THE BURDEN OF INJURY AND RESOURCES AVAILABILITY FOR EMERGENCY CARE OF PATIENTS PRESENTING WITH INJURY TO DAR ES SALAAM REGIONAL REFERRAL HOSPITALS

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By

HASSAN RIZIKI

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Medicine (Emergency Medicine) of the Muhimbili University of Health and Allied Sciences.

July, 2020

CERTIFICATION

The undersigned certifies that he has read and hereby recommended for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled: "T**he burden of injury and resources availability for emergency care of patients presenting with injury to Dar es salaam regional referral Hospitals"**, in partial fulfillment of the requirements for the degree of Master of Medicine (Emergency Medicine) of the Muhimbili University of Health and Allied Sciences (MUHAS), Dar es Salaam, Tanzania.

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Dr. Hendry Sawe

Supervisor

_____

Date

DECLARATION AND COPYRIGHT

I, **HASSAN RIZIKI**, 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 _____

DEDICATION

To my family

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LIST OF ABBREVIATIONS

- CPR- Cardio-Pulmonary Resuscitation
- EAC- East African Community
- ED- Emergency Department
- EMD- Emergency Medicine Department
- GCS- Glasgow Coma Scale
- GDP- Gross Domestic Product
- IATSIC- International Association for Trauma and Intensive care
- ICU- Intensive Care Unit
- ISS- Injury Severity Score
- IVF- Intravenous Fluid
- LMIC – Low and Middle Income Countries
- MNH- Muhimbili National Hospital
- MUHAS- Muhimbili University of Health and Allied Sciences
- RTI- Road traffic injury
- WHO- World Health Organization
- RRH- Regional referral hospital

ABSTRACT

Introduction: Emergency care for trauma patients is an important component of health care systems especially in low and middle income countries (LMIC), this is due to fact that these countries are facing huge trauma burden due to high level of injuries. However the capacity of many African health institutions in terms of equipments and skilled trained health personnel in trauma management is widely unexplored.

Aim of the Study: To determine the burden of injury and resources availability for emergency care of patients presenting with injury to Dar es Salaam regional referral hospitals (DRRH), these are Amana, Mwananyamala and Temeke regional referral hospitals)

Methods and Material: Was prospective observational cohort study done between the periods of October 2019 through December 2019 targeting all patients involved in any sort of injury presented in emergency units of Dar-es-salaam regional referral hospitals, (these are Amana, Mwananyamala and Temeke regional referral hospitals), with the accessible population being those who sustained any type of injury presenting to emergency department of any of the Dar-es-salaam regional referral hospital. Patient's demographics, injury characteristics, management strategies and disposition, reasons for referrals and the resources available on emergency care of patient with injury **were** recorded. The sampling technique **was** convenience simple random. The data **was** analyzed with STATAv13 (StataCorp, College Station, TX, USA) statistical software. Descriptive statistics, including means, standard deviations, medians, and ranges **were** calculated**.**

Results: A total of 8197 patients were seen in DRRH. Of these patients, 2462 (30%) presented with trauma-related complaints. Among patients with trauma-related complaints, 471 (78.5%) were male, and the overall median age of 30 (interquartile range of 24–38) years. Motor vehicle accidents were the most common type of injury mechanism, accounting for 387(64.5%) complaints. External and extremities injuries were the two most frequent pattern of injuries, with a 355 (59%) and 155 (26%) cases respectively. Most of the patients 416 (69%) were discharged, 10 (2%) admitted to the ward and 174 (29%) of patients were referred to MNH. At Amana only 45% of the essential equipments for airway opening and protection, 43% for oxygenation and ventilation, and 55% for monitoring and treatment were available. While at Temeke only 27% of the essential equipments for airway opening and protection, 57% for oxygenation and ventilation, and 55% for monitoring and treatment only were available. The availability at Mwananyamala was, 54% for the essential equipments for airway opening and protection, 57% for oxygenation and ventilation, and 55% for monitoring and treatment. Only 8 (47%) out of 17 categories of the required trauma care supporting personnel were available in all three emergency departments of DRRH. None of the emergency departments was staffed with Emergency physician.

Conclusion: Patients with trauma related complain impose a significant burden on emergency departments of DRRH. The burden is compounded with low resources availability in these hospitals, in terms of essentials equipments and supportive personnel/staff for emergency care of trauma patients.

DEFINITION OF KEY TERMS

- **Disability adjusted life years (DALY) -** the sum of years of potential life lost due to premature mortality and the years of productive life lost due to disability.(1)
- **Low income countries-** countries with per capita income below $400 defined by the World Bank
- **Middle income countries-** countries with per capita income between $400 and $4000defined by the World Bank
- **Road traffic fatalities-** crashes on the road ways that ends the life of a person.(1)
- **Road traffic injury-** a collision or incident that leads to injury, occurring on a public road and involving at least one moving vehicle OR fatal or non-fatal injuries incurred as a result of a road traffic crash.(1)
- **Sub-Saharan countries-** geographically the area of the continent of Africa that lies south of the Sahara either fully or partially.(1)
- **Trauma related deaths-** cessation of biological function/ life potentially caused by an injury.(1)
- **Regional referral hospital-**a level 2 hospital which provide a hospital services for the entire region.(1)

INTRODUCTION

Emergency trauma care is an important component of health care systems especially in low and middle income countries (LMIC). This is due to the highest level and increasing burden of injuries in the low and middle income countries (LMIC) (2). Injuries in low and middle income (LMIC) countries accounting the same number of deaths as HIV, TB and malaria combined (2).

The treatment and care of the injured patients in many African countries is generally poor. Victims with treatable injury lesions are six times more likely to die than in a developed country (1). The increased burden of injuries in African countries generally is due to the lack trauma care systems based on reliable and affordable guidelines (3). Despite the increasing of burden of trauma in the Low and middle and middle income countries, the trauma system and preparedness for treating trauma patients is inadequate, contributing further more to death and disability(4).

Most of the emergency health system strengthening effort in Africa has been focused on improving services at Pre- hospital and First or Tertiary level hospital. This is proved by most of the emergency medicine department and emergency medicine residency training program are located at first level hospital in Africa(5). With the second level hospital being overlooked during expansion and capacity buildings programs, yet they play a very important role in many of Low and middle income countries healthcare systems (6).

Second-level hospitals are in a challenging position in the healthcare hierarchy of LMICs. They receive patients referred from district-level hospitals, many of whom have had prolonged pre-hospital times, were under-resuscitated and arrive in urgent need of prompt diagnosis and treatment to avert preventable death and disability. However, some advanced diagnostics and definitive care items are infrequently available at these facilities (e.g. computed tomography scan, neurosurgery), requiring safe transfer to higher levels of care. Despite the integral role these hospitals occupy in LMIC emergency systems, emergency care capacity assessments at second level facilities are underrepresented in the literature. (7)

The capacity of many African health institutions in terms of the provision of equipment and skilled trained health personnel in trauma management is widely unexplored. (8). It has been estimated that the adoption of appropriate measure for trauma care would potentially save the lives of 1.5 -2.0 million people each year. This is nearly equal to 40% of all injury related death.(9)

Tanzania is among the low income country in sub-Saharan Africa with an estimated 10% of injury related complain.(10) . The leading cause of injuries is Motor traffic injuries and most of the victims are male.(10–12). Most of the injuries occur in urban area and the trend is estimated to increase due to increase of urbanization, and poor infrastructure.(2) Injuries and death from Road traffic crash (RTCs) are expected to increase if no preventive measures are taken.

In Tanzania, there are different levels of hospitals ranging from the health centers with limited resources and staffed by non-physicians with a diploma in clinical medicine, to the regional hospitals with more resources and specialist care. Most of the patients receive health care through public system, which is provided through a pyramidal structure from dispensary, health centre, district hospital, regional hospital and consultant hospitals. There is no formal pre- hospital system, and with many of these hospitals lacks in-hospital trauma care system. (13) Furthermore the exactly injury burden experienced by these hospitals and their capacity for taking care an injured patient is not well known.

