PATTERN, CLINICAL PRESENTATION AND MANAGEMENT OF MANDIBULAR FRACTURES AMONG MOTORCYCLE CRASH VICTIMS ATTENDED AT MUHIMBILI NATIONAL HOSPITAL, DAR-ES-SALAAM, TANZANIA

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MDent (Oral and Maxillofacial Surgery) Dissertation
Muhimbili University of Health and Allied Sciences
October, 2017

Muhimbili University of Health and Allied Sciences

Department of Oral and Maxillofacial Surgery

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By

Beatus Stanslaus, DDS

A Dissertation Submitted in (Partial) Fulfillment of the Requirements for the Degree of Master of Dentistry (Oral and Maxillofacial Surgery) of Muhimbili University of Health and Allied Sciences

October, 2017

CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by the Muhimbili University of Health and Allied Sciences a dissertation titled: ***"Pattern, Clinical Presentation and Management of Mandibular Fractures Among Motorcycle Crash Victims Attended at Muhimbili National Hospital, Dar-Es-Salaam, Tanzania"*** in fulfillment of the requirements for the degree of Master of Dentistry (Oral and Maxillofacial Surgery) of Muhimbili University of Health and Allied Sciences.

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Date……..

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Dr. Sira Owibingire

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Date……..…

DECLARATION AND COPYRIGHT

I, **Beatus Stanslaus,** 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……

ACKNOWLEDGEMENTS

I wish to thank God for granting me health during the period of the study. I wish to express my sincere gratitude and appreciation to Dr. Jeremiah Moshy and Dr. Sira Owibingire for their supervision, constructive criticisms and encouragement during the preparation of the study proposal and this dissertation.

I am also grateful to all specialists and consultants in the department of Oral and Maxillofacial Surgery for their assistance and guidance.

I am greatly indebted to my fellow residents in Oral and Maxillofacial Surgery department for their support, advice and patients' preparation during the period of this study.

I wish to acknowledge the support extended to me by intern doctors who were rotating in the Oral and Maxillofacial Surgery department during the period of this study.

I would like to extend my deepest thanks to my family for their encouragement, understanding, sacrifice and acceptance of my absence during the period of preparation of this dissertation.

Last but not least, I would like to thank all patients who participated in this study for their tolerance despite the hard times they were going through.

DEDICATION

I would like to dedicate this dissertation to:

My parents who nurtured and guided me tirelessly

My best friend and lovely wife, Dativa, for her endless love, dedication and support.

My children (Brian, Brighton and Briana) from whom I draw strength, confidence and happiness.

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LIST OF ABBREVIATIONS

AOCMFS	:	Association of Craniomaxillofacial Surgery
ATLS	:	Advanced Trauma Life Support
CT	:	Computed Tomography
DDS	:	Doctor of Dental Surgery
EMD	:	Emergency Medicine Department
IMF	:	Intermaxillary Fixation
IPD	:	Inpatient Department
MDent	:	Master of Dentistry
MDS-OMFS	:	Master of Dental Surgery in Oral and Maxillofacial Surgery
MNH	:	Muhimbili National Hospital
MUHAS	:	Muhimbili University of Health and Allied Sciences
OMFS	:	Oral and Maxillofacial Surgery
OPD	:	Outpatient Department
OPG	:	Orthopantomography
ORIF	:	Open Reduction and Internal Fixation
SPSS	:	Statistical Package for Social Sciences
TMJ	:	Temporomandibular Joint
WHO	:	World Health Organization

ABSTRACT

Objective: To determine the pattern, clinical presentation and management of mandibular fractures among motorcycle crash victims attended at Muhimbili National Hospital, Tanzania.

Study design: This was a descriptive cross-sectional hospital-based study.

Setting: This study was conducted at the Oral and Maxillofacial Surgery and Emergency Medicine Departments as well as in Oral and Maxillofacial Surgery wards 23 and 24 of the Muhimbili National Hospital (MNH).

Study population: All patients who attended at the Oral and Maxillofacial Surgery Department, Emergency Medicine Department and those admitted in wards 23 and 24 of the Muhimbili National Hospital with oral and maxillofacial injuries following motorcycle crashes.

Methodology: All patients with oral and maxillofacial injuries were interviewed using specially designed structured questionnaire. The interview enquired about socio-demographic information, place where injury took place, time of injury, factors related to crash occurrence, safety measures, whether a victim was a rider, passenger or pedestrian. Later, the patients were clinically examined and details of the examination included clinical presentation, type and site of maxillofacial fracture and site of mandibular fracture. Radiological investigations included plain radiography and computed tomography (CT) where necessary to confirm the fracture. The findings were recorded on a designed clinical form.

Data was entered into a computer and analyzed using SPSS programme version 20.0. The obtained data was coded, cleaned and transformed by recording and grouping. Descriptive analysis included computation of percentages, frequency of occurrence, mean and cross tabulations of variables of interest. Inferential analysis included computation of Chi-Square

test to compare proportions for possible association. A p-value of <0.05 was used as a cut-off level for significance.

Results

A total of 178 patients, who included 155 (87.1%) males and 23 (12.9%) females with a male-to-female ratio of 6.7:1 were included in this study. The age range was from 9 to 54 years with a mean age of 27.06 ±6.66 years. The age groups 21-30 and 31-40 years were the most affected. Unavailability of road signs reported by 99 (55.6%) participants contributed to significant proportion of the motorcycle crashes. Most common mechanism of injury was motorcycle-motor vehicle collisions 66 (37.1%), followed by motorcycle-motorcycle collision 56 (31.5%). The motorcyclists (61.2%) sustained injuries than the passengers (31.5%). The peak time for injury was at night 86 (48.3%), followed by evening hours 48 (27%), midday 26 (14.6%) and morning hours was the least affected 18 (10.1%).

The most common site of mandibular fracture was the symphysis 65 (36.5%) followed by the parasymphysis 55 (30.9%), condyle 45 (25.3%) and the angle 40 (22.5%). The commonest combination of mandibular fractures included the symphysis and condyle 23 (12.9%) followed by the symphysis and angle 11 (6.2%). Almost 98.3% of the patients received pain management and 97.2% were prescribed with prophylactic antibiotics. Surgical wound debridement and suturing was done in 42.1% and 48.3% respectively for the soft tissue injuries. Most patients with mandibular fractures were treated by closed reduction (eyelet wiring, arch bars with IMF), 90 (50.6%) and only 38 (21.3%) were treated by open reduction and internal fixation.

Conclusion

Mandibular fractures were more common in males than females with the majority being 21-30 years of age followed by 31-40 years. The low socioeconomic status, unavailability of road signs, alcohol consumption and non-use of helmets or use of open helmets makes the mandible vulnerable to fractures during motorcycle crash. The most fractured anatomical site was symphysis and the commonest combinations of mandibular fractures included symphysis and condyle followed by body and angle.

Findings from this study called for a need to educate the public, drivers, the road traffic department, road safety department, policy makers and health service providers on the need for road maintenance, provision of road signs, and strict enforcement of the existing traffic laws and improvement of the socioeconomic condition of the general population.

CHAPTER ONE

1.0 INTRODUCTION

The maxillofacial region includes soft and hard tissues which form the face extending from the frontal bone superiorly to the mandible inferiorly[1]. Among the facial skeletons of this region the mandible is the only mobile bone and has a horseshoe-shaped body with mandibular ramus continuing posteriorly and upward on either side. Embryologically it is a membranous bone, and is more commonly fractured than the other bones of the face[2]. Anatomically the mandible is divided into the symphysis, parasymphysis, body, angle, ramus, coronoid process, condyle, and alveolus[3]. It has important roles such as speech, chewing, swallowing, aesthetics as well as the attachment of the tongue and suprahyoid muscles[4]. The facial region is one of the most frequently injured areas of the body, and the mandible is one of the most common bone fractured due to its prominent and unprotected position on the face[5]. Areas that exhibit weakness include the area lateral to the mental protuberance, mental foramen, mandibular angle, and the condylar neck[2]. Mandibular fractures may occur alone or in combination with other craniofacial skeleton. These fractures cause functional disabilities such as poor mastication, aesthetic derangement, psychosocial problem, temporomandibular joint (TMJ) syndrome and chronic pain[6].

