study included 722 motorcycle crash injury victims, 625 (86.6%) were males and 97 (13.4%) females with a mean age of 33.9 years (SD=13.1), ranging from 13 to 90 years. Majority (65.0%) motorcycle crash injury victims were between the age of 20 and 40 years.

The extremity injuries 520 (72.0%) and head injuries 246 (34.1%) were the commonest injuries. The commonest musculoskeletal injury (66.8%) was fracture, with tibia-fibula fracture comprising the largest proportion (30.4%). There were 116 (16.1%) of motorcycle crash injury victims who sustained injury in more than one body regions. The collision between motorcycle and motor vehicle was the most frequently reported

collision (50.3%) followed by collision between motorcycle and pedestrian (27.4%). Helmet use was reported in only 44.9% of motorcycle crash injury victims including rider (61.8%) and passenger (12.6%). 49.9% of riders possessed license and its possession significantly influenced the use of helmet among riders

Motorcycle crash is major problem at Muhimbili Orthopaedic Institute Dar es Salaam and the majority of those who are involved in motorcycle crashes are youth. The majority of the injuries involved the extremity and head injuries. Riding license and use of helmet are still not widely used. And the collision between a motorcycle and motor vehicle was the most recorded.

Since motorcycle crashes are preventable and associated factors causing injuries are reducible necessary laws and restrictive regulations should be put in place. Also the educational programs on road safety should be implemented in primary schools.

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ABRIVIATIONS

ED	Emergency Department
ICU	Intensive Care Unit
MOI	Muhimbili Orthopaedic Institute
MUHAS	Muhimbili University of Health and Allied Sciences
RTC	Road Traffic crash
RTI	Road Traffic injury
MCI	Motorcycle crash injury
TRA	Tanzania Revenue Authority
BRI	Body region injury
GCS	Glasgow coma scale

CHAPTER ONE

1.1.0 INTRODUCTION

Road traffic injuries contribute significantly to the burden of disease and mortality throughout the world, but particularly in developing countries (1-3). Currently Road traffic injuries are ranked ninth globally among the leading causes of disability adjusted life years lost. It has been predicted that by 2020, they will rank as high as third among causes of disability adjusted life years (DALYs) lost (4) . Worldwide it is estimated that, 1.2 million people are killed in road crashes each year and as many as 50 million are injured(5). With increasing modernization in many developing countries, road traffic deaths are increasing and traffic deaths are projected to become the third most important health problem by 2020 (6-8).

The road traffic injury mortality rate is highest in Africa (28.3 per 100,000 population) when corrected for under-reporting, compared with 11.0 per 100,000 in Europe (4). Also the number of vehicles per inhabitant is still low in Africa: less than one licensed vehicle per 100 inhabitants in low-income Africa versus one licensed vehicle per 60 in high-income countries(4).

In Tanzania as socio-economic status changes, road traffic injuries are on the increase and are assuming greater importance as a cause of morbidity and mortality. It has also been observed that between 1990 and 2000 the number of road traffic crashes risen by 44% (9). In another study it was found that Road Traffic crash injuries were responsible of 56% of all patients admitted to Muhimbili National hospital (10). Further study reported motor traffic crash to be the leading cause of fatal injuries accounting for 41% of all deaths (11).

Formally road traffic injuries were the leading cause of permanent disability and mortality among those in productive age in developed countries but currently the developing countries are also faced by a similar challenge as they undergo what has been termed as the “epidemiology of transition”(12). The majority of those injured in road traffic crashes in developing countries are pedestrians, cyclists and motorized two-

wheel riders (2). While the population groups exposed to the highest risks of injury and death from road traffic crashes are those from lower socioeconomic groups (13, 14).

It has been observed that recently all over the world, motorcycle collisions account for a considerable rate of morbidity and mortality due to road traffic crashes (15-17). In America for instance resent literature reported that more people than ever are purchasing motorcycles, particularly more middle-aged men (18). Motorcycle is a most dangerous mode of transportation than automobile because there is no structure to protect the rider during a crash. When compared as per mile traveled it was realized that drivers are 21 times more likely to be killed on a motorcycle than in an automobile (18).

The increase of Motorcycle crash has been reported in a number of African countries. In Nigeria for instance motorcycle crashes were responsible for 54% of all injuries seen in one teaching Hospital (19). While in Uganda motorcycle crashes were responsible for 25% of all RTI seen at Mulago Teaching Hospital (20).

In developed countries motorcycling is for fun, sports and outing. However in African countries including Tanzania motorcycle is used as means of public transport and as a form of employment for youth (20, 21). The youth are using their motorcycles as makeshift taxis, often without licenses or personal protection (15). This coupled with poor road conditions has created a perfect environment for motorcycle related trauma.

It is estimated that 3.4% of the country's Gross Domestic Products is lost as a result of Road Traffic crashes in Tanzania (22). The total number of registered vehicles in 2011 in Tanzania was 977,468 of which motorized two and three wheeled vehicles were 451,304 (46.2%) (23). In year 2010 road traffic crashes were responsible for the death of 3,582 RTI victims (Males 2,758 and females 824); of which 657 (18.3%) were due to motorcycle crashes (24).

The increase of motorcycles use is probably due to the fact that motorcycles are affordable in terms of price than are motor vehicles. On the other hand its popularity could be due to their ability to maneuver heavy traffic jam and navigate on poor roads in the country side (20, 21).

This increase use of motorcycles in the country will definitely result into motorcycle crash injuries. For instance in the year 2010 the motorcycle crash injuries were responsible for 30.8% of all road traffic injuries treated at the emergency department (25).

1.2.0 LITERATURE REVIEW

Several studies have shown the proportion of motorcycle crash among road traffic injuries to be between 15 and 27% (20, 21, 26, 27). However, a study done in Singapore and Vietnam reported higher proportion of motorcycle crash of 49.1% and 62% respectively (13, 28). Madubuze and Labinjo both from Nigeria also reported higher proportion of motorcycle crash of 54% (19, 29)

It has been observed from many different studies within and outside Africa that the majority of motorcycle crash victims are those at a productive age with males being more involved. Both in developing and developed countries, the peak age for motorcycle related injury is the late teens and early to late 20s and males are more affected than females (15, 17, 20, 21, 26, 30). Tham, K Y et al reported that the majority of motorcycle crashes injury victims had the mean age of 32.5 years (SD 13.1) and (96.1%) of them being male (28).