The World Health Organization (WHO) in collaboration with the International Association for Trauma and Intensive care (IATSIC) has developed and recommended the use of The Essential Trauma Care project to provides guidelines to help improve trauma care in low and middle income countries through recommendations of the essential minimum requirements of human, physical, and organizational resources where there is no formal trauma system. (1, 2). The WHO essential trauma care guideline categorizes human and physical resources (infrastructure, equipment and supplies) that are necessary for provision of care at different levels of health facilities. The lower level health facilities are expected have less health care providers, and hence perform fewer interventions as compared to the higher-level health facilities.

PROBLEM STATEMENT

Trauma is among of the top contributor of morbidity and mortality worldwide. The trauma burden is more severe in Low income countries especially in place of increasing urbanization.(2)Tanzania is among the low income countries in sub-Saharan Africa, with a reported 10% prevalence of injury related complain of the overall complains of patients presenting to acute intake areas and emergency departments of the districts and regional hospitals in Tanzania(10). Most of the injuries occur in urban area and the trend is estimated to increase due to increase of urbanization, and poor infrastructure (2). Most of the patients receive health care through public system, which is provided through a pyramidal structure from dispensary, health Centre, district hospital, regional hospital and consultant hospitals. There is no formal pre-hospital system, and with many of these hospitals lacks in-hospital trauma care system.(13) Furthermore the exactly injury burned experienced by these hospitals and their capacity for taking care an injured patient is not well known.

RATIONALE FOR THE STUDY

The burden of trauma is increasing worldwide. More increase is expected in developing countries due to increase motorization especially in urban areas. (1)

Tanzania as a developing country has seen increasing rate of trauma patients seeking health care due to increase in motorization and urbanizations of her cities. Yet very little is known regarding the burden and resources available on management and treatment of trauma patients on urban hospitals. This study will help significantly to fill the gap in terms of knowledge and practice on burden imposed by trauma patients on emergency departments of DRRH, and resources available at these emergency departments for managing patient with injuries.

CONCEPTUAL FRAMEWORK

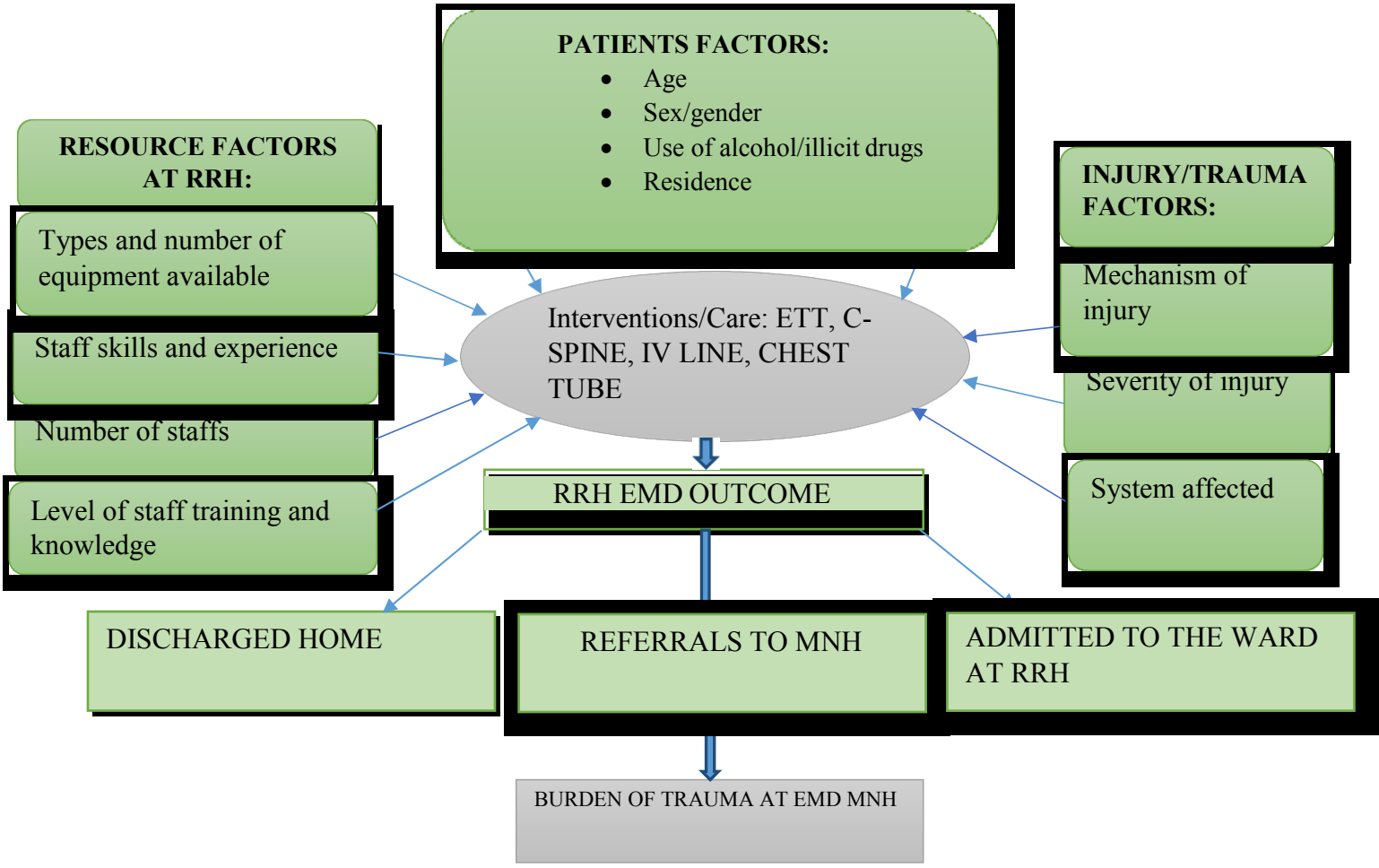

Figure 1: Conceptual framework

The Injury factors (severity of injury, mechanism of injury and system affected) together with the demographic characteristic of patient (pediatric patient, pregnant mother, how close a patient reside to the RRH, knowledge of the patient on the injury and its management, was the trauma influenced by use of alcohol/illicit drug) will determine the type of emergency interventions the patient received depending on the resources available (Types and number of equipment available, number of staffs, their level of training, skills and experience), at the emergency unit of RRH. The outcome of the patient at RRH emergency unit will determine the referral characteristics (lack of equipment; example mechanical ventilation, lack of expertise; example pediatric surgeon, lack of ICU care) and number of referrals. The number of referrals will affect the burden of trauma at Emergency Medicine Department at Muhimbili National Hospital (7, 14–16).

RESEARCH QUESTION

What is the burden of injury and resources availability for emergency care of patients presenting with injury to Dar es Salaam regional referral hospitals?

BROAD OBJECTIVE

To determine the burden of injury and resources availability for emergency care of patients presenting with injury to Dar es salaam regional referral hospitals

SPECIFIC OBJECTIVES

1. To determine prevalence of injury among patients presenting to the emergency departments of Dar es salaam regional referral hospitals

2. To describe patterns of injury among patients presenting to the emergency departments of Dar es salaam regional referral hospitals

3. To characterize management strategies and disposition of patients presenting with injuries to the emergency departments of Dar es salaam regional referral hospitals

4. To determine the reasons for referral of patients presenting with injuries to the emergency departments of Dar es salaam regional referral hospitals

5. To describe the available resources of the care of patients presenting with injuries to the emergency departments of Dar es salaam regional referral hospitals

LITERATURE REVIEW

Burden of trauma worldwide

Trauma is becoming a serious health problem throughout the world. Is the one of leading causes of death and disability worldwide. More than 5 million people die each year as a result of injuries and account for 9% of world death. (2).Injuries in low and middle income countries (LMIC) accounting the same number of deaths as HIV, TB and malaria combined.(2) Furthermore injuries are responsible for around 6% estimate of all the years lived with disability worldwide. (2). The death related to injuries is more in developing countries than Developed countries. WHO estimated about 90% of injury related death occur in low and middle income countries. (2)

Burden of trauma in Africa

African countries especially sub Saharan Africa have high rate of injury related deaths. The treatment and care of the injured patients in many African countries is generally poor. Victims with treatable injury lesions are six times more likely to die than in a developed country (17). The Essential Trauma Care (ETC) project shows there are very low presence of skills, resources, and organizational capacity in areas with the highest level of injuries in developing countries.(1). The increased burden of injuries in African countries generally is due to the lack trauma care systems based on reliable and affordable guidelines.(3). The capacity of many African health institutions in terms of the provision of equipment and skilled trained health personnel is widely unexplored.(8)

Burden of Trauma in Tanzania.

