SCHOOL OF PUBLIC HEALTH

COLLEGE OF HEALTH SCIENCES

UNIVERSITY OF GHANA

INJURY PATTERNS AND EMERGENCY CARE IN ROAD TRAFFIC ACCIDENTS IN ACCRA

BY

JAMES AGGREY-ORLEANS

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DECLARATION

I, James Emmanuel Kwegyir Aggrey-Orleans, declare that except for other people's research and publications which have been duly cited and acknowledged, this research proposal is my original work. It was written under supervision. It has not been wholly or partly presented for another degree or masters in any other institution.

James Emmanuel Kwegyir Aggrey-Orleans.

Date: 7th October, 2020 Signature:……

MPH student, Department of Biological, Environmental and Occupational Health, School of Public Health, College of Health Sciences, University of Ghana, Legon.

Academic Supervisor :

Dr Paul Kingsley Botwe

Date: 7th October, 2020. Signature:……

Department of Biological, Environmental and Occupational Health, School of Public Health, College of Health Sciences, University of Ghana, Legon.

DEDICATION

To all my teachers, through your interaction I have learnt that “the mind is not a vessel to be filled but rather a fire to be kindled”. *Anonymous*

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ABSTRACT

Road traffic accidents are a major source of morbidity and mortality in Ghana. Information on the care given to casualties and the burden of injury associated with RTAs in Ghana is inadequate. This information is needed to guide clinicians and policy makers. This study sought to examine the emergency care; injuries sustained and the socio-demographic profile of RTA casualties. This study was a cross-sectional study of all RTA casualties in 37 Military Hospital from March 2018 to March 2019. The results showed that: most RTA victims were male (66.05%), 53.95 % within 25-44 years, 54.88% were employed in blue collar jobs and 60.47% paid cash for their hospital bills. A majority (87.01%) had x-rays and laboratory investigations done in the first 48 hrs at the A&E. Orthopaedic surgeons managed 56.34% of the casualties and Neurosurgeons 21%. There were 44.67% of lower limb injuries, 23.74% upper limb injury and 13.48% head injury with 20% having multiple injuries. The highest incidence of RTAs were in vehicle occupants (35.12%), then, 30.93% in motorcycle users and 25.34% for pedestrians. A significant association was found between the following injuries and the type of RTA: head injury; chest injury; abdominal injury; lower limb injuries and soft tissue contusion. It was not so for: pelvic, spine and upper limb injuries. There was a significant association between motorcycle injury with age and sex of casualties ($p < 0.001$) for both. In conclusion is was evident that, the emergency care of casualties was satisfactory. Orthopeadic surgeons were essential in the trauma care. Injury patterns significantly differed across different types of accidents which could be used to help profile trauma patients. The socio-demographic profile of motorcycle related RTAs showed working age (25-45 years) males with no special trend in their occupation thus helping to know how to target preventive measures.

***Keywords*: Road traffic accidents, injury, trauma, motorcycle**

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LIST OF ABBREVIATIONS

Abbreviation	Full Meaning
LMIC	Low and Middle Income Countries
HIC	High Income Countries
WHO	World Health Organization
UN	United Nations
GDP	Gross Domestic Product
DALY	Disability Adjusted Life Years
A&E	Accident and Emergency
PPE	Personal Protective Equipment
MOI	Mechanism Of Injury
AO	Arbeitsgemeinschaft Für Osteosynthesefragen
SRR	Survival Risk Ratio
SBP	Systolic Blood Pressure
NHIS	National Health Insurance Scheme
RTA	Road Traffic Accident

CHAPTER 1

INTRODUCTION

1.1Background

Road traffic accidents (RTA) are a major cause of morbidity and mortality especially for people under 40 years. In Low and middle income countries (LMIC), for every RTA related death, three victims suffer permanent disability and many more dependants of these victims are affected socioeconomically. (Adogu, Llika, & Asuzu, 2011). In addition to this situation, research and data regarding the prevalence and management of RTAs in Ghana is not readily available evidenced by major challenges in retrieving such data by the investigator. It has been predicted that by 2020, road traffic injuries will rank as high as number three for causes of Disability Adjusted Life Years (DALYs) lost globally. (Frenk & Gómez-Dantés, 2011) (Lozano. 2013).