The incidence of mandibular fractures varies with population density, environment, socioeconomic status, road infrastructure, law enforcement and road traffic jam[7]. The number of patients with maxillofacial trauma involving the mandible has increased recently following introduction of the motorcycles commonly known in Kiswahili language as "*bodaboda*" as a means of public transport. The use of bodaboda for transport has been on the increase in Dar es Salaam due to high population density, intense traffic jams which make it difficult for the residents to reach working places and homes on time, poor road infrastructure especially in its suburbs, and the need for affordable means of transport.

Motorcycle crashes constitute a major but neglected emerging public health problem in developing countries and the main victims are motorcyclists, passengers and pedestrians in their young productive years[8, 9]. Motorcycle crashes pose a great challenge in managing the fractures due to unavailability of personnel and equipment. The age-long principle of fracture management; reduction, fixation and immobilization also applies to maxillofacial fractures. However, to achieve this principle factors such as degree of injury, type of fracture, the expertise of the surgeon and availability of technology/equipment should be considered[10].

1.1 LITERATURE REVIEW

The increased motorcycle crashes constitute a large proportion of road traffic crashes in developing countries including Tanzania, posing a serious public health concern. Motorcycle-related fractures represent a significant number in motor vehicle crashes in Dar es salaam-Tanzania. Among all the injuries, maxillofacial fractures pose significant functional disabilities, aesthetic and psychosocial components as well as significant public health problem in developing countries[11]. Most fractures occur in individuals' aged between 16 and 40 years which is an age group that constitutes the active productive people in the society[19, 20]. Epidemiologically, most of the maxillofacial trauma involves the mandible, accounting for 15.5% to 89.8% of all facial fractures[12, 13]. Mandibular fractures occur more commonly in males than females at a male to female ratio of 2.1:1 to 9.2:1. Majority of the patients affected with mandibular fractures are in their 3rd decade followed by those in their 2nd decade of life[21]. Other studies show that, the mean age of patients was 25.8 years and the peak age incidence was 20 to 29 years, whereas female patients had a peak age of 10 to 19 years[11, 18].

Most of the causes of fractures in males are due to motor vehicle crashes including motorcycle crashes[14, 15, 16, 17]. Males are predominantly affected due to the fact that they are more mobile as a result of economic activities and because motorcycle riders are predominantly males. This fact elucidates that males contribute a larger proportion of motorcycle users as compared to females[18].

The aetiology of maxillofacial fractures varies from country to country and they can usually be attributed to cultural, social, environmental and economic factors[22]. Common causes of mandibular fractures are motor vehicle crashes, assaults (interpersonal violence), gunshot, accidental falls, sports, occupational hazards and other less common causes[23]. Studies around the world have shown that motor vehicle crashes (57.1%) are the most common causes of maxillofacial injuries in developing countries. The underlying causes include the reliance on motorcycle as a main means of transport, poor road infrastructures, affordability,

traffic jam, and poor enforcement of laws[24]. One of the studies conducted in Nigeria; found that 40% of the road traffic crash cases were sustained from motorcycle-related crashes[25].

Mandibular fractures can involve either only one site or multiple anatomic sites simultaneously. A fracture site depends on the mechanism of injury, magnitude and direction of force, mandibular prominence and anatomy of the site. It is important to note that, most of the fractures associated with motor traffic crashes especially the motorcycle-related involve the symphysis/parasymphysis and condyle[26, 27, 28, 29]. Several studies have revealed that the commonest possible combination is fracture of the parasymphysis and subcondylar followed by fracture of the body and angle[5]. Another study conducted in Iran, showed that most of the maxillofacial fractures occurred on the mandible especially on the parasymphysis[30]. A study conducted in Switzerland regarding the relationship between trauma mechanism and fracture site, showed that fractures resulting from motor vehicle collisions were in the parasymphyseal and condylar region[13]. Another study by Motamedi et al showed that motorcycle crashes caused 55% of mandibular fractures in the condylar region followed by the symphyseal-parasymphyseal region[31].

Mechanism of crashes includes head on collision, burst tyres, motorcycle-to-motor vehicle collision and skidding off or loss of control. Among these, head on collision was the predominant mechanism of crashes[18], followed by motorcycle-other vehicle collision[32]. Most of the motorcycle-related fractures were associated with riding under the influence of alcohol[33]. Patients involved in motorcycle crashes without helmets had higher incidence of maxillofacial fractures compared to those who wore helmets. Alcohol consumption and driving without a valid motorcycle license are the risk factors associated with riding without helmet and speed [34]. High speed, imprudence and use of open helmets or non-use of helmets can explain the high number of fractures secondary to motorcycle crashes. Wearing helmets decreases mortality but does not reduce significantly the number of fractures. Available evidence shows that the incidence of maxillofacial fractures is lower when the victims wore tightly fitted protective head gear such as helmets[35, 36].

Protocols for the management of mandibular fractures are available but it is difficult to obtain a uniform protocol because of the clinical presentation of each occurring fracture, the experience of the surgeon and availability of the equipment and hardware[37]. The way mandibular fractures are treated and repaired has undergone a gradual revolution. Current established methods in the management of mandibular fractures include observation with soft diet for no displaced fractures, conservative treatment with intermaxillary fixation (IMF) by dental wiring and arch bars, gunning splints, open reduction and intraosseous wiring, open reduction with rigid internal fixation by miniplates, non-compression plates, compression plates and lag screws as well as internal fixation with bone grafting[38].

Proper treatment of these injuries is important as it helps to maintain speech, swallowing, mastication and aesthetics. Treatment of mandibular fractures involves providing the optimal environment for bone healing to occur: adequate blood supply, immobilization and proper alignment of fracture segments. Most fractures require reduction and fixation to allow for primary or secondary bone healing[39]. Optimal treatment timing for the mandibular fracture must take into consideration the type and severity of injury. However patient compliance is very important. One study noted that up to 60% of patients treated for maxillofacial fracture could be noncompliant in some form[40]. However, mandibular fractures involving teeth are considered compound (open) and should be treated with antibiotics to reduce the risk of infection[41]. Paediatric mandibular fractures are managed differently due to the mixed dentition, anatomic difference in teeth, and intrinsic makeup of the paediatric mandible. The developmental growth of the child's face should also be taken into consideration[42].

Despite the higher number of mandibular injuries seen in our setting following the introduction of "*bodaboda*" as a quick means of transportation in intense congested traffic in a busy city like Dar es Salaam, there are no comprehensive studies documented on this mishap for retrieval. Therefore, the aim of this study was to determine the pattern, clinical features and management of mandibular fractures in motorcycle crash victims attending Muhimbili National Hospital, Dar es Salaam, Tanzania.

1.2 STATEMENT OF THE PROBLEM

The number of motorcycles has increased especially in large urban areas of developing countries possibly due to increasing fuel costs, intense traffic and low purchase price for motorcycles. In Dar es Salaam-Tanzania, motorcycles are widely used for transporting small cargoes and passengers in high traffic urban areas and hard to reach suburbs of the city. Also motorcycle riding has become a new form of employment for less educated youths. The mobility, versatility and speed are attractive factors to those who want to use *bodaboda* for work or leisure.

Crashes involving motorcycles and deaths as a result of those crashes have been on the increase despite the presence and enforcement of laws and regulations on motorcycle safety gears such as helmets, defensive use of road infrastructure and traffic safety measures. Motorcycle crashes are often associated with morbidity due to the resulting functional and aesthetic disruption. Moreover, due to high concerns on facial appearance in many societies aesthetic disturbance results in adverse psychosocial trauma to many of the victims of these fractures.

Motorcycle crashes pose a great challenge in managing the fractures due to inadequate availability of specialized human personnel needed to treat these patients and equipment as well as high cost of treatment. These impose a huge burden on demand and accessibility of the health care measures to the developing nation like Tanzania. Majority of the motorcycle crash victims are young (15-39 years old) and this leads to loss of manpower group among the community due to permanent body incapacity and death. Also, this may lead to loss of family leaders leading to decreased family care and increased number of street children. Therefore, this is why the author conducted this study to investigate the pattern, clinical presentation and management of mandibular fractures among motorcycle crash victims attended at MNH, Dar es Salaam.