Injuries and death from RTCs are expected to increase if no preventive measures are taken Most of the patients receive health care through public system, which is provided through a pyramidal structure from dispensary, health centre, district hospital, regional hospital and consultant hospitals. There is no formal pre-hospital system, and with many of these hospitals lacks in-hospital trauma care system. (13) Furthermore the exactly injury burned experienced by these hospitals and their capacity for taking care an injured patient is not well known. WHO has recommended the use of The Essential Trauma Care project to provides guidelines to help improve trauma care in low and middle income countries through recommendations of the essential minimum requirements of human, physical, and organizational resources where there is no formal trauma system.(2)

Prevalence of Trauma

In 2013, 973 million (uncertainty interval (UI) 942 to 993) people sustained injuries that warranted some type of healthcare and 4.8 million (UI 4.5 to 5.1) people died from injuries. Between 1990 and 2013 the global age-standardized injury DALY rate decreased by 31% (UI 26% to 35%). The rate of decline in DALY rates was significant for 22 cause-of-injury categories, including all the major injuries (18).

From the study done by Sawe et al on; Trauma burden in Tanzania: a one-day survey of all district and regional public hospitals of these patients, reported 508 (9.7%) presented with trauma-related complaints. Among patients with trauma-related complaints, 286 (56.3%) were male, and the overall median age of 30 (interquartile range of 22–35) years.(10)

Injury Characteristics

A study on: Factors associated with road traffic injuries in Tanzania done by Respicious Boniface et al a total of 4675 road traffic injury patients were seen in studied hospitals, 76.6% were males. Majority (70.2%) were between 18 - 45 years age group. Motorcycles were the leading cause of road traffic crashes (53.4%), and drivers (38.3%) accounted for majority of victims. Fractures accounted for 34.1%, and injuries were severe in 2.2% as determined by the Kampala trauma score II (KTS II)(11).

Again from the study done by Sawe et al on; Trauma burden in Tanzania: a one-day survey of all district and regional public hospitals, road traffic crash was the most common mechanism of injury, accounting for 227 (44.7%) complaints. Open wounds and bone fractures were the two most frequent diagnoses, with a combined 300 (59%) cases (10).

A study on Injury characteristics and outcome of road traffic crash victims at Bugando Medical Centre in Northwestern Tanzania, reported the majority of road traffic crash victims. Motorcycle (58.8%) was responsible for the majority of road traffic crashes. Musculoskeletal (60.5%) and the head (52.1%) were the most common body region injured. Open wounds (65.9%) and fractures (26.3%) were the most common type of injuries sustained (12).

Management strategies and disposition

A study on: Factors associated with road traffic injuries in Tanzania done by Respicious Boniface et al; reported majorities of the patients 57.4% were admitted and 2.2% died at the casualty. Factors associated with mortality were; using police vehicles to hospital (P = 0.000), receiving medical attention within 2 to 10 hours after injury (P = 0.000), 18 - 45 years age group (P = 0.019), not using helmet (P = 0.007), severe injuries (P = 0.000) and sustaining multiple injury (P = 0.000)(11)

Again from the study done by Sawe et al on; Trauma burden in Tanzania: a one-day survey of all district and regional public hospitals Most of the patients - 325 (64%) - were discharged, 11 (2.2%) went to operating theatres and 4 (0.8%) of patients died while receiving care at the acute intake areas (10).

A study on Injury characteristics and outcome of road traffic crash victims at Bugando Medical Centre in Northwestern Tanzania also reported, the majority of patients (80.3%) were treated surgically. Wound debridement was the most common procedure performed in 81.2% of the patients. The complication rate was 23.7%. The overall average length of hospital stay (LOS) was 23.5 ± 12.3 days. Mortality rate was 17.5%. Patients who had severe trauma (Kampala Trauma Score II ≤ 6) and those with long bone fractures stayed longer in the hospital and this was significant (P < 0.001) whereas the age of the patient, severe trauma (Kampala Trauma Score II ≤ 6), admission Systolic Blood Pressure < 90 mmHg and severe head injury (Glasgow Coma Score = 3-8) significantly influenced mortality (P < 0.001)(12).

From the study Pre-referral stabilization and compliance with WHO guidelines for trauma care among adult patients referred to an urban emergency department of a tertiary referral hospital in Tanzania reported that of those enrolled,50 (13.6%) patients had received at least one stabilization intervention prior to transfer to MNH. Among 206 patients with extremity injuries, splinting was inadequate or missing in all cases; No patients with head injury received cervical spine protection. Among patients referred from a health center, 26.9% received an initial stabilization, while stabilization procedures were administered to 13.2% of those from district hospitals, and 10% of those from regional hospitals (19).

Available resources of the care of the patient presenting with injuries

From the study Compliance of District Hospitals in the Center Region of Cameroon with WHO/IATSIC Guidelines for the Care of the Injured: A Cross-Sectional Analysis it reported that all hospitals surveyed had at least one doctor available. Each reported treating a mean of 338 ± 214 injury cases every year. Most hospitals (n = 22) were globally either not compliant or partly compliant with the guidelines. Staff generally had received the appropriate basic training but had no additional training specifically directed toward trauma management. Skills for managing specific injuries (e.g., chest injuries) were poor. Availability and utilization of equipment was globally inadequate, and organizational capabilities were almost nonexistent.(3)

From a study; A review of existing trauma and musculoskeletal impairment (TMSI) care capacity in East, Central, and Southern Africa, It reported that Data were collected from 267 out of 992 (27%) hospitals, including 185 district hospitals and 82 referral hospitals. Formal accident and emergency departments were present in 31% of hospitals. Most hospitals had no general or orthopedic surgeons or medically-qualified anesthetists on staff. Functioning mobile C-arm X-ray machines were available in only 4% of district and 27% of referral hospitals; CT scanning was available in only 3% and 26%, respectively. Closed fracture treatment was offered in 72% of the hospitals. While 20% of district and 49% of referral hospitals reported adequate instruments for the surgical treatment of fractures, only 4% and 10%, respectively, had a sustainable supply of fracture implants. Elective orthopedic surgery was offered in 29% and Ponseti treatment of clubfoot was available at 42% of the hospitals (8).

A study; Availability of resources for emergency care at a second-level hospital in Ghana: A mixed methods assessment revealed marked deficiencies in many essential items and services. However, several successes were identified, such as laboratory capacity. Among the unavailable essential items, some were of low-cost, such as basic airway supplies, chest tubes and several emergency medications. Themes from staff responses when asked how to improve emergency care included: provide periodic training, increase bed numbers in the emergency unit, ensure availability of essential items and make personal protective equipment available for all staff caring for patients(7).

In contrast from a study Evaluation of Resources Necessary for Provision of Trauma Care in Botswana: An Initiative for a Local System. It reported necessary consumables, well

Infrastructure, adequate numbers of personnel and rehabilitation services were identified all meeting or exceeding ETC recommendations. Deficiencies were noted in staff knowledge of initial trauma care, district hospital capability to provide essential surgery, and the organization of trauma care (20) .