RTAs in lower and middle income countries (LMIC) account for over 85% of all road traffic deaths globally although there are more cars and motorcycles in high income countries (HIC). This trend is on a steady increase.(World Health Organization, 2018). The steady rise in the number of personal vehicle ownership and usage in LMICs would result in an anticipated 80% increase in injury and mortality rates between 2000 and 2020 (Lozano. 2013). To compound this situation, in LMICs, RTA casualties are not optimally managed though such countries seem to spend a lot of money on RTA prevention and management. In the WHO Status Report on Road Safety in Countries of the African Region, it compared high income countries (HICs) and LMICs, and found that LMIC spend a higher percentage of their gross

domestic product (GDP) on healthcare (including trauma care) than HIC. This leads to further strain on their budgets making them poorer.(World Health Organisation, 2018).

Ghana, like other LMIC has to grapple with the mortality, morbidity, disability and economic losses associated with RTAs. This high incidence of RTAs is accounted for by three broad factors. Firstly, road and environmental factors: this includes the motorable state of the roads; the presence or absence of functioning street lights; appropriate road markings; availability of road signs; weather conditions and visibility. Secondly, there are vehicular factors. These include whether or not vehicles are road worthy and the presence or absence of safety features such as seat belts in cars. Thirdly, human or driver factors are considered. This encompasses the proper licensing of people who are qualified to drive; regular monitoring and checks to ensure strict compliance with traffic regulations; education and preventive strategies to prevent or reduce the gravity of road traffic accidents (Constant & Lagarde, 2010).

1.2 Problem Statement

Ghana, is currently witnessing increasing socioeconomic development and an associated increase in rural-urban migration. As such, there are increasing number of people travelling between cities and towns for commercial, educational, recreational and social reasons. This situation, coupled with the recent unlicensed use of motorcycles for commercial taxis, has led to an increase in the incidence and vulnerability of road users to RTAs. Road traffic accidents, put a burden on the underfunded and oversubscribed health services. It also leads to loss of

livelihood for the victims and their families. In addition a large proportion of Ghanaians are employed in the informal sector, they earn daily wages and resort to out of pocket payment for healthcare. Those who are insured with the National Health Insurance Scheme, (NHIS) are not totally covered for all hospital charges owing to trauma care. The loss of human lives, health, productivity and money owing to road traffic accidents takes a heavy toll on the expenditure of most LMIC including Ghana. (Hesse & Ofosu 2014) (Chalya et al., 2010), The health and socioeconomic burden of RTAs in Ghana could be mitigated through primary preventive measures as being done by the National Commission on Road Safety Commission of Ghana(National Road Safety Commission of Ghana. 2011) and importantly, through secondary prevention. Secondary prevention involves the efficient medical management of casualties after the accident has happened to reduce subsequent morbidity and mortality. The emergency care of RTA casualties especially within the first forty-eight (48) hours has been shown to have a huge impact on reducing morbidity, mortality and economic losses to the individual and the state. (Liberman & Roudsari, 2010).

1.3 Justification

This study was aimed at looking at the emergency management and the injury profile of all RTA victims with a special attention on motorcycle users. Special attention was taken in motorcycle accidents because the commercial use of motorcycles seem to be contributing heavily to the incidence of RTAs in Accra(Pers com). The findings from this study would provide baseline data on the care of RTA victims from the site of injury to the emergency room. It also would catalogue the trends of injuries that victims sustain based on the mechanism of injury (type of accident). This information would be beneficial to front line medical officers in the care of RTA victims. Health administrators and policy makers would also benefit by knowing the needed