1.3 RATIONALE OF THE STUDY

This study was part of fulfillment of the requirement of the master of dentistry in Oral and Maxillofacial Surgery degree programme. Information emanating from this study has provided results with useful information and knowledge regarding the etiology, pattern, clinical presentation and management of mandibular fractures. The findings of this study will shade light by providing the hospital and the Ministry of Health, Community Development, Gender, Children and Elderly with evidence-based information for decision making and planning preventive strategies, deploying human personnel, purchasing equipment and conducting educational programmes in the hospital and nationwide.

Furthermore, these findings will alert the authorities particularly the Ministry of Home Affairs-traffic police department for early intervention, proper management and preventive measures. The information and knowledge from this study further have provided modalities of treatment at Muhimbili National Hospital and the outcome of such treatment. Also this information will help to reduce the morbidity and mortality associated with mandibular fractures in motorcycle crash victims by providing valuable ways of handling maxillofacial trauma for the clinicians and researchers countrywide.

1.4 RESEARCH QUESTION

What is the pattern, clinical presentation and treatment modalities of mandibular fractures in motorcycle crash victims seen at MNH?

1.5 RESEARCH OBJECTIVES

1.5.1 BROAD OBJECTIVES:

To determine the pattern, clinical presentation and management of mandibular fractures among motorcycle crash victims attended at Muhimbili National Hospital (MNH).

1.5.2 SPECIFIC OBJECTIVES:

1. To determine demographic characteristics of motorcycle crash victims with mandibular fractures who attended treatment at Muhimbili National Hospital.
2. To determine contributing factors for accidents among motorcycle crash victims with mandibular fractures who attended treatment at Muhimbili National Hospital.
3. To determine the clinical presentation of mandibular fractures among motorcycle crash victims treated at Muhimbili National Hospital.
4. To determine the severity of mandibular fractures in helmet and non-helmet users among motorcycle crash victims attending Muhimbili National Hospital.
5. To determine the treatment modalities of mandibular fractures sustained by motorcycle crash victims treated at Muhimbili National Hospital.

CHAPTER TWO

2.0 MATERIAL AND METHODS

2.1 Study Settings

The study was conducted at the Oral and Maxillofacial Surgery (OMFS) and Emergence Medicine Departments (EMD) as well as Oral and Maxillofacial Surgery wards 23 and 24 of the Muhimbili National Hospital (MNH).

2.2 Study Design

This was a descriptive cross-sectional hospital-based study.

2.3 Study Duration

The study was conducted for seven (7) months, starting from July 2016 to February 2017.

2.4 Study Population

The study population included all patients who attended at the OMFS department, EMD and wards 23 and 24 of MNH with mandibular fractures following motorcycle crashes during the study period.

2.5 Inclusion and Exclusion Criteria

2.5.1 Inclusion Criteria

All motorcycle accident victims who attended at the OMFS department, EMD and oral and maxillofacial wards 23 (male ward) and 24 (female ward) with mandibular fractures and consented to participate in the study.

2.5.2 Exclusion Criteria

Motorcycle accident victims who presented at the OMFS Department, EMD and wards 23 and 24 with maxillofacial fractures without mandibular fracture. Patients who presented with mandibular fractures due to other causes other than motorcycle crashes.

2.6 Sampling Procedure

The convinient non-statistical sampling procedure whereby all motorcycle crash victims who presented at the OMFS and Emergency Medicine Departments and those admitted in oral and maxillofacial wards 23 and 24 with oral and maxillofacial injuries after thorough examination and investigation. Those who were diagnosed with mandibular fractures were enrolled into the study after consenting.

2.7 Sample Size Estimation

Sample size to this study was estimated based on previous study by Kilasara et al, 2006[43].

2.8 Sample Size Calculation

The sample size was calculated from the formula:

$$n = \frac{Z^2 P\ (1 - P)}{E^2}$$

Whereby:

- n Sample size
- Z 95% confidence interval (1.96)
- P 70.7%, Previous prevalence of mandibular fractures[43]
- E Error margin (7%)

Using the above formula the maximum sample size was **178** oral and maxillofacial fractured patients.

2.9 Data Collection

All patients were interviewed using specially designed questionnaire (appendix III) to obtain sociodemographic data, patients' presenting complaints, place where injury took place, time of injury, factors related to accident's occurrence, safety measures and status of the victim. Findings of clinical examination, radiological finding and the mode of treatment were recorded for analysis.

2.9.1 Patient Interview

The investigator in a secluded room conducted interviews and responses were recorded in the questionnaire. The interview enquired about socio-demographic information (age, sex, address, education level and marital status), place where injury took place, time of injury, factors related to crash's occurrence (speed, alcohol consumption, illicit drugs and status of the road), safety measures (helmet wearing, number of passengers, traffic rule observance) and whether a victim was a rider, passenger or pedestrian.

2.9.2 Clinical Examination

A thorough clinical examination was carried out by the principal investigator at the emergency medicine department in a special room with the patient on the examination bed using artificial light, at the oral and maxillofacial surgery department examination was done while the patient was seated on a dental chair using artificial light and in the wards (23 and 24) the exercise was done in the side room with the patient on the examination bed using natural light. The details of the examination included clinical presentation (swelling, laceration, ecchymosis, fractured teeth, malocclusion, pain, numbness, step deformity, bone crepitus and impaired swallowing), type of fracture (simple or compound), type of bone fractured (maxilla, zygoma, orbital and frontal) and site of mandibular fracture (alveolar, symphysis, parasymphysis, body, angle, ramus, condyle and coronoid).

2.9.3 Investigations

All patients had series of routine and specific investigations, which included hematological and radiological investigations. Radiological investigations included plain radiography (orthopantomography, skull posterior anterior and lateral view, water's view, submentovertex view and Towne's view) and computed tomography (CT) where necessary to confirm the fracture. The principal investigator with the assistance of an experienced radiologist did the interpretation of these radiological investigations. The outcomes of clinical and radiological evaluations were recorded in a specially designed clinical form ready for analysis.

2.10 Data Analysis

Data was entered into a computer and analyzed using Statistical Package for Social Sciences (SPSS) programme version 20.0. The collected data was coded, cleaned and transformed by recording and grouping. Descriptive analysis included computation of percentages, frequency of occurrence, mean and cross-tabulations of variables of interest.
Inferential analyses included computation of Chi-Square statistics to compare proportions for possible association. A p-value of <0.05 was used as a cut-off level for significance. Dependent variables included loss of consciousness, severity of fracture, pattern of fracture, clinical presentation and treatment modalities. Independent variables included residence, age, sex, education level, speed, time of injury, alcohol consumption, illegal drugs consumption, number of passengers, nature of the road, traffic infrastructures, use of helmet and type of helmet.

2.11 Ethical Considerations

Ethical clearance was granted by the MUHAS Senate Research and Publications Committee. This was used to obtain permission from the administration of the Muhimbili National Hospital. Following detailed explanation concerning the nature and purpose of the study, informed consent (appendix I and II) was sought from participants in writing before enrollment in the study. The participants were assured of confidentiality but also their right to participate and right to withdraw without any conditions. There was no physical or psychological risk for participants of this study. Those patients found to have mandibular fractures were given appropriate treatment.

CHAPTER THREE

3.0 RESULTS

3.1 Socio-demographic features

The study comprised 178 motorcycle crash victims who sustained oral and maxillofacial fractures and the mandible being one of the fractured bones. One hundred and fifty-five (87.1%) were males while twenty-three (12.9%) were females, corresponding to a male-to-female ratio of 6.7:1.

The age of the subjects ranged from 9 to 54 years with a mean age of 27.06 ± 6.66 years. The age group 21-30 years was the most affected followed by the age group 31-40 years (Table1).

Table 1. Distribution of patients with mandibular fractures by age and sex

Age group (years)	Gender of the patients		No. of patient(Percentage)
	Male	Female	
0-10	0	1	1 (0.6%)
11-20	25	5	30 (16.9%)
21-30	86	12	98 (55.1%)
31-40	39	4	43 (24.2%)
41-50	4	1	5 (2.8%)
51+	1	0	1 (0.6%)
Total	**155 (87.1%)**	**23 (12.9%)**	**178 (100%)**

Majority 80 (44.9%) of motorcycle crash victims with mandibular fractures had a maximum of primary school education followed by those with secondary school education 56 (31.5%), and the least affected were those who had no formal education, 2 (1.8%) and those with higher education level, 6 (5.5%). Majority 49 (45.0%) among the motorcyclists had primary education followed by 32 (29.4%) with secondary education, (Table 2).