In Finland it was reported that 40% of injured motorcycle riders were between 16-18 years old (31). The reason being in Finland at the age of 16 they are allowed to ride motorcycles with engine capacity of 125cc whereas in other countries they are not allowed.

In looking at the socioeconomic pattern of riders aged 17-19 years, the rate of injury (both minor and severe) in lower income groups was 2.5 times greater than for those in higher socio-economic groups (32). In Uganda it was observed that the majority of motorcycle crash injury victims were self-employed individuals (20).

More recent studies show higher proportions (41 to 62%) of those who are involved in motorcycle crash injuries to be riders followed by pedestrians (20, 21, 26, 33). Riders involved in road traffic crashes are likely to be seriously disadvantaged by the lack of available safety equipment such as seat belts, lower limb protectors and air bags. And due to the nature of the crashes, trauma to the exposed extremity and head account for a significant proportion of these injuries (17, 30, 34-36).

Lower extremity injuries, which affect 32% to 80% of injured riders, are the most common outcomes of nonfatal motorcycle crashes (20, 28, 33, 36-39). And the commonest extremities injuries were fractures with tibia and fibula fractures on the lead (20, 39).

Therefore it is possible that injuries resulting from motorcycle crashes are likely to have a certain pattern which may differ from place to place, country to country due to human, environmental and motorcycle factors.

In another study it was found that head injury (40.1%) was the most frequently occurring injury followed closely by extremity injuries (38.1%) (38). More studies support the fact that in motorcycle crash most injuries occur in the lower extremity with the lower leg most often affected followed by knee and femur (15, 16, 26, 40, 41). In contrary study done in Jamaica observed much higher proportion (48.8%) of head injury occurrences.

In the previous studies it was found that during motorcycle crash there are possibilities of more than one body region being injured (17, 20). However it was observed that for those with injury in more than one body regions, lower limb injuries were rarely associated with head injuries (17).

From safety perspective a helmet is the most important part of a motorcycle. Its use has been shown to have a 72% effectiveness in reducing the incidence of head injuries on a crash (42). It has been shown that an unprotected rider is 40% more likely to die in a crash than a rider who is wearing a helmet (43). In Taiwan, after introducing a law which required mandatory wearing of helmet for the riders and their passengers the motorcycle crash fatalities decreased by 14% and head injury fatalities by 22% (44).

However, like most active interventions, full benefit or protection is dependent on many parameters including use rates, whether standard or approved devices are used and how they are used.

Despite the fact that the use of helmet has shown benefits in reducing the incidence of head injuries it has not been widely used. For example studies done in Uganda, Nigeria,

Sudan and Tehran observed very low rate of using of helmet among motorcycle users (15, 26, 33, 45).

In Jamaica, although the road traffic act mandates motorcycle riders to wear approved helmets still it was found that only 34.3% of motorcycle crash injury victims wore a helmet at the time of a collision (30). On the other hand it was found that in California as many as 48% of observed motorcyclists used nonstandard helmets as a result, head injuries were found to be more frequent and of greater severity among those wearing nonstandard helmets than among those wearing standard helmets or even those wearing no helmets at all (46).

There are five types of motorcycle collision named motorcycle and motor vehicle, motorcycle and motorcycle, motorcycle and pedestrian, lone motorcycle and motorcycle and stationary objects. Of these mechanisms the collision between a motorcycle and motor vehicle is the commonest reported (41-72.3%) (20, 21, 26, 40).

1.3.0 PROBLEM STATEMENT

Motorcycle related trauma is and remains a major cause of morbidity and mortality in those of productive age in developing world (21). Tanzania being one of the developing countries is also expected to experience the motorcycle crashes epidemic. Injuries and death from road traffic crash are expected to increase if no preventive measures are made (4). The observed increase in number of registered motorcycles in Tanzania is also expected to reflect the increase trend of motorcycle crash injuries (23). At Muhimbili Orthopaedic Institute (MOI) motorcycle crash injuries are common and will probably increase in the feature. For instance in the year 2010 motorcycle crash injuries were responsible for 30.8% of the road traffic injuries seen at emergency department of Muhimbili Orthopaedic Institute (25).

Most of road traffic crash victims including motorcycle crash victims end up at Muhimbili Orthopaedic Institute for treatment on emergency bases or for definitive treatment. This is so because MOI is the center in the country offering best Orthopaedic and Trauma services. A growing number of motorcycle crash as reported by police and other local source is expected to change the pattern of injuries and hence influence the treatment in future. So far this information has not been documented in Muhimbili Orthopaedic Institute.

1.4.0 RATIONALE

There is no published data or previous studies on the pattern of motorcycle injuries from motorcycle crash associated factors in the country. The purpose of this study therefore was to describe the epidemiology of motorcycle crash; injuries pattern and associated factors among motorcycle crash victims treated at emergency department of Muhimbili Orthopaedic Institute. The study was done for a period of six months, aiming at showing the magnitude of motorcycle crash injuries at Muhimbili Orthopaedic Institute and hence helps in identifying potential areas for intervention to reduce morbidity and mortality rate from motorcycle crash.

The information will also be useful in developing a protocol for management of motorcycle crash victim before and after reaching health facilities. Also the information provided by this study may be indeed useful in the public awareness campaigns and road safety use programs. The study is equally expected to help in recognizing the role and importance of associated factors in motorcycle crashes.

1.5.0 OBJECTIVES

1.5.1Broad objectives:

To evaluate injury pattern and associated factors among patients treated at the Emergency Department (ED) of Muhimbili Orthopaedic Institute (MOI) following motorcycle crashes.

1.5.2 Specific objectives

1. To determine the proportion of motorcycle crash victims among road traffic crash patients treated at the emergency department of MOI between March 2011 and September 2011.
2. To determine the demographic factors of Motorcycle crash victims attended at the emergency department of MOI between March and September 2011.
3. To determine injuries by body region sustained by motorcycle crash victims between March 2011 and September 2011.
4. To identify the risk factors associated with injuries among motorcycle crash victims attended at emergency department of MOI between March 2011 and September 2011.