medical logistics and manpower to provide for health institutions that deal with casualties care. It must be noted that in LMICs the ideal situation where a health facility has all the needed equipment and consumables is uncommon. (Hesse & Ofosu 2014) This study seeks to gather more evidence to advocate for the use of other personal protective equipment for motorcycle riders beyond just helmet use. Having evidence of the injury patterns and required emergency care would also help medical officers to critique the established casualty management protocols such as the Advanced Trauma Life Support (ATLS) from the American College of Surgeons and the Primary Trauma Care (PTC) from the Royal College of Surgeons, United Kingdom. (Liberman & Roudsari, 2010).

1.4 Research Question

1. What sort of injuries are sustained by road traffic accident victims; does the type of accident matter?

2. What are the demographic characteristics of people involved in motorcycle road traffic accidents?

3. What sort of emergency care do RTA casualties receive?

1.5 Study Objective

1.5.1 Aim

To examine the injury pattern and emergency care given to road traffic accident victims.

1.5.2 Specific Objectives

1. To determine the most common injuries and combination of injuries sustained by all victims of road traffic accidents.

2. To explore the socio-demographic profile of those involved in motorcycle related accidents.

3. To determine the emergency investigations done for all RTA victims in the first 48 hrs of admission.

I.6 Conceptual framework

The sequence of events that lead to road traffic accidents (Fig. 1) start with the interaction of 3 main factors in the community: human factors, vehicle factors and road and environmental factors. These interact to result in a road traffic accident. There are a series of events that happen afterwards which may determine the final outcome in most cases of road traffic accidents. Understanding the sequence of events also assists international, national and local authorities in addition to healthcare workers to know where to intervene to achieve 3 main effects. The first effect is to prevent RTAs from happening at all this is primary prevention. The second is to mitigate the effect of the accident on the casualty and the community after it has happened that is secondary prevention. Lastly tertiary prevention tries to limit the effect of the disability and morbidity associated with the injuries sustained in order to return the casualties to their families and occupations with some useful function. The focus of this study is on secondary prevention which is very essential especially in LMICs.