Table 2. **Distribution of study participants with mandibular fractures according to education level and role during motorcycle crashes**

Education level	**Motorcycle crash victims**			
	Motorcyclist	**Passenger**	**Pedestrian**	**Total**
No formal education	2 (1.8%)	2 (3.6%)	0 (0.0%)	4 (2.2%)
Partial primary school	7 (6.4%)	1 (1.8%)	3 (23.1%)	11 (6.2%)
Primary school education	49 (45.0%)	26 (46.4%)	5 (38.5%)	80 (44.9%)
Partial secondary school	13 (11.9%)	4 (7.1%)	0 (0.0%)	17 (9.6%)
Secondary school education	32 (29.4%)	20 (35.7%)	4(30.8%)	56 (31.5%)
Higher education	6 (5.5%)	3 (5.4%)	1(7.7%)	10 (5.6%)
Total	**109 (61.2%)**	**56 (31.5%)**	**13 (7.3%)**	**178 (100%)**

The majority 59 (33.1%) of the motorcycle crash victims were unemployed individuals, followed by 49 (27.5%) street vendors and 35 (19.7%) employees. Peasants were the least affected. Most of the motorcyclists were unemployed, 38 (34.9%) followed by street vendors, 29 (26.6%); again peasants were the least, (Table 3).

Table 3. Distribution of patients with mandibular fractures according to their occupation and role during motorcycle crashes.

Occupation	**Motorcycle crash victims**			
	Motorcyclist	**Passenger**	**Pedestrian**	**Total**
Peasant	7 (6.4%)	2 (3.6%)	1 (7.7%)	10 (5.6%)
Street vendor	29 (26.6%)	16 (28.6%)	4 (30.8%)	49 (27.5%)
Business man	18 (16.5%)	6 (10.7%)	1 (7.7%)	25 (14.0%)
Employed	17 (15.6%)	15 (26.8%)	3 (23.1%)	35 (19.7%)
Unemployed	38 (34.9%)	17 (30.4%)	4(30.8%)	59 (33.1%)
Total	**109 (61.2%)**	**56 (31.5%**	**13 (7.3%)**	**178 (100%)**

Oral and maxillofacial fractures among motorcycle crash victims affected mostly single 105 (59.0%) followed by married 66 (37.1%) population. The cohabiting and divorced groups were the least affected (Table 4).

Table 4. Distribution of patients with mandibular fractures according to their marital status and roles during motorcycle crash.

Marital status	Motorcycle crash victims			
	Motorcyclist	**Passenger**	**Pedestrian**	**Total**
Single	63 (67.9%)	38 (67.9%)	4 (30.8%)	105 (59.0%)
Married	42 (38.5%)	16 (28.6%)	8 (61.5%)	66 (37.1%)
Cohabiting	1 (0.9%)	2 (3.6%)	1 (7.7%)	4 (2.2%)
Divorced	3 (2.8%)	0 (0.0%)	0 (0.0%)	3 (1.7%)
Total	**109 (61.2%)**	**56 (31.5%**	**13 (7.3%)**	**178 (100%)**

3.2 Risk factors associated with motorcycle crash

Majority of the study participants reported that 99 (55.6%) of the crashes were due to un-availability of road signs compared to 67 (37.6%) who reported availability of road signs during the time of motorcycle crashes.

The commonest mechanism of crash was motorcycle-motor vehicle collision 66 (37.1%), followed by motorcycle-motorcycle collision, 56 (31.5%). Another mechanism of injuries included those who lost control, 36 (20.2%) and hit post/wall which accounted 20 (11.2%). The motorcyclists 109 (61.2%) sustained injuries than the passengers 56 (31.5%) and pedestrians 13 (7.3%). Majority 66 (37.1%) of mandibular fractures occurred most when motorcyclists were riding at a speed of 31-50kpm, followed by those at 51-60kpm, 46 (25.8%) fractures and at 61-80kpm, 42 (23.6%) fractures.

Table 5: Distribution of patients with mandibular fractures according to the number of fracture sites and the riding speed during the crash

	Number of mandibular fracture sites					
Speed (kph)	**1**	**2**	**3**	**4**	**5**	**Total**
0-30	14 (17.1%)	3 (4.0%)	0 (0.0%)	2(50.0%)	1 (33.3%)	20 (11.2%)
31-50	32 (39.0%)	29 (38.7%)	4 (28.6%)	0 (0.0%)	1 (1.5%)	66 (37.1%
51-60	18 (22.0%)	22 (29.3%)	4 (28.6%)	1 (25.0%)	1 (33.3%)	46 (37.1%)
61-80	17 (20.7%)	19 (25.3%)	5 (35.7%)	1 (25.0%)	0 (0.0%)	42 (23.6%)
81-100	1 (1.2%)	2 (2.7%)	1 (7.1%)	0 (0.0%)	0 (0.0%)	4 (2.2%)
Total	**82 (100%)**	**75 (100%)**	**14 (100%)**	**4 (100%)**	**3 (100%)**	**178 (100%)**

The higher the riding speed the more the mandibular fracture sites noted. Those who were riding at a speed between 61-80kph had multiple sites fracture, 5 (35.7%) in three sites compared to 4 (28.6%) in three mandibular sites when riding at a speed of 31-50 kph and 51-60kph, (table 5).

For most of the victims who sustained mandibular fractures, the peak time for injury was at night 86 (48.3%). It was found that 56 (31.5%) of the victims were riding the motorcycles under the influence of alcohol, compared to 122 (68.5%) who did not consume alcohol.

3.3 Clinical presentation of mandibular fractures

Majority 176 (98.9%) of the patients presented with pain as the main clinical feature, followed by swelling 172 (96.6%), step deformity 171 (96.1%), malocclusion 163 (91.6%) and Ecchymosis 159 (89.3%) and the least clinical features included fractured teeth 38 (21.3%), laceration 86 (48.3%, numbness 119 (66.9%), difficulty swallowing 127 (71.3%) and bone crepitus 139 (78.1%).

Of all the anatomical sites involved, the symphysis 65 (36.5%) was the most fractured followed by the parasymphysis 55 (30.5%), the body 46 (25.8%), the condyle 45 (25.3%), the angle 40 (22.5%) and the alveolar process 30 (16.9%). The least affected sites were the coronoid process, 2 (1.1%) and ramus 6 (3.4%), (Table 6).

Table 6: Distribution of the mandibular fracture sites among motorcycle crash victims

Site	Frequency	Percentage (%)
Symphysis	65	36.5
Parasymphysis	55	30.9
Body	46	25.8
Condyle	45	25.3
Angle	40	22.5
Alveolar	30	16.9
Ramus	6	3.4
Coronoid process	2	1.1

The most often encountered combined mandibular fractures were the symphyseal-condylar fractures, 23 (12.9%) followed by those involving the symphysis and angle, the parasymphyseal and angle and the body and angle fractures, 6.2% each type, (Table 7).