CHAPTER TWO

2.0.0 METHODOLOGY

2.1.0 Study design:

This was a hospital based descriptive cross-sectional study done at Muhimbili Orthopedic Institute emergency department.

2.2.0 Study area/period

The study was carried out at the emergency department of Muhimbili Orthopaedic Institute from 15th March to 15th September 2011. Muhimbili Orthopaedic Institute has a bed capacity of 165 beds and is the only tertiary hospital offering trauma, orthopaedic and neurosurgical services in Dar es Salaam and neighboring regions (Pwani, Morogoro and Tanga). It is the main referral center for patients from Dar es Salaam City and the whole country. These patients are either referred from regional hospitals or self referred. They either reach Muhimbili Orthopedic Institute through emergency medicine department of Muhimbili National Hospital or brought in by relatives/friends/good Samaritans and sometimes they do come to Muhimbili Orthopaedic Institute directly.

2.3.0 Study population

The study population comprised of motorcycle crash victims aged 13yrs and above who presented at the emergency department of Muhimbili Orthopaedic Institute between March 2011 and September 2011.

2.4.0 Inclusion criteria

All motorcycle crash victims aged 13 years and above treated at Muhimbili Orthopaedic Institute in the course of this study.

Motorcycle crash victims who came unconscious were also enrolled in this study after obtained consent from their relative or from themselves after gaining conscious either in ICU or in the ward.

2.5.0 Exclusion criteria; Patient who refused to consent and patient who was below 13yrs old.

2.6.0 Sample size estimation

The proportion 25% (22) was used in calculating the sample size using the following formula.

$N = Z^2p\ (1-p)/E^2$

Where N is sample size

Z= 1.96 at 95% confidence interval

P= proportion of motorcycle crash injury victims which is 25%

E= is the margin error rate 5%

Substituting these values to the equation above; $N= 1.96^2 \times 0.25(0.75)/ (O.05)^2$;

N will be **289** motorcycle crash victims. Plus 10% to increase the internal validity of study got sample size of 318. Therefore minimum sample size was 318 motorcycle crash victims treated at Muhimbili Orthopaedic Institute in the period of 15th March to 15th September 2011.

722 motorcycle crash injury victims treated at emergency department of Muhimbili Orthopaedic Institute from 15th March to 15th September 2011, who fulfilled the eligible criteria set in this study, were enrolled.

2.7.0 Measurement and data source

2.7.1 Research instruments

Standard structured Questionnaire was used in a face-to-face interview. Pre-test of questionnaire was done two weeks before the beginning of this study. There was one Nurse at emergency department who notified the researcher when a motorcycle crash victim arrived. One trained researcher assistant was needed for interviewing patients and data entry. The x-ray films for musculoskeletal injury were done at MOI as per institute protocol. The interpretations and recording of x ray films was done by author.

2.7.2 Data collection tools and technique

Data were collected using a standard structured questionnaire. Information collected included motorcycle crash victim's demographic information, status (whether rider, passenger, pedestrian) and type of collision. The pre hospital transport by relatives, police, and the rider who caused crash or nurse from other hospital was recorded. Other parameters that were recorded are time interval between crash and arrival at emergency department of Muhimbili Orthopaedic Institute, body region injured, possession of driving license and duration since its first offer, duration since started riding motorcycle, use of helmet, type of road and if he/she drank alcohol.

Diagnosis was reached through clinical history, examination and radiological investigations (e.g. x ray). Topographic locations of injuries were then entered in the structured questionnaire.

Also the information about diagnosis, registration number was retrieved from patient's file and admission register books. Death of motorcycle crash victim which occurred in hospital either at the emergency department, intensive care unit or in the ward was also recorded.

Injuries were classified as head injury (severe; GCS$\leq$ 8, moderate; GCS= 9 to 13 and mild $\geq$14), spine injury (cervical, thoracic and lumber sacral), chest injury (rib fractures, pneumothorax and haemothorax, lung contusion), abdominal injury and extremity

injuries (fractures, dislocation and soft tissue injuries). The extremity injuries were further divided into injuries of the upper and lower limbs. Dislocation of joints, sprains and soft tissue injuries (tendon injuries, lacerations, abrasions and contusions) were also recorded.

2.8.0 Data processing and analysis

The filled questionnaires were checked for quality, coded and entered into Statistical Package for Social Studies (SPSS) program (version 15). Frequency distributions were used to describe categorical variables, and means and standard deviation for continuous variables. Chi-square was used to test for association of categorical variables. P-value of 0.05 was considered significant.

2.9.0 Ethical issues

The proposal was cleared by the Muhimbili University of Health and Allied Sciences ethical clearance board before the study was conducted. Written informed consent was obtained from all eligible participants after being informed of the aims of the study. The parents or relatives were asked to consent on behalf of the unconscious or those below 18 years of age. Confidentiality was assured and the information was only used for the purpose intended by the study. Only the researcher and assistant could access the data. Patients were informed that their refusal to participate could not affect their management in-anyway. Critically injured patients with inability to recall the past events were still enrolled in the study and interviewed after recovery or their relatives were asked to give the missing information.

CHAPTER THREE

3.1.0 RESULTS

Table 1 shows the distribution of road traffic injuries by mode of transport used. Motorcycle injuries accounted for more than quarter (36.5%) of the victims. The riders and pedestrians were injured in 46.4% and 29.4% respectively of "motorcycle crashes" (Table 2).

Table 1: The road traffic injuries attended at the emergency department of MOI.

Cause	Total number	Percentage (%)
Motor vehicles	1504	61.1
Motorcycles(2and3) wheels	886	36.5
Bicycles	39	1.6
Total	2429	100

There were 97 (13.4%) females and 625 (86.6%) males. The age of motorcycle crash injury victims ranged from 13 to 90 years with a mean age of 33.9 years (SD=13.1). The majority of the victims (66.6%) were aged between 21 and 40 years (Table 1 and Figure 1).