METHODOLOGY

Study area

The study was done at emergency departments of Dar –es- salaam Regional Referral hospitals (RRH) that is Mwananyamala, Amana and Temeke referrals hospitals**.** Mwananyamala Regional Referral hospital is located in Kinondoni District and provides coverage of health services for Kinondoni district. The hospital has 254 bed capacity and 342 numbers of staffs. The hospital is made up of the following Departments, Internal medicines, Surgery, Pediatrics, Obstetrics and Gynecology, Outpatient Department, Administration and other units like Radiology ,Laboratory ,mortuary, preventive , RCH Clinic, Oral Health services, Eye services, Diabetes Clinic, TB/LEP, Mental Health Unit, HIV/AIDS Care and Treatment clinic (CTC), Physiotherapy, Pharmacy ,VCT services, geriatric clinic and National Health Insurance Fund.

Amana Regional Referral Hospital is a regional referral hospital for Ilala municipal council located along Uhuru road in Ilala ward. Its catchment population is estimated to be 1,220,611 according to 2012 National population census. Amana RRH is a referral health facility for 28 public, 168 private, 7 parastatal and 26 FBOs health facilities in Ilala Municipal council. The Hospital departments include Administration, OPD, emergency services, Laboratory, Radiology, Surgery, Pharmacy, Ophthalmology, and Dentistry, Preventive services, Dermatology, Pediatrics, Obstetrics & Gynecology, Orthopedic and trauma, Physiotherapy, CTC, Internal medicine, Physiotherapy, CSSD, Mortuary, Dental, psychiatry and Social Welfare services. The outpatient attendance ranges from 800-1200 per day while the inpatient ranges from 370-390 per day.

Temeke Regional Referral Hospital is located in Temeke Municipality in Dar es Salaam City. It is serving the Temeke population which is estimated to be 1,691,646. The hospital is made up of the following Departments, Internal medicines, Surgery, Pediatrics, Obstetrics and Gynecology, Outpatient Department, Administration and other units like Radiology ,Laboratory ,mortuary, preventive , RCH Clinic, Oral Health services, Eye services, Diabetes Clinic, TB/LEP, Mental Health Unit, HIV/AIDS Care and Treatment clinic (CTC), Physiotherapy, Pharmacy ,VCT services, geriatric clinic and National Health Insurance Fund

All three Regional Referral Hospitals are referring patient to Muhimbili National Hospital.

Study design:

Was two parties study**;**

-A prospective observational cohort study for the burden imposed by patients presented with injury to Dar es Salaam regional referral hospitals. The study was done for three month from October 2019 to December 2019.

-A single day survey study on the resources and personnel availability for emergency care of patients presented with injury on Dar es Salaam regional referral hospitals.

Target Population:

All patients received emergency care for injury in all regional referral hospitals in Tanzania and resources capacity of all regional referral hospitals in Tanzania on emergency care of patient with injury.

Accessible Population:

All the patients presented with injury related complain and the resources available at emergency departments of Mwananyamala, Amana and Temeke referral hospitals.

Study population:

All the trauma patients from those with minor injuries to the severely ill ones, presented at emergency departments of Mwananyamala, Amana and Temeke regional referral hospitals during the study period, and the resources available at these departments for emergency care of patients with injuries.

Sampling Design

Consecutive convenience sampling technique was used to enroll all patients presenting with injury who meet the inclusion criteria during the study period. The data was collected within 24hours everyday including weekend and public holidays during both day and night shifts**.** Data was gathered during the same time as the patient was seen at emergency department. The sources of information were the existing computerized systems for primarily managing the trauma patient presented at Amana, Temeke and Mwananyamala regional referral hospitals. The missing information in the system was rechecked and clarified with the attending doctor before the patient leave the emergency department.

Subjects selection criteria

Inclusion criteria

All the patients presented with injury at emergency departments of Mwananyamala, Amana and Temeke referral hospitals.

Exclusion criteria

All patients who presented at emergency departments of Mwananyamala, Amana and Temeke referral with the following characteristics:

- All non-trauma (without injury related complains) patients.
- All trauma patients with missed information /data.
- All trauma patients who were already dead on arrival at emergency department

Variables

Predictors' variables

- Demographic data: Age, sex, mode of arrival and occupation
- Injury timing, location, mechanism and severity(life threatening injuries, potentially disabling injuries, and pain and psychological injuries)
- Physiologic parameters (Blood pressure, respiratory rate, saturation, heart rate, blood glucose and temperature, Glasgow coma score)
- Pre-referral stabilization care provided (IV placement, IV fluids, splinting, neck-collar, suturing, intubation, surgery, chest tube placement, catheterizations, analgesia, tetanus, antibiotics)
- Resources available in terms of human resources(staffing, their knowledge and skills) and physical resources (equipments and supplies)

Outcome variables

- Outcome at emergency department(died, lose organ or survives)and Length of stay
- Disposition status(discharged home, admitted, went to theatre or referred)
- Reasons of referral

Sample size estimation

From the study of Pre hospital stabilization and compliance with WHO guidelines for trauma care among adults patients referred to an urban emergency department of tertiary hospital in Tanzania.Which was done by Nanyori J. lucumay et al and published on BMC Emergency Medicine 2019. It reports a proportion of 14.1% of trauma patients being referred from regional hospital to Muhimbili National hospital.

Using this study, the calculation of sample size was as follows:

Sample size: $\mathbf{N = 4Z\alpha^2P\ (1\text{-}P)/\ (W^2)}$

Whereby:

N= Minimum required sample size

Zα= Standard normal deviation for α. A level of confidence of 95% will be chosen for this study.

P= Expected proportion with the characteristic of interest, which is referrals from regional hospitals to Muhimbili National hospital

W= Total Width of confidence interval. A width of 10% is chosen for this study.

Therefore minimum sample size calculated will be:

$\mathbf{N = 4X1.96^2\ X\ 52\ (48)\ /\ (10^2)}$

N= <u>202</u>

Therefore a minimum of 202 patients with an injury was needed from each Regional Referral Hospital. That is Mwananyamala, Amana and Temeke regional referral hospital.

DATA MANAGEMENT

Data collection:

Research assistants were thoroughly trained prior to the commencement of data collection to which patients they should recruit. Started by screening of all patients who were attended at emergency department. All patients with non trauma related complaint, and those with trauma related complain but meet the exclusion criteria were excluded from the study. Any patient regardless of his/hers sex and age, with injury related complain presented at emergency department of Amana, Temeke or Mwananyamala RRH was recruited in the study. A data collecting sheet was used to collect the data prospectively as patients arrive in the ED until they leave the ED. The data was collected within 24hours everyday including weekend and public holidays during both day and night shifts**.** Data was gathered during the same time as the patient was seen at emergency department. The sources of information were an existing computerized system for primarily managing the trauma patient presented at emergency departments of Amana Temeke and Mwananyamala regional referral hospitals. The missing information in the system was rechecked and clarified with the attending doctor before the patient leave the emergency department.