Table 7: Distribution of multiple mandibular fracture sites among the motorcycle crash victims

Anatomic fracture site	Frequency	Percentage	P-value
Alveolar + angle	5	2.8 %	0.283
Alveolar + condyle	5	2.8%	0.169
Symphysis + angle	11	6.2%	0.123
Symphysis + condyle	23	12.9%	0.016
Parasymphysis + angle	11	6.2%	0.374
Parasymphysis + condyle	6	3.4%	0.002
Body + angle	11	6.2%	0.466
Body +condyle	6	3.4%	0.018

3.4 Severity of fractures among helmet users:

In this study, only 68 (38.2%) used helmets, and among those who had helmets, 41 (23.0%) used open helmets and 27 (15.2%) were closed helmets. The loss of consciousness was observed in 70 (39.3%) of the participants with no helmets, in 30 (16.9%) participants with open-face helmets and in 12 (6.7%) participants with closed-face helmet. Again, most fractures occurred in those patients who had not used helmets. Fifty-one (28.7%) study participants had fractures in two sites, as compared to 47 (26.4%) who had fractures in only one site of the mandible when not using helmet. About 17 (9.6%) patients with mandibular fractures and had used open helmet presented with fractures in two sites and 7 (3.9%) had fractures in three sites (Table 8). In this study, there were a total of 90 participants with simple mandibular fractures and 88 participants with compound mandibular fractures. Majority of the compound mandibular fractures 59 (33.1%) occurred in those participants without helmets compared to 51 (28.7%) who sustained simple mandibular fractures. Compound mandibular fractures occurred in 23 (12.9%) with open-face helmets compared to 18 (10.1%) who had simple mandibular fractures. Majority of participants 21 (11.8%) with closed-face helmets had simple mandibular fractures compared to 6 (3.4%) with compound mandibular fractures, (Table 8).

Table 8: Distribution of multiple mandibular fractures among users and non-users of helmets

Helmet used	**Number of mandibular fracture sites**					
	1	**2**	**3**	**4**	**5**	**Total**
No helmet	47 (26.4)	51(28.7%)	7 (3.9%)	3 (1.7%)	2 (1.1%)	**110(61.8%)**
Open-face helmet	15 (8.4%)	17 (9.6%)	7 (3.9%)	1 (0.6%)	1 (0.6%)	**41(23.0%)**
Closed-face helmet	20 (11.2%)	7 (3.9%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	**27(15.2%)**
Total	**82(46.1%)**	**75(42.1%)**	**14(7.9%)**	**4(2.2%)**	**3 (1.7%)**	**178 (100.0%)**

3.5 Treatment of mandibular fractures

Pain management was achieved through analgesics, in 98.3% of the patients. In about 97% of the patients with open wounds, antibiotics were given for three days. Tetanus prophylaxis was given to 57.9% of the patients. Surgical wound debridement and suturing were done in 42.1% and 48.3% participants with soft tissue injuries respectively.

The most common treatment carried out for the hard tissue injuries 90 (50.6%) patients was closed reduction, mainly by Erich arch bars and inter maxillary fixation (IMF). Open reduction and internal fixation (ORIF) using titanium plates and screws were performed in 38 (21.3%) patients. ORIF and IMF were performed in 15 cases (8.4%) while IMF and bone splinting were performed in 11 cases (6.2%). Bone splinting only was performed in 18 (10.1%) cases. There was no patient who needed ORIF and bone reconstruction. Regarding multiple mandibular fractures, 51 (28.7%) patients were treated by IMF, 11 (6.2%) ORIF, 2 (1.1%) splinting; combined ORIF and IMF to 10 (5.6%) patients and combined Splinting and IMF to 4 (2.2%), (table 9).

Table 9: Distribution of patients with mandibular fractures according to types of combined mandibular fractures and treatment modalities

Types of combined mandibular fracture	**Treatment modality**					
	splinting	IMF	ORIF	IMF+ ORIF	IMF+splinting	Total
Alveolar+angle	1(0.6%)	3(1.7%)	0(0.0%)	0(0.0%)	1(0.6%)	**5(2.8%)**
Alveolar+condyle	1(0.6%)	3(1.7%)	0(0.0%)	0(0.0%)	1(0.6%)	**5(2.8%)**
Symphysis+angle	0(0.0%)	6(3.4%)	1(0.6%)	2(1.1%)	2(1.1%)	**11(6.2%)**
Symphysis+condyle	0(0.0%)	17(9.6%)	4(2.2%)	2(1.1%)	0(0.0%)	**23(12.9%)**
Parasymphysis+angle	0(0.0%)	7(3.9%)	3(1.7%)	1(0.6%)	0(0.0%)	**11(6.2%)**
Parasymphysis+condyle	0(0.0%)	4(2.2%)	0(0.0%)	2(1.1%)	0(0.0%)	**6(3.4%)**
Body+angle	0(0.0%)	6(3.4%)	2(1.1%)	3(1.7%)	0(0.0%)	**11(6.2%)**
Body+condyle	0(0.0%)	5(2.8%)	1(0.6%)	0(0.0%)	0(0.0%)	**6(3.4%)**
Total	**2(1.1%)**	**51(28.7%)**	**11(6.2%)**	**10(5.6%)**	**4(2.2%)**	**78(43.8%)**

CHAPTER FOUR

4.0 DISCUSSION

This study revealed that the incidence of mandibular fractures among motorcycle crash victims was highest in younger patients (21-30years of age). This observation was in congruent to other studies where the dominant age groups with a high incidence were 21-30 and 31-40 years[11, 18, 19, 20, 21]. This reflects the fact that, the age groups 21-30 and 31-40 years are the active people in economic activities and aggressive in life compared to very young and old age groups.

Mandibular fractures occur more frequently in males, with a male to female ratios ranging from 2.1:1 to 9.2:1[14, 15, 16, 17, 18], so the ratio found in our study (6.7:1) fell within this range. The high frequency of mandibular fractures among motorcycle crash victims in men could be due to the fact that there is a high frequency of mobility in the process of fulfilling their roles as breadwinners for many families. In addition to that, men could be more exposed to public behaviors such as leisure, alcohol drinking and driving more often than women hence this could make them more prone to injuries than women. Furthermore, men could be courageous to drive recklessly under the influence of alcohol, late hours and more often men do not observe traffic regulations hence are prone to injuries than women.

Many mandibular fractures were seen in study participants with low education level and these accounted for 53.3% of all mandibular fractures seen. Study participants with low education would more likely to have low socio-economic status that could force them to engage in activities for earning life such as motorcycle riding or use cheap transport as motorcycles for their movements which expose them to high risk of motorcycle crashes. In this study the majority (61.2%) of the motorcycle crash victims were motorcyclists. Also, the majority (87.6%) of patients was from urban areas, among them 51.3% had low education, no formal occupation, and therefore could look for alternative ways to enable them to earn their life.

The finding that more accidents occurred in the urban areas than the rural is perhaps due to heavy traffic jam and congestion in the urban area. The increased number of motorcycle

crash victims in Dar es Salaam is consistent with the fast increase in the number of motorcycles in Tanzania used for cheaper and easier means of transportation, delivery services and could rush through the heavy traffic in most of the city.

Some factors have been identified as contributing to the risk of motorcycle related injuries. These factors could be environmental and human which influence the crash events. The motorcycle crashes victims have been attributed to non-helmet use by riders and their passengers, excess passenger, speeding, reckless driving, lack of certified driver training and valid licensing, poor traffic infrastructures, poor regulation and law enforcement and possible use of alcohol and illicit drugs[22]. An association between the mechanism of injury and the outcome of mandibular fractures was observed but not statistically significant. The most prominent mechanism of injury responsible was the motorcycle-motor vehicle collision (37.1%) followed by motorcycle-motorcycle collision (31.5%) which was in contrast with other studies[18, 32] in which motorcycle-motorcycle collision was predominant followed by motorcycle-motor vehicle collision.

Alcohol consumption was assessed subjectively but most of the participants denied riding under the influence of alcohol. In this study, riding under the influence of alcohol was observed in 31.5% of motorcycle crash victims which was consistent with other studies[33]. The mode of injury being motorcycle-motor vehicle collision and the reason could have been that, alcohol consumption is known to impair driving ability, judgment and causes carelessness and loss of concentration.

Another important finding was un-availability of road signs in most of traffic infrastructures. The study showed that 55.6% of the motorcycle crash victims were involved in injuries due to unavailable road signs compared to 37.6%, which occurred in presence of road signs. The reason for this could be, most of the road humps, bumps and zebra crossing had no signs and when available they were very near. The characteristics of the motorcyclists were speeding; violating traffic control signals such as zebra crossing and driving off the roads leading to crashes involving motorcyclists, passengers and/or pedestrians.