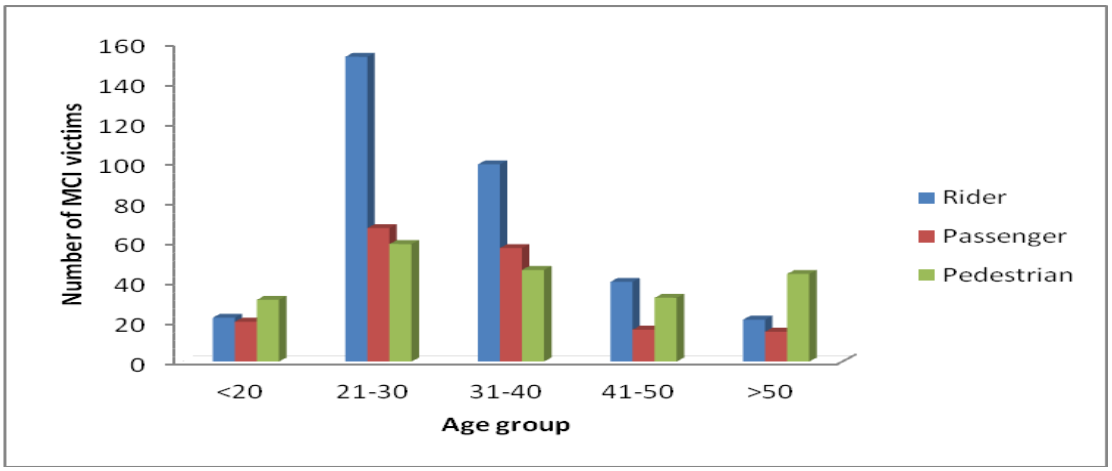


Figure 1: Distribution of the age groups among motorcycle crash injury victims.

Table 2: The Socio-demographic characteristics of the motorcycle crash injury victims.

Characteristic		n(= 722)	Percentage (%)
	≤ 20	73	10.1
	21-30	279	38.6
Age	31-40	202	28.0
	41-50	88	12.2
	>50	80	11.1
	Male	625	86.6
Sex	Female	97	13.4
	Employed	112	15.5
	Student	53	7.3
Occupation	Self employed	557	77.2
	None	22	3.0
	Primary	472	65.4
Education	Secondary	177	24.5
	other training	51	7.1
Status of the	Rider	335	46.4
victim	Passenger	175	24.2
	Pedestrian	212	29.4
Residence	Dar es Salaam	529	73.3
	Other regions	193	26.7
Total		722	100.00

Table 3: Distribution of injuries by body regions among motorcycle crash injury victims.

Type of injury	Total number	Percentage of total (n=722) (%)
Lower extremity	417	57.8
Upper extremity	103	14.3
Head	246	34.1
Chest	12	1.7
Pelvis	26	3.6
Spine	17	2.4
Abdomen	4	0.6
Soft tissue injuries	241	33.4
> one body region injuries	116	16.1

Note: one person could be affected in more than one region. Soft tissue injuries (abrasions, lacerations, sprain, contusions and Tendon)

As regards the anatomical location of injuries, injuries to the extremities were the commonest (72.0%), followed by head injury (34.1%) (Table: 3).

The commonest musculoskeletal injury was bone fractures (66.8%), with tibia and fibula fractures being predominant (30.4%) (Figure: 2). There were more cases of closed fractures 64.9% (n=479) than open fractures. More than half of all tibia and fibula fractures (50.9%) were open fractures.

Twenty five patients (3.5%) suffered dislocation with the commonest site being the shoulder (16) followed by the hip (3), knee (2), elbow (2), ankle (1) and inter-vertebral joint (1).

Fifty eight percent of the victims' sustained injury to the right side followed by 39% left side and 3% on both sides.

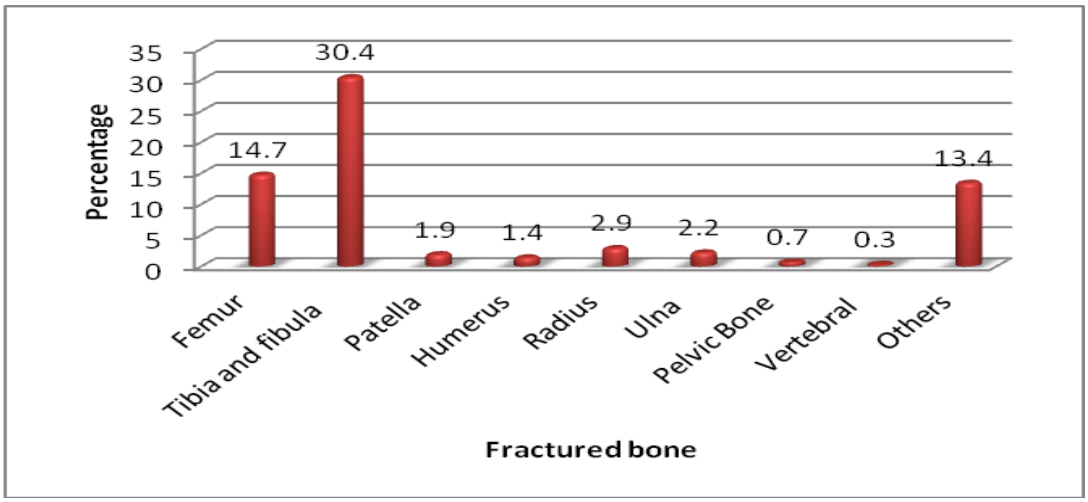


Figure 2: Distribution of musculoskeletal injuries (bone fractures).

Figure 3 below shows type of collisions that resulted into motorcycle crash injuries. 84.1% of the motorcycle crashes occurred on the tarmac roads.