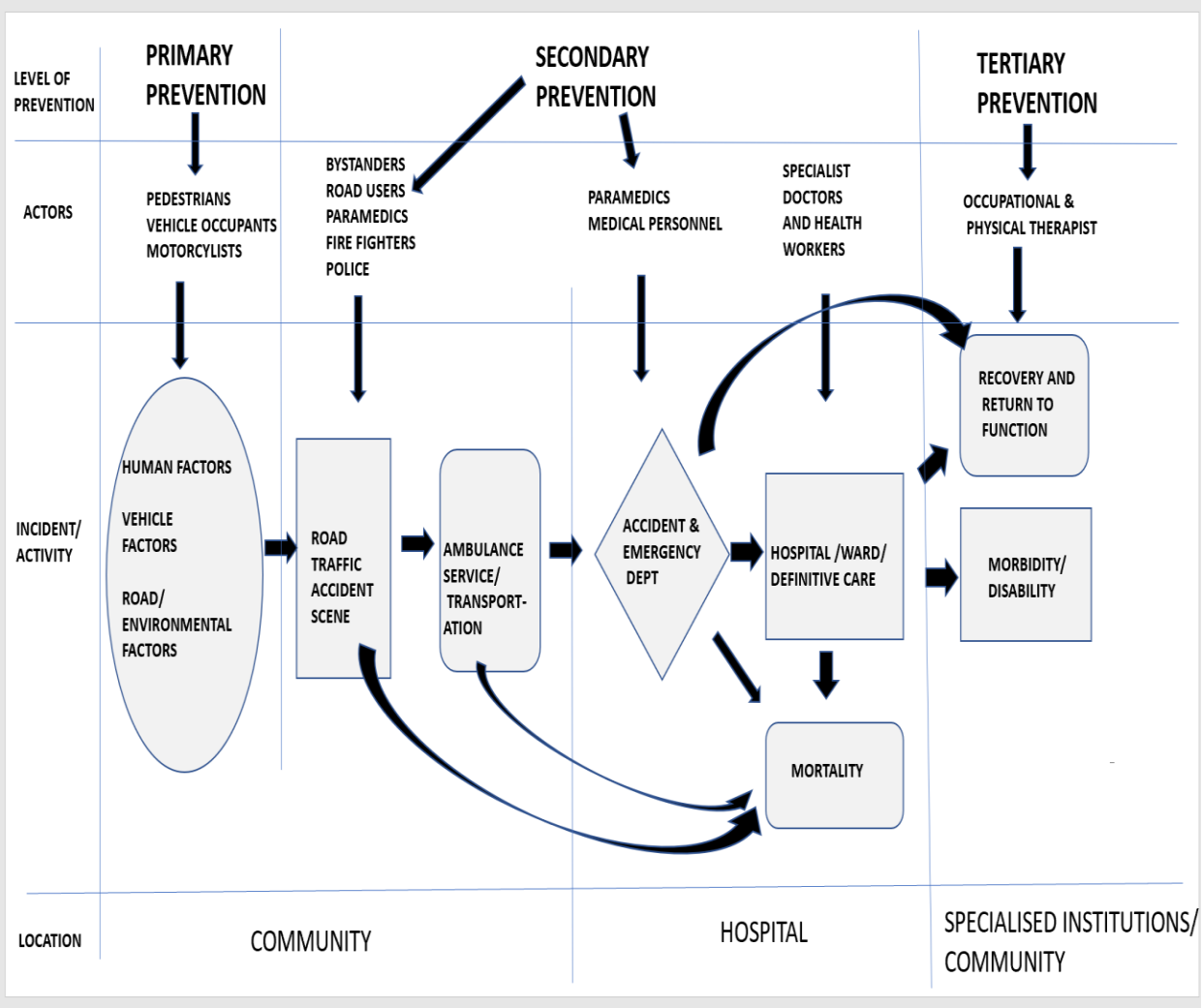

Figure 1. Conceptual framework for chain of events that lead to RTAs, the aftermath and the points of possible intervention.

CHAPTER 2

LITERATURE REVIEW

2.1 General Overview of Road Traffic Accidents

Road traffic accidents (RTA) are operationally defined as motor vehicle collisions involving motorized and non-motorized vehicles, pedestrians or both. Other terms that have been used to describe RTAs include motor vehicular accidents; motor vehicular collision; road traffic collision etc. The term collision or crashes instead of accidents has been used by the legal and law enforcement agencies because it indicates that these events are largely due to negligence and poor judgement and are preventable in most cases. RTAs often cause damage to property but more importantly causes injuries and even death. Injuries have traditionally been defined as physical damage to a person caused by an acute transfer of energy (mechanical, thermal, electrical, chemical, or radiation energy) or by the sudden absence of heat or oxygen.(Miller & Thompson, 2015)

All over the world, RTAs are a major source of unintentional trauma. Globally, trauma is the leading cause of mortality in persons under of 40 years. For every RTA related death, three victims suffer permanent disability and many more dependants of these victims are affected socioeconomically (Lozano et al., 2013) RTAs are a significant source of morbidity in all age groups around the world. Although low and middle income countries have the lowest motorization rate globally (less cars per head) there is a disproportionately large number (about 85%) of global RTAs occurring in low and middle income countries (LMIC). According to the World Bank Country and Lending Groups Report, most countries in Sub Saharan Africa and

South-East Asia fall into the LMIC group. Countries in Western Europe, North America and limited parts of Asia are in the high income group (HIC). Whereas injuries accounted for 6% of deaths in high-income countries, they caused 12% of deaths in LMIC. Figures from the Sub Saharan Africa alone are said to be higher. The current upward trend of RTA incidence has led experts to predict an 80% increase in RTAs from 2000 to 2020. It is also expected that RTAs would be the third highest cause of Disability Adjusted Life Years (DALYS) in the heavily affected countries.