The study found that mandibular fractures could involve only one site, multiple sites of the mandible as well as in combination with other craniomaxillofacial bones. Mandibular symphyseal fractures were common followed by parasymphyseal fractures among motorcycle crash victims and this was comparable with other studies[26, 27, 28, 29]. Other studies conducted in different parts of the world including Africa, showed that the symphysis or parasymphysis and condyle were the most affected anatomical sites. The reasons for this included anatomy of the site and mechanisms of injury. Although the mandible is the strongest bone in the facial region, it has certain areas of weakness hence vulnerable to fracture. Areas that exhibit weakness include the area lateral to the mental protuberance, mental foramen, mandibular angle and the condylar neck[2]. Combined mandibular symphysis and condyle fracture were predominant and statistically significant, followed by symphysis and angle, parasymphysis and condyle, and body and body combinations and this was in consistent with other studies[5, 13, 30, 31].

Motorcycle crashes are dangerously high, therefore reliable and valid data regarding helmet safety are needed for mandatory helmet use. Standard safety helmets reduce the frequency and severity of maxillofacial injuries resulting from motorcycle crashes. The use of no helmets or open helmets has contributed to the severity of injury among motorcycle crash victims hence increased disability and morbidity as well as health care costs. This is because the only device that can prevent the worst injury in the maxillofacial region is the helmet. In this study, it was statistically significant that, helmet use prevented the severity of mandibular fractures. It was observed that those patients with open or no helmets were the ones who sustained multiple fractures. The reasons for non-helmet use by most of the victims could be a short travel distance, not riding on main roads, in a hurry, physical discomfort, sharing the use of the helmet with others, hairstyle concerns, believed in a low chance of having an accident and unable to carry the helmet. All these contributed to the fact that most of the motorcycle crash victims not to use helmets. However, wearing a helmet may not reduce the incidence of injury but may reduce fracture severity and prevent traumatic brain injury among motorcycle crash victims.

There were many treatment modalities for mandibular fractures but the treatment chosen depends on many factors such as cost of treatment, affordability by the patient, feasibility in the hospital, patients' willingness to avail the treatment advised. In this study, many patients who had severe injuries analgesics were prescribed for pain control. About 98.3% of the patients with oral and maxillofacial injuries needed analgesics.

Patients with open wounds prophylactic antibiotics were given for the duration of five days, and this included almost all 97.2% of the patients with oral and maxillofacial fractures[41]. Tetanus wound prophylaxis was given to 57.9% of the patients. Those patients who presented with soft tissue injuries, surgical wound debridement and wound suturing was done to 42.1% and 48.3% respectively. Soft tissue management was done immediately after complete assessment and stabilization of the patient according to the standard protocol of the advanced trauma life support (ATLS) at emergency medical department of the Muhimbili National Hospital. Majority of the patients treated in this study had closed reduction with Erich arch bars and intermaxillary fixation (50.6%) as the treatment and few patients were treated with open reduction and internal fixation (ORIF), 21.3%, which is consistent with other studies[20]. About 8.4% were treated with combined modalities (ORIF and IMF). The intermaxillary fixation was combined with ORIF in those patients who had semi-rigid fixation (using intraosseous wire and miniplates) for the mandibular fractures. Simple methods of fracture reduction and immobilization were used on outpatient basis under local anaesthesia and the results were satisfactory to the surgeon and to the patients. In addition, those who needed open reduction and internal fixation using titanium plates or intraosseous wires were treated under general anaesthesia and the postoperative results were satisfactory.

The open reduction and internal fixation is the gold standard of treatment of mandibular fractures. However, this treatment modality is not done routinely in our department due to the lack of facilities for the ORIF and when available the cost of treatment is usually high (unaffordable) to the patients. Because of this reason, most of the patients were treated with closed reduction and when possible intraosseous wires are used.

4.1 CONCLUSION

Mandibular fractures were more common in males than females with majority being 21-30 years of age followed by 31-40 years. The low socioeconomic status, unavailability of road signs, alcohol consumption and non-use of helmets or use of open helmets makes the mandible vulnerable to fractures during motorcycle crash. The most fractured anatomical site was symphysis and the commonest combinations of mandibular fractures included symphysis and condyle followed by body and angle. The most common treatment modality was by IMF using Erich arch bars.

Findings from this study called for a need to educate the public, drivers, the road traffic department, road safety department, policy makers and health service providers on the need for road maintenance, provision of road signs, and strict enforcement of the existing traffic laws and improvement of the socioeconomic condition of the general population.

4.2 RECOMMENDATIONS

This study has brought forward the following recommendations:

- An awareness campaign should be conducted nationwide in order to reduce motorcycle crashes.
- The laws regarding the use of closed helmets by both passengers and drivers, speed limits and traffic rules should be enforced.
- To conduct a study with a large sample representing all zones in the country in order to get a good pattern of mandibular fractures among the motorcycle accident victims in Tanzania.

4.3 LIMITATIONS OF THE STUDY

- Due to socio-economic status of the patients affected, some of the investigations and treatment modalities were not offered hence management was compromised somehow.
- Unavailability of hardware for the open reduction and internal fixation hence compromised treatment.
- Financial constraints.

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APPENDICES

APPENDIX I: CONSENT FORM – ENGLISH VERSION

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES (MUHAS)

DIRECTORATE OF RESEARCH AND PUBLICATIONS

MUHAS INFORMED CONSENT

ID NO……..

Consent to participate in a study

Greetings! My name is Dr. Beatus I am working on this research with the objective of studying pattern, clinical presentation and management of mandibular fractures among motorcycle accident victims attended at Muhimbili National hospital, Dar es Salaam, Tanzania.

Purpose of Study: The study is conducted in partial fulfillment of requirement for the degree of Masters of Dentistry in Oral and Maxillofacial Surgery of MUHAS. This study is aiming to determine pattern, clinical presentation and management of mandibular fractures among motorcycle accident victims attended at Muhimbili National hospital, Dar es Salaam, Tanzania. You are being asked to participate in this study because you have particular knowledge and experiences that may be important to the study. Kindly, please be honest and true for betterment of the results that could lead to better intervention and recommendations for future.

What Participation Involves: If you agree to join the study, you will be interviewed in order to answer a series of questions in the questionnaire prepared for the study. You will also undergo a clinical examination in order to know clinical presentation of your problem. Thereafter, you will undergo a series of investigations including blood count and X-rays.

Confidentiality: I assure you that all the information collected from you will be kept confidential.

Your name will not be written on any questionnaire or any report /documents that might let someone identify you. Your name will not be linked with research information in any way. All information collected on forms will be entered into computers with only the study identification number.

Confidentiality will be observed and unauthorized persons will have no access to the data collected.

Risks: We do not expect that any harm will happen to you because of participating in this study. Some questions could potentially make you feel uncomfortable. You may refuse to answer any particular question and stop the interview any time.

Right to Withdraw and Alternatives: Taking part in this study is completely voluntary. You can stop participating in this study at any time, even if you have already given your consent. Refusal to participate or withdraw from the study will not involve penalty.

Benefits: The information gathered from you will ascertain the pattern, clinical presentation and management of mandibular fractures among motorcycle victims and will therefore aid in the management of patients with this condition and plan for future preventive programmes.

Who to Contact : If you ever have questions about this study, you should contact the Principal Investigator, Dr. Beatus Stanslaus of Muhimbili University of Health and Allied Sciences, P.O. Box 65001, Dar es Salaam.

If you ever have questions about your rights as a participant, you may call Prof. S. Aboud, Director, Research and Publications, P.O. Box 65001, Telephone +255 22 2152489 Dar es Salaam and Dr Jeremiah Moshy who is the supervisor of this study.

Do You Agree? Participant agrees……Participant does not agree……

I…….have read and understand the contents in this form. My questions have been answered. I agree to participate in this study.

Signature of participant……..

Signature of Principal Investigator……

Date of Signed consent……..

KIAMBATANISHO II: FOMU YA RIDHAA – KISWAHILI

CHUO KIKU CHA SAYANSI ZA AFYA MUHIMBILI

KURUGENZI YA TAFITI NA UCHAPISHAJI

FOMU YA RIDHAA

Namba ya utambulisho…….

Ridhaa ya kushiriki kwenye utafiti

Salamu! Naitwa Dkt. Beatus Stanslaus, nashughulika kwenye utafiti huu wenye

lengo la kutathimini majeraha na matibabu katika kinywa na uso kwa wahanga wa ajali za pikipiki wanaohudhuria katika hospitali ya Taifa Muhimbili, Tanzania.