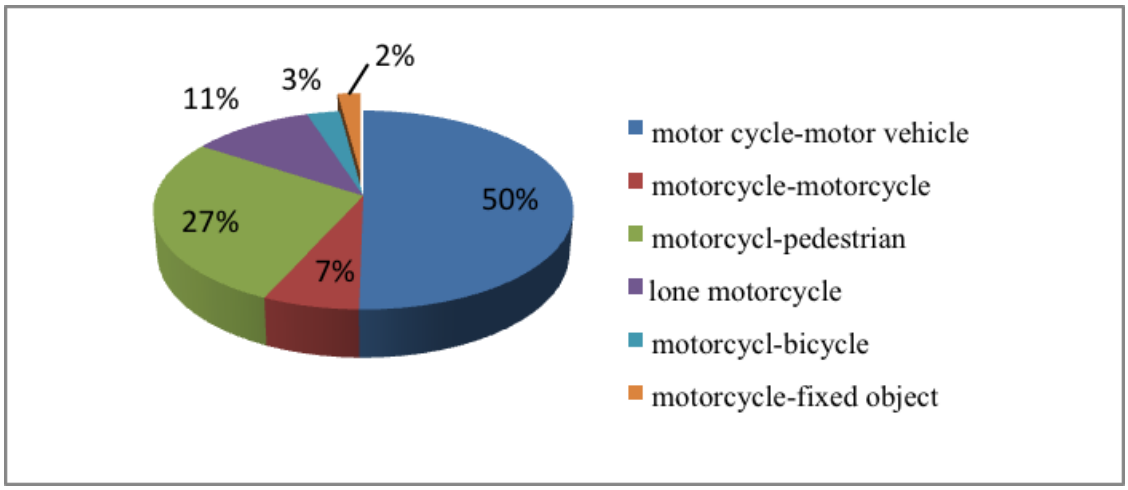


Figure 3: Mechanism of motorcycle crash.

Table 4: Association of helmet use and possession of riding license among riders.

Driving license	Non Helmeted	Helmeted	Total
With License	38(22.8%)	129(77.2%)	167
Without license	90(53.6%)	78(46.4%)	168
Total	128(38.2%)	207(61.8%)	335

49.9% of riders had license and twice as many licensed riders had helmets on as compared to non-licensed riders (x^2= 36.688, p< 0.001). Also a significant large proportion (51.8%) of head injuries occurred among riders without license compared to those who were possessing license (28.1%) (X^2 = 19.505, p < 0.001).

The majority of the riders (40.0%) were riding their own motorcycle, 29.0% employed as riders for commercial purpose whereas 23.0% and 8.0% of the riders were riding borrowed and family motorcycles respectively during the crash.

46.7% of riders were involved in motorcycle crash without having passenger whereas 48.9% and 4.4% of the riders had one passenger and more than one passenger respectively during the crash.

The rate of using helmet among riders and passengers was recorded in 44.9% with significant large proportion of riders (61.8%) wearing helmet at the time of crash compared to passengers (12.6%) (X^2 = 112.56, P= 0.001).

Table 5: An association between head injury occurrence and use of helmet

Helmet Use	No head injury	Head Injury	Total
Non Helmeted	158(56.2%)	123(43.8%)	281
Helmeted	174(76.0%)	55(24.0%)	229
Total	332(65.1%)	178(34.9%)	510

Larger proportion of head injuries occurred among individuals who did not wear a helmet (x^2= 21.672, p < 0.001).

72.0% of the motorcycle crashes occurred during daytime and 28.0% during night hours. Of those which occurred in the daytime majority (40.0%) occurred between 12.00 hours and 19.00 hours and those which occurring at night hours 26.0% occurred between 19.00hours and midnight.

The majority of motorcycle crash victims arrived at the ED of MOI within 12hr after injury (1-6hrs = 30.6% and 6-12hrs = 48.1%) followed by 17.9% of those arrived in more than 24hrs after injury and very few arrived at an interval of 12 to 24 hrs (3.5%) after injury.

Sixty percentage of the motorcycle crash injury victims were admitted in the ward and 34.5% of them needed emergency surgical intervention. 3.5% motorcycle crash injury victims needed intensive care unit admission and 5.5% of the motorcycle crash injury victims died in hospital either at the emergency department, intensive care unit or in the ward. Of those who died 65.0% had head injury.

Alcohol intake at the time of motorcycle crash was reported in 55(7.6%) individuals of whom 22 (6.9%) were riders, 11(6.3%) passengers and 21(9.9%) pedestrians.

Majority of riders had crash on motorcycles equipped with engine size ranging between 101 and 150 cc (84.0%) followed by 151 and 250cc (16%).

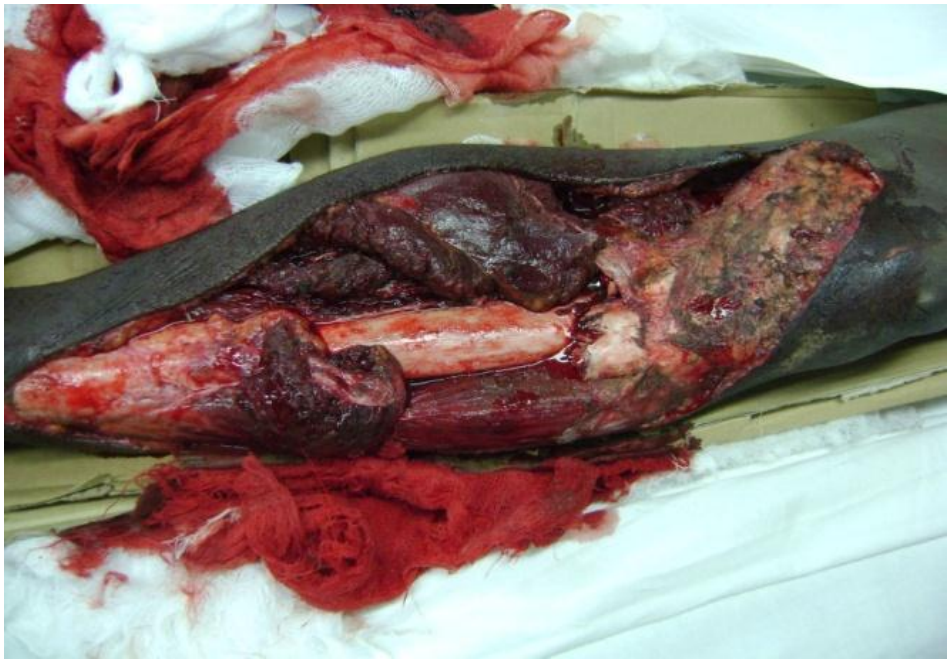
Most of the motorcycles were used for commercial purposes (55%) followed by private uses (34%).