The impact of RTAs on the population must be examined in terms of its health and socioeconomic implications. The United Nations considers the prevention of road traffic accidents a global public health priority and has declared the decade of 2011 to 2020 as the "Decade of Action for Road Safety." It is thought that globally 1.4 million people are killed as a result of road traffic accidents every year. About 20 million are disabled each year from RTAs. The trend is on a steady increase and shows some variations based on the socioeconomic status of the country in question. It has been observed that in developed countries the incidence of RTAs decreases with increasing per capita gross domestic product (GDP) of the country. However in developing countries it increases according to rising GDP. This implies that without the needed safeguards and preventive measures the more vehicles a country has the more RTAs it would have. As stated earlier about 85% of road traffic accidents occur in developing countries. Even though there are more vehicles per person in developed countries. A disproportionate number of injuries were sustained by males, who accounted for about 68% of all victims in injury-related deaths in 2015. Although injuries are sustained across all age groups, they affect young people (persons between 10 and 34 years of age) in particular, accounting for more than 40% of deaths in this age group. More than half of all deaths (52%)

occurring in males 10 to 34 years of age are caused by injuries. In 2010, there was an estimated 5.1 million trauma related deaths globally (this includes intentional and unintentional trauma) — about 1 out of every 10 deaths in the world — and the total number of deaths from injuries was greater than the number of deaths from infection HIV–AIDS, tuberculosis, and malaria combined (3.8 million).(World Bank Report on Disability, 2011)

The Global Burden of Disease (GBD) study categorized the major causes of death and disability worldwide into three main groups: the first group comprises of communicable, maternal, perinatal, and nutritional conditions; the second group covers non communicable diseases such as hypertension and diabetes and the 3rd group includes both intentional and unintentional trauma. While HICs have usually one or at most 2 of these groups to contend with, LMICs such as Ghana are plagued with all three. The WHO alongside other multinational agencies have collaborated with many LMICs to roll out programmes to control diseases in the first two groups i.e. Communicable and infections diseases in group one and Chronic lifestyle diseases in group two. Relatively less effort has gone into the control of Trauma (Group three). With the current knowledge of the burden of injuries from trauma, an evidence-based approach to the prevention and management of injuries should be adopted. Major global causes of death and disability were in the recent past managed in a similar fashion. (World Health Organisation, 2018) (Bhalla et al., 2011)

2.2 Impact of Road Traffic Accidents on the Health of the Population

There are several scales used to assess the burden of injuries at the population level, these scales can be used to integrate mortality and morbidity into a single score. Examples of these scales are: Health Utilities Index, Health and Activity Limitation Measure, Quality of Well Being (QWB),

European Quality of Life Scale (EuroQoL), Facility Condition Index (FCI), Disability Adjusted Life Years (DALYs), Short-Form 6-Dimensions (SF6-D). Others are Injury Impairment Scale, Healthy Days, and Healthy Expectancy. The health implications of injury and disease are usually expressed with different indices and figures. The Disability Adjusted Life Years (DALYs) is one such index. One DALY is one lost year of "healthy" life. The sum of these DALYs across the population, can be thought of as a measurement of the gap between current health status and an ideal health status where the entire population lives to an advanced age, free of disease and disability.

The original Global Burden of Disease Study and WHO updates for years 2000 through to 2004 applied several social value weights in the calculation of DALYs such as: disability weights, time discounting and age weights. DALYs for a disease or health condition is calculated as the sum of the Years of Life Lost (YLL) due to premature mortality in the population and the Years Lost due to Disability (YLD) for people living with that health condition or its sequelae: this is mathematically expressed as: DALY = YLL + YLD. The YLL basically corresponds to the number of deaths multiplied by the standard life expectancy at the age at which the death occurred. The mathematical expression for YLL for a given cause, age and sex: YLL = N x L. Where: N = number of deaths; L = standard life expectancy at age of death in years. YLL measures the incident stream of lost years of life due to deaths, an incidence perspective has also been taken for the calculation of YLD in the original Global Burden of Disease Study. To estimate YLD for a particular cause in a particular time period, the number of incident cases in that period is multiplied by the average duration of the disease and a weight factor that reflects the severity of the disease on a scale from 0 (perfect health) to 1 (dead). The basic formula for YLD is as follows: YLD = I x DW x L. Where: I = number of incident cases ; DW = disability