The data for the availability of equipment and supportive staff for emergency care of trauma patient at these departments was collected using a structured checklist (see appendix 1) adopted from WHO guidelines for essentials trauma care (ETC)(1). Each equipment on the checklist was assessed and then put into one of the following two categories:

- Absent or present but not working was given 0
- Present and working was given 1

Items were physically assessed including expiry dates and working conditions. For example, if a procedure was not performed because equipment was waiting for repairs, it was scored as 0.If they had equipment but it had never been used because none of the staff knew how to use it, it was scored as 0. Availability of staff was assessed through the head of the emergency department /or matron and human resources office; their availability immediately on the hospital during working hours or after hours (as defined by the Tanzanian Government) was recorded

Validity and Reliability of the tool

Data collection was done using purpose designed CRF and all measurements were repeated twice to ensure reliability, and the researcher has review part of CRF (at least 20%)and calculation of the kappa for inter-observer agreement was done to ensure validity of the data collection process. The data was transferred from hand written standardized data collection form into online Research Electronic Data Capture (RED Cap, Version 6.0.1 Vandbilt University, Tennessee, USA), every day during the collection. The principal investigator has overseen the data check to ensure accuracy and quality of the data**.**

Data analysis:

The data from RedCap (Version 6.0.1, Vanderbilt University, Tennessee, USA) **was** exported into and Excel file (Microsoft corporation, Redmond, WA, USA) then imported and analyzed with STATAv13 (Stata Corp, College Station, TX, USA) statistical software. Procedure, frequency and univariate functions were performed to check for any outliers and clean the dataset. Descriptive statistics was used for all the objectives, means and standard deviations **were** calculated for the normally distributed data, medians and ranges **were** calculated for the skewed data.

The prevalence of injury among patients presenting to the emergency departments was calculated as a proportion of injured patients amongst all patients. The characteristics and pattern of injury was calculated as proportions of mechanism of injury and the system affected of the injured patients among the all injured patients. The management strategies were grouped as emergency, supportive and definitive with the proportion of each management strategy being calculated among the all injured patients. The referral factors were grouped as lack of expertise, lack of equipments, severity of injury and system affected. Proportion of all referrals was calculated among all injured patients, and the proportion of each factor was calculated among all referrals. The resources availability was checked against the recommended WHO and IATSIC standard, and the proportion of each human and equipment resource available was calculated against the recommended standard.

ETHICAL CLEARENCE

Ethical approval was obtained from the Muhimbili University of Health and Allied Sciences Research Committee. Permissions to collect data were obtained from Amana, Temeke and Mwananyamala regional referral hospitals. Waiver of consent was permitted as there was no direct patient intervention, the sources of information /data was secondary from the patient's files**,** and all the data was stored in a de-identified format to ensure no breach of confidentiality.

RESULTS

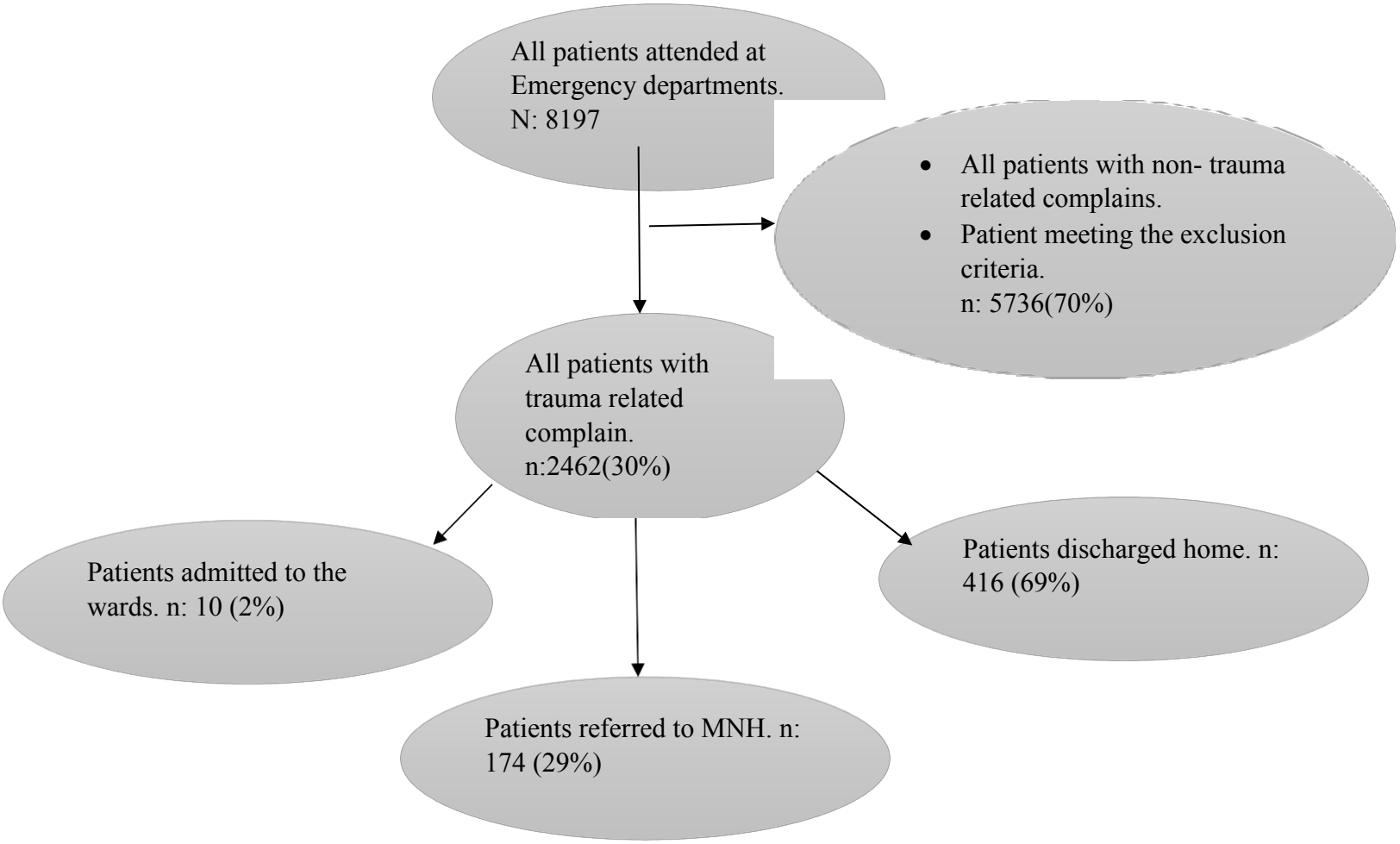

Figure 2: Flow diagram:

In this study a total of 8197 patients were attended in all of the three emergency departments of Dar-es-salaam RRH. After excluding **5736 patients** with non trauma related complains and trauma patients who meet the exclusion criteria, a total of 2462 patients with trauma related complain remains. Then 600 patients was conveniently sampled and enrolled in the study.

Prevalence of injury among patients presenting to the emergency departments of Dar es Salaam regional referral hospitals

During the study period, the total numbers of 8197patients were seen at Emergency departments of Dar-es-salaam regional referral hospitals. Of these 2462 (30 %) patients are those who sustained various types of trauma. The median age was 30 years (Interquartile range 24–38 years), and 471 (78.5%) were male. Table 1

At Mwananyamala Regional Referral hospital (RRH), the total numbers of 2114 patients were seen at Emergency department of Of these 940 (44.5 %) patients are those who sustained various types of trauma.The median age was 30 years (Interquartile range 24–38 years), and 146 (78%) were male. Table 1

At Temeke Regional Referral hospital (RRH) a total number of 2732 patients were seen a in Emergency department during a study period. Of these 891(32%) patients are those who sustained various types of trauma. The median age was 30 years (Interquartile range 23-37 years), and 158 (79%) were male. Table 1

At Amana Regional Referral hospital (RRH) at total number of 3351 patients were seen in Emergency department during a study period. Of these 631 (18.8%) patients are those who sustained various types of trauma.The median age was 30 years (Interquartile range 24–38years), and 157 (78.5%) were male. Table 1

Table 1: DEMOGRAPHICS

PATIENTS CHARACTERISTIC	**DRRH Overall**	**Amana**	**Temeke**	**Mwananyamala**
All patients. N	8197	3351	2732	2114
Trauma patients. n(%)	2462(30%)	631(18.8%)	891(32%)	940(44.5%)
Sex: Male n (%)	471(78.5%)	157(78.5%)	158(79%)	156(78%)
Age: Median (IQR) years	30(24-38)	30(24-38)	30(23-37)	30(24-38)
Age Group	**n(%)**	**%**	**%**	**%**
< 5 Years	11(2)	3	2.5	0.5
5-15 years	35(6)	10.5	3.5	4
16-55 years	523(87)	79.5	90.5	91
> 55 years	31(5)	7	3.5	4.5
Occupation	**n (%)**	**%**	**%**	**%**
Skilled work	125(21)	17.2	27.5	16
Non skilled work	395(66)	67.1	41.5	75
Student	80(13)	15.7	14	9

Patterns of injury among patients presenting to the emergency departments of Dar es salaam regional referral hospitals

Motor vehicle accidents were the most common type of injury mechanism in all the three hospitals. With most injuries being sustained on external parts of the body and extremities. There is slightly increase in patients number during the night times than the day.