3.1.0 ILLUSTRATIONS

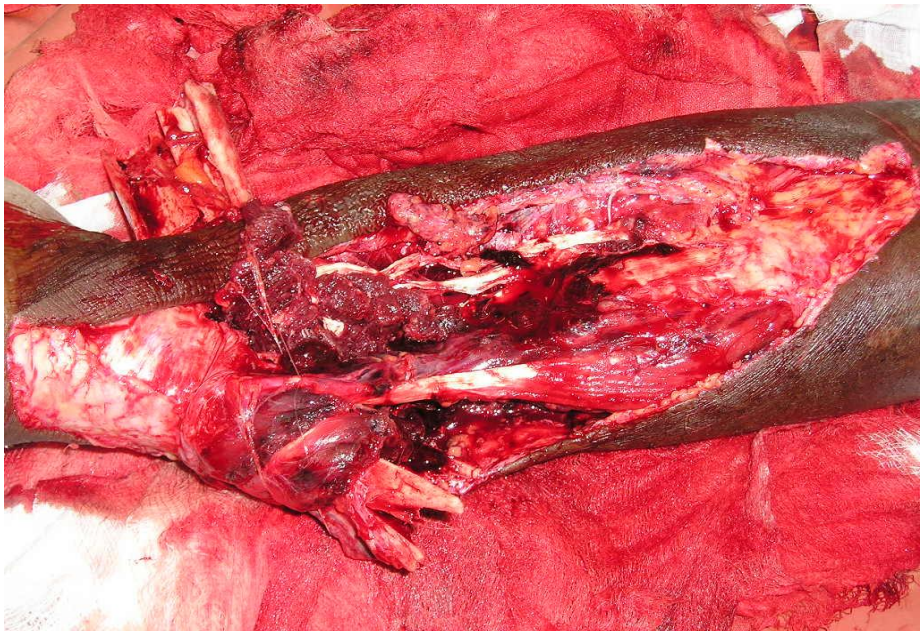
The photographs below show photos of the commonest injuries sustained by motorcycle crash injuries victims who were treated at MOI between March and September 2011.



Photograph A: Traumatic amputation of distal leg following motorcycle crash.



Photograph B: An open fracture of tibia and fibula with severe soft tissue injuries.



Photograph C: Severely communuted open fracture of tibia and fibula



Photograph D: Crashed hand



Photograph E: segmental fracture of the femur (pertrochenteric fracture and middle of the shaft fracture).

CHAPTER FOUR

4.1.0 DISCUSSION

Although Dar es Salaam is becoming a highly urbanized city the infrastructures have not kept pace. Dar es Salaam is the major commercial, administrative and industrial centre of Tanzania with a large number of registered motor vehicles. The city has no sufficient transport system and the majority of the roads are of poor surface conditions caused partly by lack of maintenance. Dar es Salaam has a land area of 1800 square kilometers with a population of approximately five million (47). There has been a lot of alarming information about increasing motorcycle crashes in De res Salaam and all over the country (24, 25).

In this study the proportion of motorcycle crash injuries among road traffic injuries was found to be higher (36.5%) than reported by authors elsewhere (20, 21, 26, 27). They found that the proportion of motorcycle crash injury was ranging between15 and 27%. But these findings are much lower than the 49.1% and 62.0% which was reported in Singapore and Vietnam respectively (13, 28). These differences can be explained by motorcycle crash associated factors within the regions where these studies were conducted e.g. Human and environmental factors.

The majority of motorcycle crash injury victims were of the age between 21 and 30 years (45.7%). This is similar to other studies where the majority of patients involved in motorcycle crash were aged between 20 and 29 years (25-40%) (20, 21, 30). In contrary two studies done elsewhere reported the majority of motorcycle crash injury victims (40% to 50%) to be less than age of 20 years (31, 40). The reason why the youth (at the age of 20 - 40 years) are involved in motorcycle could be explained by the fact that at this age group majorities are engaged in productive activities that require them to move fast enough from one area to another and in so doing are predisposed to risks of being involved in road traffic crashes.

86.6% of motorcycle crash injury victims were male. None of the female victims were riding a motorcycle at the time of the crash. Similar findings have been reported

elsewhere (15, 17, 20, 26, 28, 40). This could be explained by the fact that there are more male riders than female.

In this study the majority (46.7%) of motorcycle crash injuries were found to be riders. Similar findings were reported elsewhere where they found that 41.0% to 62.0% of motorcycle crash injury victims were riders (15, 20, 21, 26, 33). This shows that the riders constitute the majority of motorcycle crash injury victims reporting to hospitals. Therefore this particular group requires a special attention when planning strategies to prevent motorcycle crashes.

In the present study the majority had attained primary education level (65.4%) and 77.2% were self-employed. In Uganda it was also found that 54.7% of motorcycle crash injury victims were self employed (20). This group of people probably can't afford private transport and so depend much on public transport and walking. It has been found that the level of education as an indicator of socioeconomic status, could reflect the type of transport one chooses; for example people with no schooling relied more on walking and public transport (13).

In this study the extremities were the commonest body regions injured (72%) followed by head injuries (34.1%). This is in agreement with the previous findings elsewhere (15, 17, 20, 33, 36, 41).The vulnerability of the extremities in particular the lower limbs could be due to a number of factors such as anatomical location, lack of protectors on the extremity and poor assembly of rear wheel . In this study as with other studies from elsewhere the commonest lower limb injuries were found to be fractures of tibia and fibula (17, 20, 26, 36, 39, 48).

In the present study it was also found that 16% of the motorcycle crash victims sustained injuries to more than one anatomic region (system) with large proportion of victims having extremities and head injuries. In Singapore they observed much small proportion of motorcycle crash injury victims with injury to more than one body regions and also lower limb injuries were rarely associated with the head injury (17). These differences can be due to the fact that the rates of using helmets in Singapore were much higher than

those observed in this study. The occurrence of injury in more than one body region shows the severity of injuries that are resulting from motorcycle crash.