weight ;L = average duration of the case until remission or death (years); The Global Burden of Disease 2010 study published by IHME in December 2012 used an updated life expectancy standard for the calculation of YLL and based the YLD calculation on prevalence rather than incidence: YLD = P x DW. where: P = number of prevalent cases; DW = disability weight; social value weights (age-weighting and discounting)(Murray et al., 2012).

2.3 Injuries Found in RTA Casualties

Road traffic accidents often result in isolated injuries to one part of the body, multiple injuries to the same organ system and polytrauma. Polytrauma is a condition where 2 or more organ systems in the casualty is injured. The main systems of the body prone to injury are: the central nervous system (head and spine injury), the cardiovascular system (injury to the heart arteries and veins resulting in haemorrhage), the respiratory system (rib cage and lung injury), the gastrointestinal system (abdominal injury), the genitourinary system (abdominal and pelvic injury), the musculoskeletal system (limb injuries and fractures). Injuries during RTAs are sustained through direct collision of the body with the vehicle, other road users, ejection from the vehicle or motorcycle onto the road, entrapment within a mangle vehicle resulting in crushed body parts, burns and inhalational injury from vehicles on fire (Chapman, 2010)(Lecky et al., 2010). Motor cycle users (two wheeled motorised vehicles) are at a more than 30% increased risk of being involved in an RTA compared other vehicle users. Factors that would influence the severity of injury are: the mechanism of injury, the speed (kinetic energy) of the colliding vehicles; the use of seat belt, airbags, helmets and the safety profile of the colliding vehicles. Any part of the RTA casualty is at risk of injury. Some injuries are however more

common than others. The lower limbs are most commonly injured. The entire body is prone to major injuries in motor cycles compared to cars.

Mortality from RTAs has been found to be trimodal in its occurrence: About 50% of casualties are known to die at the accident scene from their injuries. Severe head injuries and massive haemorrhage account for these. About 30% survive but die in the following 4 hours (the golden hour); these deaths are potentially preventable. Haemorrhage and cardiorespiratory injuries fall in this category. The remaining 20% succumb to severe sepsis and multiple organ failure and die within 6 weeks from time of injury.

The management of severe injuries proceeds in well-defined stages. These stages are sequential but with significant overlaps. They are: accident scene First Aid and casualty evacuation; hospital resuscitation, stabilization with definitive care and finally, rehabilitation of the injured in order to restore their functionality. (Tsang, Mckee, Engels, Paton-Gay, & Widder, 2013)

The care of trauma victims must be discussed in three time frames: care at the site of the accident (Trauma Scene Care); care during transport (MEDEVAC) and care in the hospital as in-patients and out-patients. Trauma scenes are chaotic and hazardous thus the safety of caregivers is the first consideration. The police and fire services are key players in trauma care on the field. The mandatory use of personal protective equipment (PPE) must be ensured. Gloves, aprons and goggles are the minimum PPEs required on the field. Universal Precautions to ensure infection prevention and control (IPC) must be strictly adhered to. At the accident scene in LMICs first responders are often by-standers who are often not trained in even basic First Aid. The training of paramedics must be done alongside the provision of ambulances in order to better manage casualties from the accident scene till arrival at the hospital. The two main systems of Pre