Table 2: PATTERNS OF INJURY

INJURY CHARACTERISTICS	DRRH OVERAL N (%)	AMANA n (%)	TEMEKE n (%)	MWANANYAMALA n (%)
Time of injury				
Day	277(46)	89(44.5)	97(48.0)	91(45.5)
Night	323(54)	111(55.5)	103(51.1)	109(54.5)
Mechanism of injury				
Motor vehicle accident	387(64.5)	127(64.5)	136(68)	124(62)
Fall	61(10)	25(12)	19(9.5)	17(8.5)
Assault	129(21.5)	38(18.5)	39(19.5)	52(26)
Animal bite	5(1)	3(1.5)	0(0)	2(1)
Burn	18(3)	7(3.5)	6(3)	5(2.5)
Pattern of injury /system				
Head or neck (including cervical spine)	54(9)	20(10)	16(8)	18(9)
Face (including skeleton, nose, mouth, eyes and ears)	14(2)	5(2.5)	4(2)	5(2.5)
External injury	355(59)	133(66.5)	115(57.5)	107(53.5)
Abdomen or pelvic contents	0(0)	0(0)	0(0)	0(0)
Chest (including thoracic spine and diaphragm)	5(1)	1(0.5)	2(1)	2(1)
Extremities or pelvic girdle	155(26)	40(20)	55(27.5)	60(30)
Multisystem/polytrauma	17(2)	1(0.5)	8(4)	8(4)

Management strategies of patients presenting with injuries to the emergency departments of Dar es Salaam regional referral hospitals.

Most of trauma patients attended at Dar-es-salaam regional referral hospitals received adequate amount of primary stabilization, in terms of emergency airway, breathing, circulation and disability stabilization. Nevertheless about one third of the trauma patients did not received injury stabilization or definitive trauma care treatment at emergency department before disposition. Table 3

Table 3: MANAGEMENT STRATEGIES

MANAGEMENT STRATEGY	DRRH OVERAL Done N (%)	AMANA Done n (%)	TEMEKE Done n (%)	MWANANYAMALA Done n (%)
Primary survey:				
Airway stabilization	577(96)	192 (96)	192 (96)	193 (96.5)
Breathing stabilization	595(99)	199(99.5)	198(98.5)	199(99.5)
Circulation stabilization	590(98)	198(99)	194(97%)	198(99)
Disability stabilization	559 (93)	190(95)	180(90)	189(94.5)
Definitive treatment and injury stabilization	426(71)	156(78)	129(64.5)	141(70.5)

The reasons for referral of patients presenting with injuries to the emergency departments of Dar es Salaam regional referral hospitals

In overall 29% of the patients presented with trauma at Emergency departments of Dar-es-salaam RRH, were referred to Muhimbili National Hospital (MNH Upanga and Mloganzila campuses). With Lack of Expertise account for 49% of the referrals. And Lack of Equipment, specifically Computerize Tomography (CT) scan account for 51% of the referrals. Table 4

At Amana Regional Referral Hospital 22% of the patients presented with trauma at Emergency department were referred to Muhimbili National Hospital (MNH Upanga and Mloganzila campuses). With Lack of expertise, account for 45% of the referrals. And Lack of equipment, specifically Computerize Tomography (CT) scan account for 55% of the referrals. Table 4

At Temeke Regional Referral Hospital 35.5% of the patients presented with trauma at Emergency department were referred to Muhimbili National Hospital (MNH Upanga and Mloganzila campuses). With Lack of expertise account for 45% of the referrals. And Lack of equipment, specifically Computerize Tomography (CT) scan account for 55% of the referrals. Table 4

At Amana Regional Referral Hospital 29.5% of the patients presented with trauma at Emergency department were referred to Muhimbili National Hospital (MNH Upanga and Mloganzila campuses). With Lack of Expertise, account for 58% of the referrals. And Lack of Equipment, specifically Computerize Tomography (CT) scan account for 42% of the referrals. The average time from the point of arrival of the patient to the time of referral was two hours. Table 4

Table 4: OUTCOME DESPOSITION AND REFERRAL FACTORS

DISPOSITION AND REFFERALS FACTORS	DRRH OVERAL **N (%)**	AMANA **n (%)**	TEMEKE **n (%)**	MWANANYAMALA **n (%)**
Disposition:				
Discharged home	416 (69)	146 (73)	129 (64.5)	141 (70.5)
Admitted to the ward	10 (2)	10 (5)	0 (0)	0 (0)
Referred:	174 (29)	44 (22)	71 (35.5)	59 (29.5)
Reason for referral :				
Lack of expertise/personnel	86 (49)	20 (45)	32 (45)	34 (58)
Lack of equipment	88 (51)	24 (55)	39 (55)	25 (42)
Injury to referral time (median)	2 Hours	2 Hours	2 Hours	2 Hours

The available equipments for the care of patients presenting with injuries to the emergency departments of Dar es Salaam regional referral hospitals

The shortage of equipment for management of airways and breathing was observed in emergency departments of all three hospitals. A laryngoscope set for adult and pediatric was not found in any of the hospital's emergency department. While none of the hospitals' emergency department had endotracheal tubes or laryngeal mask airways of any size, a working suction device was present in all three hospitals. We also found that an oxygen supply was available in all three hospitals while a working bag valve mask was present in two of the three hospitals. None of the hospitals had a working ventilator or underwater drain set. Table 5

Monitoring of acutely ill patients is of absolute importance for providing the best care possible and optimizing efficiency of such care. All three emergency departments of Dar-es-salaam regional referral hospitals had blood pressure monitoring devices and thermometers. Cardiac monitoring and oxygen saturation monitoring could was possible in all three emergency departments. None of the hospitals had a transcutaneous pacer. In trauma patients, immobilization has a number of advantages including pain control and protection of neurovascular structures. All the three emergency departments surveyed, none had spine boards/beds or semi-rigid neck collars which could be used, neither had access to CT scan. Table 5

At Amana regional referral hospital only 45% of the essential equipments for airway opening and protection, 43% for oxygenation and ventilation, and 55% for monitoring and treatment only were available. At Temeke regional referral hospital only 27% of the essential equipments for airway opening and protection, 57% for oxygenation and ventilation, and 55% for monitoring and treatment only were available. At Mwananyamala regional referral hospital only 54% of the essential equipments for airway opening and protection, 57% for oxygenation and ventilation, and 55% for monitoring and treatment only were available. Table 5

Table 5: EQUIPMENTS AVAILABLE FOR EMEGERNCY MANAGEMENT OF TRAUMA PATIENTS AT DRRH

EQUIPMENT	AMANA	TEMEKE	MWANANYAMALA
For opening and protecting airway			
Availability %	45	27	54
1. Laryngoscope set	0	0	0
2. Endotracheal tube	0	0	0
3.Suction device	1	1	1
4.Size 0, Oral Pharyngeal Airway (OPA)	0	0	0
Size 1, OPA	0	0	0
Size 2, OPA	1	0	1
Size 3, OPA	1	0	1
Size 4, OPA	1	1	1
Size 5, OPA	1	1	1
5. Laryngeal mask airway	0	0	0
6.Magill's forceps	0	0	1
To deliver oxygen and ventilation			
Availability %	43	57	57
1.Bag valve mask	0	1	1
2.Partial re-breather mask	1	1	1
3.Nebuliser	1	1	1
4.Oxygen supply	1	1	1
5.Ventilator	0	0	0
6.Semi-rigid collar	0	0	0