This current study had a mortality rate of 5.5% and the majority of those who died were severe head injury and poly-trauma motorcycle crash injury victims. However the mortality observed in this study was lower than what has been recorded by the Tanzania police (24). This difference probability explains the probability of more motorcycle crash injury victims dying before arriving at health facilities. Three motorcycle crash injury victims had amputation of the extremities following motorcycle crash. One of them had traumatic amputation above elbow, head injury and chest injury. The other two each had crashed leg at the level below the knee joint and they were all amputated below the knee joint.

Motorcycle and motor-vehicles collision accounted for 50.3% of the motorcycle crashes reported. This is similar to the findings that were reported elsewhere where up to 64.0% of motorcycle collision were due to motorcycle and motor-vehicle collision (17, 20, 40). This shows that probably co-operation, awareness and concern for others and good riding and driving habits are essentials among all road users. The study also found that the pedestrian (27.4%) remains a vulnerable group to motorcycle crash similar to what has been reported elsewhere (15, 20, 21).

Most of the motorcycle crashes (84%) occurred on the tarmac road. Likewise in Sudan70.2% of motorcycle crash occurred on main paved road in central Juba (15). The motorcycles crashes on the tarmac road probably because of higher traffic density as the paved/tarmac roads are the main thoroughfare for the city. The smoothness of the road may make riders ride with less caution. It is also possible that the straight roads allow riders to attain a higher speeds making easier for them to crash.

Most of the motorcycle crashes were reported to occur during day time with peak in the afternoon similar to what has been reported elsewhere(15, 49). In Dar es Salaam traffic is very busy early in the morning, lunch and evening time. The reason being residents are moving to and from work and at the same time students are also rushing to and from school. Also in the service road and sidewalks are clogged with the street vendors

displaying their merchandize at a point forcing pedestrians to walk on roads and motorcycles to ride in between motor vehicles.

In the present study the majority of riders were crashed when they are alone or carrying one passenger. This might be so because majority of riders are doing business. Their wish is to ride faster so as reach the passenger's destination and get back quickly to their waiting places in order to get another passenger. And by doing so they might put themselves into risk of being involved in a crash.

From a safety perspective a helmet is the most important part of a motorcycle. Its use has been shown to be 72% effective at reducing the incidence of head injuries (42). The use of a helmet in this study was recorded in 44.9% of motorcycle crash injury victims with a significant proportion of riders wearing a helmet at the time of the crash. These findings are higher than what has been reported by authors elsewhere (15, 20, 26, 30, 33). However this was much lower than in Singapore where 100% helmet use has been documented (17). In this study a larger proportion of head injuries significantly occurred among individuals who did not use a helmet. Hence helmet use was a highly significant protective factor against head injury. It was also found that the possession of license has influence on using a helmet among riders. The rate of helmet use among passengers involved in motorcycle crash was very low compared to the riders. These differences in the rate of helmet use shown above could be due to existing differences in the setting of the study. But known practical problems are acceptability, size, availability and sharing of helmet among passengers.

In the present study about 50.1% of riders did not possess a riding license, close to 46.5% which were reported in Juba, Sudan, (15). Also those without riding licenses were significantly likely to suffer head injury. Normally the License is given to qualified individuals after attending pre riding courses and tested by the traffic police. Therefore this finding show that majority of the riders do not have enough experience required before engaging in riding of a motorcycle.

The majority (48.1%) of the motorcycle crash victims arrived at emergency department of Muhimbili Orthopaedic Institute between 6hrs and 12hrs of injuries which was later

than reported elsewhere (21). However the present study is unique in the sense that its environmental setting unlike the other reported study does not have an established infrastructure to support emergency evacuation such as paramedic, 1st level, 2nd level and 3rd level trauma centre.

Due to economic hardship the youth are probably buying motorcycles for public transport business in order to earn living.

In this study the majority of motorcycle crash victims (54.9%) had crashes on commercial motorcycles. Likewise in Uganda and Nigeria they found large proportion of motorcycle crashes to occur on commercial motorcycles (20, 21). This prominence is an area of important socio-economic development that requires proper measures to prevent crashes resulting from motorcycle crashes.

CHAPTER FIVE

5.1.0 Conclusion

Motorcycle crash is a major cause of road traffic injury among victims attended at MOI and was the second to motor vehicle crashes. The youth, self employed and individuals with primary school education were the commonest involved in a motorcycle crashes. The riders and pedestrians were commonly injured in motorcycle crashes.

The majority of the injuries involved the extremity and head. Tibia and fibula fractures were the commonest musculoskeletal injuries recorded. Injury to more than one system was also common.

Larger proportion of the riders didn't possess the riding license. The helmet was still not widely used. Motorcycle and motor vehicle collision was the commonest recoded mode of crash accounting for majority of the injuries.

5.2.0 Recommendations

As a safety measures to motorcycle users the following measures are suggested.

- Strict enforcement of road laws
    a. That instructs the riders to undergo comprehensive pre-riding course and be tested by traffic police before possessing a riding license.
    b. That instructs the use of helmet during riding
- There is need of teaching the subject of Road safety and use in primary school since majority of the individuals ends up with primary education.
- Further studies are needed to establish
    - The role of using motorcycle in public transport
    - The mechanisms of motorcycle crashes and ways they can be prevented.
    - Why helmet has not been widely used despite the fact that it has been proven effective in reducing morbidity and mortality resulting from motorcycle crashes.

5.3.0 STUDY LIMITATIONS

This study was done in one hospital and data were collected over a period of time so the findings may fail to reflect the true picture of motorcycle crashes; injuries pattern and associated factors in Tanzania. The study also fails to establish the causality of motorcycle crashes.

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APPENDIX ONE

QUESTIONNARE

MOTORCYCLE CRASH: INJURIES PATTERN AND ASSOCIATED FACTORS AMONG PATIENTS TREATED AT MUHIMBILI ORTHOPAEDIC INSTITUTE-2011.