Umuhimu wa Utafiti: Utafiti huu unafanyika katika kutimiza sehemu ya matakwa ya shahada ya uzamili ya upasuaji kinywa wa Meno na Sura ya Chuo kikuu cha afya na Sayansi ya Tiba Muhimbili.

Utafiti unalenga kuchunguza sababu , dalili na majeraha na tiba kwa kuvunjika taya la chini. Unaombwa kushriki katka utafiti kutokana na upeo na ufahamu ulio nao ambavyo ni muhimu kwa utafiti huu. Tafadhali kuwa mkweli na muwazi kwa vile matokeo ya utafiti huu yanaweza yakatoa maamuzi na mapendekezo ya baadaye.

Jinsi ya Kushiriki: Ukikubali kushiriki katika utafiti huu, utasailiwa ili kuweza kujibu maswali toka kwenye dodoso lililoandaliwa kwa ajili ya utafiti huu na kisha utafanyiwa uchunguzi ambao utahusisha kuangalia maeneo ulioumia, pia utafanyiwa vipimo mbalimbali kama vile vipimo vya damu kuangalia wingi wa seli mbalimbali za damu na picha za x-ray.

Usiri: Taarifa zote zitakazo kusanywa zitaingizwa kwenye ngamizi kwa kutumia namba za utambulisho. Kutakuwa na usiri na hakuna mtu yeyote asiyehusika atakayepata taarifa zilizokusanywa.

Madhara: Hatutegemei madhara yoyote kukutokea kwa kushiriki kwako katika utafiti huu.

Faida: Kama utakubali kushiriki katika utafiti huu taarifa utakazotoa zitatuwezesha kujua ukubwa wa tatizo ambao ni muhimu katika uamuzi wa kuzuia au kupunguza tatizo.

Athari na Kutokea Madhara: Haitegemewi kupata madhara yoyote kutokana na ushiriki wako katika utafiti huu. Baadhi ya maswali yanaweza yasikupendeze, unaweza kukataa kujibu swali lolote la aina hiyo na unaweza kuamua kusimamisha udahili wakati wowote.

Uhuru wa Kushiriki na Haki ya Kujitoa: Kushiriki kwenye utafiti huu ni hiari. Unaweza kujitoa kwenye utafiti huu wakati wowote hata kama umeshajaza fomu ya ridhaa ya kushiriki utafiti huu. Kukataa kushiriki au kujitoa kwenye utafiti huu hakutaambatana na masharti yoyote.

Nani wa Kuwasiliana Naye: Kama una maswali kuhusiana na utafiti huu, wasiliana na mtafiti mkuu wa utafiti huu, Dkt. Beatus Stanslaus wa Chuo Kikuu cha Afya na Sayansi ya Tiba Muhimbili, S.L.P 65001, Dar es Salaam. Kama una swali kuhusu stahili zako kama mshiriki unaweza kumpigia Prof. S.Aboud, Mkurugenzi wa Utafiti na Uchapishaji , Chuo Kikuu cha Afya na Sayansi ya Tiba Muhimbili, S.L.P 65001 Dar es Salaam, Simu: +255 22 2152489 Dar es Salaam au msimamizi wa utafiti huu Dkt. Jeremiah Moshy.

Je umekubali? Mshiriki amekubali……. Mshiriki hajakubali……

Mimi …….nimesoma na kuelewa maelezo ya fomu hii. Maswali yangu yamejibiwa. Nakubali kushiriki katika utafiti huu.

Sahihi ya mshiriki……..
Sahihi ya mtafiti mkuu……..
Tarehe ya kutia sahihi ya idhini ya kushiriki…….

APPENDIX III: QUESTIONNAIRE-ENGLISH VERSION

DEMOGRAPHIC DATA

1. Serial No_____ 2.Date_____ 3. Hosp. Reg. No_____

4. Address: District_____ Area _____ Tel.No. _____

5. Patient type: 1.Out patient 2. In-patient

6. Age (In years) ……

7. Sex: 1. Male 2. Female

8. Residence: 1.Urban 2. Rural

9. Education level:

a) No formal education
b) Partial primary education
c) Primary education
d) Partial secondary education
e) Secondary education

6. Tertiary education

10. Marital status:

a) Single
b) Married
c) Widow
d) Widower
e) Divorced
f) Cohabiting

11. Occupation:

a) Peasant
b) Street vendor
c) Businessman
d) Employed
e) Unemployed

12. Victim:
    a) Motorcyclist
    b) Passenger
    c) Pedestrian
13. The injury occurred on: Date …../…../……..
14. At what time did the injury occur?
    a) Morning
    b) Midday
    c) Evening
    d) Night
15. Mode of injury:
    a) Head-on collision
    b) Skidded/slipped off
    c) Hit post/wall
    d) Motorcycle with other motor vehicle
16. Speed:
    a) 0-30kph
    b) 31-50kph
    c) 51-60kph
    d) 61-80kph
    e) 81-100kph
    f) >100kph
17. Riding under the influence of alcohol: a) Yes b) No
18. Riding under the influence of illicit drugs: a) Yes b) No
19. Where did the accident take place?
    a) Upcountry (Urban)
    b) Upcountry (Rural)
    c) Dar es Salaam Urban
    d) Dar es Salaam Peri Urban

20. Nature of the road during accident:
    a) Potholed rough road
    b) Smooth road
    c) Potholed tarmac road
    d) Tarmac road well maintained
21. Traffic infrastructures:
    a) Working traffic lights at road junctions
    b) Broken traffic lights at road junctions
    c) Road signs available
    d) Road signs not available
22. Number of passengers:
    a) Only one
    b) Two passengers
    c) Three passengers
    d) Four passengers
23. Use of protective gears: a) Yes b) No
24. Type of protective gears used:
    a) Helmet only
    b) Wind glasses only
    c) Wind jacket only
    d) Helmet and glasses only
    e) Helmet and jacket only
    f) Glasses and jacket only
    g) Helmet, glasses and jacket
25. Helmet users: a) Yes b) No
26. Type of helmet:
    a) Open helmet
    b) Closed helmet

27. Did you lose consciousness following the injury? a) Yes b) No

If yes

28. For how long did you lose consciousness?

a) Less than 5 minutes
b) 5-10 minutes
c) 1-6 hours
d) 6-12 hours
e) Others (Specify)…….

29. When did you first report for treatment after the injury? : date …/…/……

30. Time lag between injury and reporting for treatment was:

a) ……Minutes
b) ……Hours
c) ……Days
d) ….. Months
e) ……Years

31. If delayed, what was the reason?

a) No money for treatment cost
b) No nearby hospital
c) There was no pain
d) Am scared of treatment
e) Others (Specify)……..……

KIAMBATANISHO IV: DODOSO-KISWAHILI

TAARIFA BINAFSI

1. Namba…… 2. Tarehe……3. Namba ya Hosp…….

4. Anwani: Wilaya …….. Eneo……Namba ya simu……,

5. Aina ya mgonjwa: 1.Wa nje 2.Wa wodini

6. Umri (Miaka)…….

7. Jinsia 1. Mme 2. Mke

8. Makazi: 1.Mjini 2.Vijijini

9. Kiwango cha Elimu:

a) Hukupata elimu kabisa
b) Hakumaliza elimu ya msingi
c) Elimu ya Msingi
d) Hakumaliza elimu ya sekondari
e) Elimu ya sekondari
f) Zaidi ya sekondari

10. Hali ya ndoa:

a) Hujaoa/Hujaolewa
b) Umeoa / Umeolewa
c) Mjane
d) Mkane
e) Mtaliki/Mtalika
f) Huna ndoa ila unaishi na Mwenza

11. Kazi:

a) Mkulima
b) Mfanya biashara ndogondogo
c) Mfanya biashara
d) Muajiriwa
e) Huna kazi