7.Underwater drain set	0	0	0

For monitoring and treatment

Availability %	55	55	55
1.Cardiac monitor	1	1	1
2.12 lead E.C.G	1	1	1
3.Defibrillator	0	0	0
4.Transcutaneous pacer	0	0	0
5.Cardiac arrest board	0	0	0
6.Stethoscope	1	1	1
7.Pulse oxymeter	1	1	1
8.Blood pressure monitoring device	1	1	1
9.Thermometer	1	1	1
10.Spine board/bed	0	0	0
11. CT scan	0	0	0

KEY: 1= Available

0= Not available

The trauma care supporting personnel available at the emergency departments of Dar es Salaam regional referral hospitals

Medical Officers and Registered nurses were the most available human resource in emergency departments of Dar-es-salaam regional referral hospitals. All the three emergency departments did have access of emergency consultation to General surgeon, ENT surgeon and orthopedic surgeon. None of the three Dar-es-salaam regional referral hospitals was staffed by Emergency physician. Access to emergency specialist consultation on Pediatric surgeon, Neurosurgeons Vascular surgeons and Maxillofacial surgeons were not available in all three emergency departments. Only 8 (47%) out of 17 categories of the required trauma care supporting personnel were available in all three emergency departments of Dar-es-salaam regional referral hospitals. Table 6

Table 6: TRAUMA CARE SUPPORTING PERSONEL AVAILABLE AT EMERGENCY DEPARTMENTS OF DRRH

STAFF/PERSONEL	AMANA	TEMEKE	MWANANYAMALA
Availability %	47	47	47
1. Emergency physician	0	0	0
2. General surgeons	1	1	1
3. Anesthesiologists	1	1	1
4. Nurse-anesthetics	1	1	1
5. Pediatric surgeon	0	0	0
6. Orthopedic surgeon	1	1	1
7. Neurosurgeons	0	0	0
8. Vascular surgeons	0	0	0
9. Thoracic surgeons	0	0	0
10. Maxillofacial surgeons	0	0	0
11. Radiologists	1	1	1
12. Urologists	0	0	0
13. ENT surgeons	1	1	1
14. Medical officer	1	1	1
15. Plastic surgeons	0	0	0
16. Intensive care nurses	0	0	0
17. Registered nurses	1	1	1

KEY: 1= Available

2= Not available

DISCUSSION

Prevalence of injury among patients presenting to the emergence departments of Dar es Salaam regional referral hospitals

In this study we have found that, Emergence departments in Dar-es –salaam regional referral hospitals are facing high trauma burden compared to the rest of country (10). With a third of the patients attended at emergence departments of these hospitals had trauma related complains. These may be contributed by the fact that, these hospitals are serving the most populated and developed city in the country with rapid motorization (1, 10). We also found that, majority of patients in our study were between 24 to 30 years, these highlights the potential economic burden of injuries in the city and the country at large.

Motor traffic accidents/injuries were the most common cause of trauma. These results has been contributed by the fact that; Dar-es-salaam as a rapidly developing city with a rapid rates of urbanization, motorization and heavy traffic jams, has resulted in increasing usage of motorcycle (Bodaboda) to quickly maneuver through the heavy traffic jams in the city with poor adherence to traffic rules and regulation. These statistics are consistent with many published literatures from Sub-Saharan Africa and Tanzania (21, 10, 11, and 22).

Patterns of injury among patients presenting to the emergency departments of Dar es Salaam regional referral hospital

However this study has also shown that despite the huge burden of trauma patients faced by these emergence departments, majority of the patient attended have sustained minor external injuries which has been managed accordingly and safely discharged home (21).

Management strategies and disposition of patients presenting with injuries to the emergency departments of Dar es Salaam regional referral hospitals

In this study we found that, most of the trauma patients attended at Dar-es-salaam regional referral hospitals received adequate amount of primary stabilization, in terms of emergency airway, breathing, circulation and disability stabilization. These has been contributed by the fact that majority of the patients seen in these departments have minor external injuries which do not need special skills to manage and stabilize them.

However the study has also shown that, patients who needed but did not received airway and disability stabilization are three times more than those who did not received breathing and circulation stabilization. This is due the fact that; these hospitals are less equipped with airway opening and protection equipments e.g. endrotracheal tube, laryngoscope set and neck collars. But are much equipped with breathing and circulation equipments e.g. oxygen cylinders, oxygen mask and canulars. We also found out that, about one third of the trauma patients did not received injury stabilization or definitive trauma care treatment at emergency department before disposition. This has been contributed by the low availability of trauma care supportive personnel at emergency departments in these hospitals. None of the hospitals has Emergency physician (13, 19).

The reasons for referral of patients presenting with injuries to the emergency departments of Dar es Salaam regional referral hospitals

The study has shown that, a third of the patients with trauma related complain seen at Emergency department of Dar-es-salaam Regional referral hospitals has been referred to Emergency department of Muhimbili National Hospital Muhimbili (MNH), the only one full-capacity Emergency department in Tanzania, which is also located in Dar-es-salaam. All patients needing advanced emergency interventions and stabilization are dependent on this fully equipped emergency centre.(23). The huge referral numbers is due to the fact that these hospitals are less equipped and poorly staffed to stabilize, investigate and treat a severely injured trauma patient. WHO guidelines for essential trauma care has recommended the availability of Computer tomography (CT) scan, Neurosurgeon and Orthopedic surgeon in level 2 hospitals(regional

hospitals) (1). More emphasis is needed to equip each of the Dar-es-salaam regional referral hospitals with a CT scan and Neurosurgeon as they account as reasons for more than half of the referrals.

The available resources for the care of patients presenting with injuries to the emergency departments of Dar es Salaam regional referral hospitals

Availability of equipment in health facilities not only improves staff morale, but also provides more convenient, efficient and safe patient care. We found that all the three Dar-es-salaam regional referral hospitals emergency departments have shortage on basic equipment for acute resuscitation, such as laryngoscope set, endotracheal tubes, defibrillator machine and underwater drain set (3).The shortage is due to lack of fund to buy the equipment or delays in the procurement process. All the three emergency departments surveyed do not provide adequate resuscitation on trauma patients; rather, most of the severely injured patients are referred to Muhimbili National Hospital.

The deficit observed on human resources in all emergency departments surveyed is a significant problem. Our study found that, neither of the emergency department was having an Emergency physician who could oversee and run the department in emergence perspective (10, 13). Furthermore these hospitals lack most of specialist on trauma supportive personnel team as recommended by WHO, such Neurosurgeon, ENT surgeon, Maxillofacial surgeon and Pediatric surgeon (1, 8, and 24). This has compromise the emergency care of trauma patients in these hospitals and increased number of referrals to MNH. More funds are needed to be allocated on training of more specialists in order to improve the quality of emergency care on trauma patients in the country.

LIMITIONS

This study targeted only regional referral hospitals in a single city. This probably does not reflect true capacity of other emergency departments in other regions in the country. It would thus be expected that a similar assessment in other regions of the country would reveal different results. Furthermore our results reflect reported and recorded patient characteristics, which may be incomplet

CONCLUSIONS

Patients with trauma related complain impose a significant burden on emergency departments of DRRH. The burden is compounded with low resources availability in these hospitals in terms essentials equipments and supportive personnel/staff for emergency care of trauma patients. Future studies should focus on the reasons of low resources availability in emergency departments of Dar-es-salaam regional referral hospitals.

RECOMMENDATIONS

This study has helped to highlight the real nature of DRRH emergency department. This study has highlighted that more staff and equipment are needed to properly manage trauma in DRRH. This study has highlighted that if DRRH are properly equipped may reduce much of the referrals to MNH. This study can be used as an assist to write a protocol/policy on emergency management of patient with trauma presented in emergency departments/acute intake units of Dar-es-salaam regional referral hospitals and the whole Tanzania at large.