Patient's Demographic Factor **Reg. No……/S. No……..**

1. Age of the patient ……..
2. Sex 1. Male 2. Female
3. Level of Education
    1. Not attended
    2. Primary education
    3. Secondary education
    4. University/college education
    5. Other trainings
    6. Not known
4. Occupation
    1. Employed
    2. University student
    3. Secondary school student
    4. Pupil (primary)
    5. Business man/women
    6. Petty business
    7. Driver
    8. Peasant
    9. others
5. Place of Residence: District ……/Township…….

6. Place of crash: District ……../Town……

7. When did crash happen? A: Date…. /…. /….

B: Time: 1. Day Time a) Morning b) afternoon

2. Night Time a) before mid night b) mid night to 5am

8. Patient's status**:**

1. Rider/Driver (Go to Q.9)
2. Passenger (Go to Qn13)
3. Pedestrian (Go to Q 18

RIDER EXPERIENCE

9. Do you have Driving license? 1. Yes 2. No (ans Qn 11).

10. Duration since first issue to date of injury?

1. 0-3 month
2. 4-7 month
3. 8-12 month
4. >1 year
5. >2 year

11. How long have you bee driving?

1. 0-3 Month
2. 4-7 month
3. 8-12 month
4. >1 year
5. >2 years

12. Type of motorcycle: 1. Mark ……2. Country of origin ……

13. The Use of Motorcycle: 1. Commercial 2.Private use 3. Company 4. Not known

14. Engine size of motorcycle(cc)
    1. 50-100
    2. 100-150
    3. 150-200
    4. 200-250
    5. Not known
15. Motorcycle Ownership:
    1. Owner
    2. Employed/driver
    3. Hire/borrowed
    4. Family
16. Number of Victims involved per motorcycle (state if any died at injury site)
    a. 0
    b. 1
    c. 2
    d. 3
    e. 4
    f. >4
17. Helmet usage 1.Yes 2. No
    1. full face
    2. Half face Helmet
    3. Other protection
    4. No protection at all
18. Alcohol use
    1. Suspected (by report or observation/confirmed by blood test) (Concentration…..)
    2. No information available (Not taken at all)
19. Type of the road where crash took place
    1. Paved
    2. Tarmac
    3. Foot path
    4. Zebra cross
    5. Gravel
    6. Street road
    7. Traffic light jct.
    8. Other
20. Type of collision (Mechanism of injury)
    1. Motorcycle –motor vehicle
    2. Motorcycle- motorcycle
    3. Motorcycle- pedestrian
    4. Lone motorcycle(falling from motorcycle)

5. Motorcycle- Bicycle
6. Other collision

TYPE OF INJURY (IES) SUSTAINED

21. Body region injured/diagnosis …… …….

1. Head injury
2. Neck injury(cervical spine)
3. Chest injury…….
4. Abdomen injury(V.lnjuries)
5. Thoracic spine injury
6. Lumber sacral Spine injury
7. Extremity(upper/lower limb)
8. Pelvis injury
9. Bladder/urethral injury

22. Type of injury for spine, Head, Upper and lower limb

1. Fracture (answer qn 23)
2. Dislocation ……
3) Tendon injuries ……
4. Sprain/strain
5. Soft tissue injuries
6. laceration

23. Bone fractured 1 …….. 2 …….. 3……

1. Closed
2. open

24. Which side? 1. Right 2. Left

25. For Head injuries state severity: 1. Severe 2. Moderate 3. Mild

26. Pre hospital transport by

1. Relative
2. Police
3. Nurse from other hospital
4. Others

27. Arrival interval

1. > one hour
2. >one to six hour
3. >six to twelve hour
4. >twelve to twenty four hours
5. >Twenty four to fourty eight hours
6. >fourty eight

28. Disposition

1. Treated and discharged
2. Operated and admitted
3. Admitted in ICU
4. Admitted in the ward
5. Died at ED
6. Death in the ward and ICU

29. Type of surgery (Mention) …… Type of implant ……..

30. Is this the first motorcycle crash/injury? 1. Yes 2. No

APPENDEX II

Consent form

My name is **Bryson Mcharo**. I have obtained permission from the MUHAS RESEACH COMMETTEE and also from MOI to conduct the study on;

Motorcycle crash: Injuries Pattern and Risk Factors among patient treated at Muhimbili Orthopaedic Institute following Motorcycle crash.

Road traffic injuries are a leading cause of death and disability worldwide and so in this country. By injury I mean "any physical damage or wound, caused either unintentionally (by accident) or intentionally (on purpose), such as a cut, bruise, burn, fracture, or loss of consciousness due to a blow to the head or neck". It could be the result of a traffic collision, fall, fire or gunshot.

Recently motorcycling has become popular as means of public transport and source of employments to youth in Tanzania. As a result motorcycle crash injuries are also expected to increase.

I would like to understand how big the problem of Motorcycle crash injuries pattern and associated risk factors is. To get this information, I am carrying out hospital based interviews in this community of patients who are on treatment at MOI after motorcycle crash. The results from this study will be used to help community awareness of the problem, possible prevention strategies and also will help agencies and officials decide on what needs to be done about the problem and assess whether health services to treat injured people are adequate.

I will also ask you some questions about your demographic factors; you're driving experience, type of road, Time and place of crash, number of passenger and mechanism of injury in general.

The questions about crash, injuries, mechanism of injury and risk factors that I would like to ask you will take about 15 minutes of your time. This information will be kept securely and no one outside of this study will find out the answers that you give me.

During the course of the interview, I will write the answers down so that no information gets lost but I will not ask your name so that none of this information can be traced back to you. The results will not be reported as individual cases, but only as overall results for

the community. You are free to stop the interview at any point, or do not answer any of the questions that we ask.

Who to contact; If you have any questions regarding the study contact me

Dr mcharo Bryson (phone: 0713362834)
MOI, P.O.Box 65474, Dar es Salaam.
Email address: mcharobi@yahoo.com

For questions concerning your rights as participant contact Prof. M. Aboud, chairman of college research and publication committee,
P.O.Box 65001, Dar es Salaam
Telephhone: 2150302/6

Do I have your permission to proceed? Yes / N0

Signature of participant…….

Signature of investigator……..

Date ……../……../…….