Hospital Trauma Life Support (PHTLS) at the accident scene are the Franco-German System of "Stay-and-Play" and the Anglo-American System of "Scoop-and-Run". The "stay-and-play" system involves paramedics and trauma surgeons moving their equipment to the accident site to resuscitate and stabilize the patient before the patient is transferred to the hospital. The accident and emergency room is thus brought to the accident site. On the other hand, the "scoop and run" involves the paramedics giving minimum resuscitation at accident seen and quickly transporting the casualty to the hospital. The emphasis here is on the quick transport to the hospital where major resuscitation and stabilization is done. A balance between "scoop and run" and "stay and play" is probably the best approach for trauma casualties in developing counties. The choice of system to be used in a given RTA scenario should be based on 3 main factors. The factors to consider are : the mechanism of injury and injuries sustained by the casualties (blunt versus penetrating trauma); the distance to the hospital from the accident site (urban versus rural) and the available medical resources and health personnel (Johansson et al., 2012).

Communication is the next consideration. Care providers must make contact with emergency services. Help must be sought and information given to all hospitals, ambulance services and stake holders such as the police and fire service in order to ensure efficient patient care.

Triaging refers to the process of sorting out the injured based on the severity of their injuries and the priorities of care needed. This sorting system is based on the injured person's ability to walk, breathe and maintain a pulse, followed by a scored physiological assessment placing the victim in different categories. The 4 main categories used are: The Emergency Group (red); the Urgent Group (yellow) ; the Minor Injury Group (green) and the Dead Group (black). The colour scheme used in identification may differ from one geographical region to the other.

The mechanism of injury (MOI), type of vehicles involved and the use of protective equipment or its absence helps in predicting the likely injuries and their severity. Early recognition of injuries in RTA victims is based on a rapid and systematic questioning and examination protocol. A casualty entrapped in a car may be difficult to reach, but an immediate examination can be made of the airway, breathing and circulation – the 'ABC' of trauma assessment, which guides immediate management, extrication and transfer. (Solomon, Warwick, & Nayagam, 2010)

2.4 Clinical (Emergency and Continued) Management of the RTA casualty

Life-threatening airway injuries are treated first; the exception to this is catastrophic external haemorrhage, in which situation bleeding is controlled first and then the "ABC" system is followed.

The ABC system refers to a mnemonic used for the sequence of examination and treatment. 'A' refers to the airway management in addition to stabilizing the cervical Spine. 'B' refers to the assessment of the breathing of the patient including ventilation (the delivery of oxygen to and from the lungs). 'C' refers to the assessment of the circulatory system of the patient and the control of haemorrhage. 'D' refers to the assessment of the level of consciousness of the patient often denoted as Disability. 'E' refers to the complete exposure of the patient and the control of his/ her temperature (environment).

2.5 Care of the Casualty at the Accident and Emergency Department

Two factors are important at the hospital setting: well trained and equipped trauma teams and comprehensive trauma management protocols. The trauma team should be multi-disciplinary and led by a doctor trained in advanced trauma management.

2.5.1 Trauma Management Protocol

Pre Hospital Trauma Life Support (PHTLS), Basic Life Support (BLS), Advanced Trauma Life Support (ATLS) and Primary Trauma Care (PTC) are the main management systems in use in most countries. In the ATLS protocol, the first two stages involve initial rapid assessment and management followed by definitive care which is the third stage. The first stage is the Primary Survey and Resuscitation (rapid assessment and treatment of life-threatening injuries) followed by a Secondary Survey (head-to-toe re-evaluation to identify all other injuries). After the first two stages, then comes the Definitive Care stage. In definitive care, specialist care is required to manage specific injuries identified during the initial assessment. (Solomon et al., 2010).

2.5.2 Trauma Team

The trauma team usually comprises a multidisciplinary group of health workers from the specialties of anaesthesia, emergency medicine, surgery, nursing and support staff, each of whom provides simultaneous inputs into the assessment and management of the trauma patient, their actions are coordinated by a team leader who must be a doctor. The trauma team must aim to rapidly resuscitate and stabilise the casualty, prioritise and determine the nature of the injuries and prepare the patient for definitive care, be that within or outside the hospital.