12. Mhanga:
    a) Muendesha pikipiki
    b) Abiria
    c) Mtembea kwa miguu
13. Je ni lini ulipata ajali?: Tarehe …/…./….
14. Je, ni wakati gani wa siku ajali ilitokea:
    a) Asubuhi
    b) Mchana
    c) Jioni
    d) Usiku
15. Jinsi ulivyopata ajali:
    a) Kugongana uso kwa uso na pikipiki
    b) Kwa kuteleza
    c) Kugonga nguzo au ukingo
    d) Kugongana uso kwa uso na gari
16. Mwendo:
    a) 0-30 kks
    b) 31-50kks
    c) 51-60kks
    d) 61-80kks
    e) 81-100kks
    f) >100kks
17. Kunywa pombe na kuendesha a) Ndiyo b) Hapana
18. Kutumia madawa ya kulevya na kuendesha a) Ndiyo b) Hapana
19. Je, ajali ulipatia maeneo?
    a) Mkoani mjini
    b) Mkoani vijijini
    c) Dar es Salaam mjini
    d) Dar es Salaam nje ya mji

20. Hali ya barabara wakati wa ajali:
    a) Barabara ya vumbi isiyo na matengenezo
    b) Barabara ya vumbi iliyotengenezwa vizuri
    c) Barabara ya lami isiyo na matengenezo
    d) Barabara ya lami iliyotengenezwa vizuri
21. Miundo mbinu ya barabara:
    a) Taa za kuongozea magari kwenye makutano ni nzima.
    b) Taa za kuongozea magari kwenye makutano ni mbovu
    c) Alama za barabarani hakuna
    d) Alama za barabarani zipo
22. Idadi ya abiria kwenye pikipiki:
    a) Mmoja tu
    b) Wawili
    c) Watatu
    d) Wanne
23. Ulikuwa umevaa vifaa vya usalama? a) Ndiyo b) Hapana
24. Aina gani ya vifaa vya usalama ulivaa?
    a) Kofia ngumu peke yake
    b) Miwani peke yake
    c) Koti zito peke yake
    d) Kofia ngumu na miwani
    e) Kofia ngumu na koti
    f) Miwani na koti
    g) kofia ngumu, miwani na koti
25. Ulivaa kofia ngumu? a) Ndiyo b) Hapana
26. Ulivaa aina gani ya kofia ngumu?
    a) Iliyofunika kichwa na uso wote
    b) Iliyofunika kichwa na uso nusu

27. Je, ulipopata jeraha hili ulipoteza fahamu? a) Ndiyo b) Hapana

28. Kama ulipoteza fahamu je ni kwa muda gani
    a) Chini ya dakika 5
    b) Dakika 5-10
    c) Masaa 1-6
    d) Masaa 6-12
    e) Nyinginezo (Taja)
29. Je, lini ulifika hospitali kwa mara ya kwanza baada ya jeraha?: tarehe …./…./…….
30. Je, ni muda gani ulipita kabla ya kufika hospitali baada ya kupata jeraha?
    a) Dakika……
    b) Masaa…….
    c) Siku……
    d) Miezi……..
    e) Miaka…….
31. Kama ulichelewa, sababu gani ilikucheleweshа?
    a) Hana pesa za nauli na kulipia matibabu
    b) Hakuna hospitali ya karibu
    c) Hakua na maumivu
    d) Anaogopa matibabu
    e) Nyinginezo (Taja)…….……

APPENDIX V: CLINICAL EXAMINATION FORM

Clinical Presentation

Swelling	1 Yes	2No
Laceration	1 Yes	2No
Ecchymosis	1 Yes	2No
Fractured teeth	1 Yes	2No
Malocclusion	1 Yes	2No
Pain	1 Yes	2No
Numbness	1 Yes	2No
Step deformity	1 Yes	2No
Bone crepitus	1 Yes	2No
Impaired swallowing	1 Yes	2No

Maxillofacial fractures

Le Fort I	1 Yes	2 No
Le Fort II	1 Yes	2 No
Le Fort III	1 Yes	2 No
Nasal	1 Yes	2 No
Naso-orbital-ethmoidal	1 Yes	2 No
Zygomatic complex	1 Yes	2 No
Orbital	1 Yes	2 No
Infraorbital rim	1 Yes	2 No
Frontal bone	1 Yes	2 No

Mandibular fractures

Alveolar bone:	1 Yes	2 No
Symphysis:	1Yes	2No
Parasymphysis:	1Yes	2No
Body:	1Yes	2No
Angle:	1Yes	2No
Ramus:	1 Yes	2No

Condyle:	1 Yes	2No
Coronoid process:	1 Yes	2No
Simple fracture:	1 Yes	2No
Compound fracture:	1 Yes	2No

RADIOLOGY FORM

Postero-anterior view skull	1 Fracture	2 No fracture
Waters View skull	1 Fracture	2 No fracture
Orthopantomography (OPG)	1 Fracture	2 No fracture
Lateral view skull	1 Fracture	2 No fracture
Townes view skull	1 Fracture	2 No Fracture
CT scan	1 Fracture	2 No Fracture

TREATMENT NEEDS

Tetanus Toxoid (TT)	1Yes	2No
Bleeding Control	1 Yes	2No
Intravenous fluids	1 Yes	2No
Blood transfusion	1 Yes	2 No
Surgical airway	1 Yes	2 No
Surgical wound toilet	1 Yes	2 No
Wound suturing	1 Yes	2 No
Teeth extraction	1 Yes	2 No
Analgesics	1Yes	2 No
Antibiotics	1 Yes	2 No
Alveolar bone splinting	1 Yes	2 No
Intermaxillary fixation (IMF)	1 Yes	2 No
Open reduction Immobilization and fixation	1 Yes	2 No
Open reduction and bone reconstruction	1 Yes	2 No

APPENDIX VI: ILLUSTRATIONS

Figure 1: Pre-operative orthopantomography showing bilateral mandibular fractures (left subcondylar and right parasymphysis region).

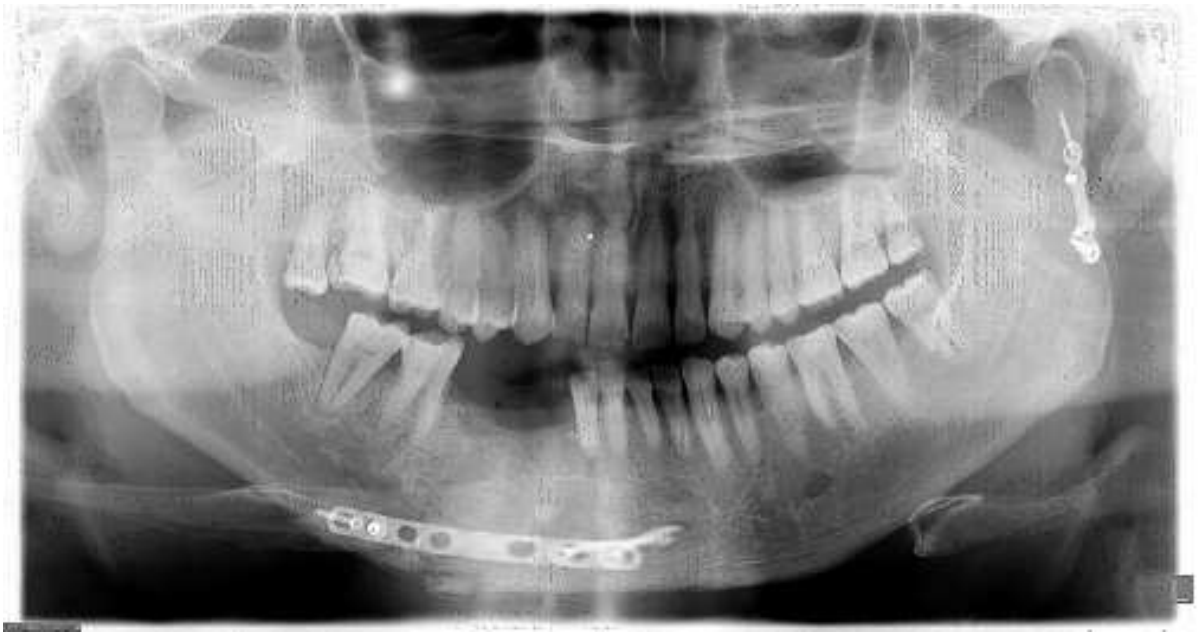

Figure 2: Post-operative orthopantomography showing mandibular fracture plates (Left subcondylar mini-plate 1.6mm and right load bearing 2.4mm).