DECLARATIONS

Competing interests

The author declares no conflicts of interest

Ethical Approval and consent to participate

The study was conducted after obtaining permission from the MUHAS Institutional Review Board and Management of Mwananyamala RRH, Amana RRH and Temeke RRH.

Consent to publish

Not applicable

Availability of data and material

The data set supporting the conclusion of this article is available from the authors on request.

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APPENDIGES

Appendix 1
DATA COLLECTION FORM

INCLUSION CRITERIA

All trauma patient presented at Emergency medicine departments at Mwananyamala Regional Referral, Amana Regional Referral and Temeke Regional Referral hospitals.

DEMOGRAPHICS

1. Subject ID _____
2. MR number _____
3. Last name _____
4. First name _____
5. Date of birth (Dd-mm-year) _____
6. Age _____
7. Date and time of arrival at EMD (Dd-mm-year; hh: min) _____
8. Patient phone number: _____
9. Next of kin number and name: _____
10. Name of referring facility: _____
11. Sex
    - ☐ Male
    - ☐ Female
12. Marital status
    - ☐ Single
    - ☐ Married
    - ☐ Divorced
    - ☐ Widowed
13. Level of education
    - ☐ None
    - ☐ Primary
    - ☐ Secondary
    - ☐ University/college
14. Occupation
    - ☐ Employed
    - ☐ Peasant/unskilled labor
    - ☐ Retired

- ☐ Student

15. Level of referring facility
    - ☐ Health center
    - ☐ District hospital
    - ☐ Regional hospital
    - ☐ Police/military hospital
    - ☐ Private clinic

MECHANISM OF INJURY

1. Date and time of injury (Dd-mm-year; hh: min) _____
2. Location of injury _____

3. Chief complaint
   - ☐ Stab wound
   - ☐ MVC
     - o Car/truck/daladala-driver
     - o Car/truck/daladala- passenger
     - o Pedestrian struck by car/truck/daladala
     - o Motorcycle- driver
     - o Motorcycle –passenger
     - o Pedestrian struck by motorcycle
     - o Bajaj- driver
     - o Bajaj- passenger
     - o Pedestrian struck by Bajaj
     - o Pedestrian struck by train
   - ☐ Fall
   - ☐ Animal bite
   - ☐ Gunshot wound
   - ☐ Miscellaneous

4. Use of safety equipment
   - ☐ Yes
   - ☐ No

5. Alcohol use
   - ☐ Confirmed by patient
   - ☐ Suspected or reported by relative/accompanying person
   - ☐ Suspected by care provider

SEVERITY OF INJURY AND EMERGENCY TREATMENT GIVEN

VITALS

- ☐ SBP (mmHg) _____
- ☐ DBP (mmHg) _____
- ☐ PR (per minute) _____
- ☐ RR (per minute) _____
- ☐ SpO2 (% RA) _____
- ☐ Temp (°C) _____
- ☐ RBG (mmol/L) _____

☐

1. Airway assessment
   - ☐ Normal/patent
   - ☐ Compromised
     - o Suctioning
     - o Positioning
     - o OPA/NPA
     - o Intubation
     - o Neck collar
     - o Other
   - ☐ Normal
   - ☐ Abnormal
     - o Oxygen therapy
     - o BVM
     - o Needle decompression
     - o Chest tube
     - o Pleural tap
     - o Other
2. Breathing assessment

3. Circulation assessment
- ☐ Normal
- ☐ Abnormal
  - o IV fluids
  - o Blood transfusion
  - o Other

4. Disability assessment
- ☐ Normal
- ☐ Abnormal
  - o IV mannitol
  - o IV dextrose
  - o Other
- ☐ GCS
  - o Eye _____
  - o Verbal _____
  - o Motor _____

5. Exposure assessment
- ☐ Normal
- ☐ Abnormal
  - o Splinting
  - o Analgesia
  - o Tetanus toxoid
  - o Debridement
  - o Suturing
  - o Dressing

6. RADIOLOGICAL INVESTIGATIONS
- ☐ Normal
- ☐ Abnormal with results

_____

7. LABARATORY INVESTIGATIONS
- ☐ Full blood picture
- ☐ Electrolytes

SYSTEM AFFECTED			
	YES	NO	N/A
Head			
Ear Nose and Throat			
Maxillofacial			
Cardiovascular			
Respiratory			
Abdominal			
Genitourinary			
Musculoskeletal			
Back			
Spinal cord			
Skin			

EMERGENCY TREATMENT GIVEN			
	YES	NO	N/A
C- spine immobilization			
Endotracheal intubation			
Chest tube placement			
2 large bore IV lines			
IV fluids			
Blood transfusion			
Antibiotics			
Pelvic binder			
Tetanus toxoid			
Splinting			
Urethral catheterization			
Suturing			
Compression dressing			
Airway adjuncts (OPA/NPA)			
Analgesia			

DEFINITIVE TREATMENT GIVEN			
	YES	NO	N/A
Simple wound dressing			
Major wound dressing			
Simple lacerationrepair			
Major laceration repair			
Closed fracture reduction			
Joint dislocation reduction			
Pelvic binder			
Surgery			
Other……			

OUTCOME DATA

Length of stay .....hour/s

Dispositional status:

1. Discharged YES NO ☐ ☐
2. AdmittedYES NO ☐ ☐
3. Operating theatre YES ☐ NO ☐
4. Referred: YES ☐ NO ☐

Reasons for referral;

System affected YES ☐ NO ☐

Lack of expertise YES NO ☐

Lack of equipment YES NO ☐

6. Time of referral ;
   Day Time YES ☐ NO ☐
   Night Time YES ☐ NO ☐
7. Died; YES NO ☐ ☐

Cause of Death…….

HUMAN RESOUCES AND EQUIPMENT AVAILABLE

Number of staff/personnel

- ☐ Specialist _____
- ☐ General practitioner _____
- ☐ Registered Nurse _____
- ☐ Health attendant _____

Level of training

- ☐ Emergency medicine specialist
- ☐ General surgeon
- ☐ Orthopedic surgeon
- ☐ Emergency trauma care/ basic life support training

Availability of staff safety equipment:

- ☐ YES
- ☐ NO

Availability of treatment equipment:

- ☐ Airway protection equipment
- ☐ Breathing support equipment
- ☐ Circulation resuscitation equipment
- ☐ Functioning Operating Theatre
- ☐ Ability of staff to operate the equipment or perform a procedure in response to the level of training

Appendix 2: Ethical Clearance

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR OF POSTGRADUATE STUDIES

P.O. Box 65001
DAR ES SALAAM
TANZANIA
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E-mail: dpgs@muhas.ac.tz

Ref. No. DA.287/298/01A/

01 August, 2019

Dr. Hassan Riziki,
MMed. Emergency Medicine,
School of Medicine
MUHAS.

RE: APPROVAL OF ETHICAL CLEARANCE FOR A STUDY TITLED "THE BURDEN OF INJURY AND RESOURCES AVAILABILITY FOR EMERGENCY CARE OF PATIENTS PRESENTING WITH INJURY AT DAR ES SALAAM REGIONAL REFERRAL HOSPITAL".

Reference is made to the above heading.

I am pleased to inform you that, the Chairman has, on behalf of the Senate, approved ethical clearance for the above-mentioned study. Hence you may proceed with the planned study.

The ethical clearance is valid for one year only, from **01st August, 2019 to 31st July 2020.** In case you do not complete data analysis and dissertation report writing by **31st July, 2020,** you will have to apply for renewal of ethical clearance prior to the expiry date.

Dr. Emmanuel Balandya
ACTING: DIRECTOR OF POSTGRADUATE STUDIES

cc: Director of Research and Publications
cc: Dean, School of Medicine, **MUHAS**