2.6 Specific Injuries

There are many specific injuries that must be clearly defined. This is important in order to assess the injuries sustained. A case definition of all possible injuries sustained during road traffic accidents must be accepted by all researchers in order to compare results. The Use of the ICD-10

(International Classification of Diseases 10th Edition) aids in this regards. The specific injuries that can be sustained are as follows:

2.6.1 Head Injuries

Head injuries result from direct trauma to the head. The impact is transmitted into the substance of the brain in various degrees. In mild cases there is a minor contusion with a resultant brief loss of consciousness and memory. Injuries may also be severe in cases of penetration or open head injury. The structural trauma to the brain at the time of injury is termed primary brain injury. The resultant inflammation of the brain and surrounding tissues could result in secondary brain injury. Secondary brain injury could result in hypoxia, hypercarbia and hypotension and followed rapidly by death.

Mortality associated with head injuries is significant and account for half of the deaths from trauma (road traffic accidents, assaults, occupational injuries and sport injuries). These injuries can be classified into three groups based on the Glasgow Coma Scale (GCS) : Mild: GCS 13–15; moderate GCS 9–12 and severe, GCS 3–8. Regardless of the initial nature of head injury admission and monitoring in a hospital is required. (Solomon et al., 2010)

2.6.2 Scalp Wounds

Scalp wounds are lacerations, abrasions or avulsion injury on the scalp. They may be superficial or deep. Haemorrhage associated with this type of injury is profuse because of the rich vascular supply. It is potentially a fatal injury.

2.6.3 Skull Fractures

A break in the skull bone may be a simple linear fracture, a depressed fracture or even have associated bone loss. The severity of this injury has to do with the associated injury to the underlying brain and meninges.

2.6.4 Extradural and Subdural Haematoma

Bleeding within the cranial vault can lead to localized clotted blood which could exert a mass effect and lead to cerebral compression. This is referred to as a space occupying lesion (SOL).

2.6.5 Severe Brain Contusion

This is as a result of blunt trauma to the brain substance. An intracranial haematoma commonly occurs with this injury. Patients with severe head injuries (a GCS score of 8 or less) require early intubation and ventilation with management in an intensive care unit (ICU). Operative treatment may be required.(Miller & Thompson, 2015) (Deakin et al.,2010).

2.6.6 Cervical Spine Injuries

The cervical spine is a transit zone for major organs and conduits for the cardiorespiratory system. Structural injury to it through trauma may lead to compression and disruption of the oesophagus, trachea, carotid and jugular vessels and Phrenic nerve (essential for respiration) leading to death.

2.6.7 Breathing and Chest Injuries.

The thoracic cavity contains all the vital organs for circulation and respiration. It is protected by the rib cage. During trauma the ribs, lungs, heart and great vessels are vulnerable. Chest injuries could be blunt or penetrating. Severe injuries if not managed with assisted ventilation could

rapidly lead to death. Chest x-rays are often required to make a diagnosis. In some cases CT scans may be required.

2.6.8 Tension Pneumothorax

The variation in pressure within the chest is the mechanism by which respiration occurs. In this type of injury, air enters the pleural cavity and gets trapped leading rapidly to hypoxia and loss of cardiac output, and cardiac arrest. A high index of suspicion is needed to make a diagnosis. Emergency decompression of the tension pneumothorax via a thoracostomy is life saving.

2.6.9 Open pneumothorax

An open wound in the chest wall will allow the influx of massive quantities of air and result in a pneumothorax. Such an injury diverts air from the lung into the pleural cavity and leads to hypoxia. This is potentially fatal . Urgent closure of the defect in the chest wall with a valve-like flap is needed.

2.6.10 Massive Haemothorax

Haemothorax refers to the accumulation of massive amounts of blood in the pleural cavity. The blood pooled in the chest reduces the effective circulation volume of blood in the patient leading to shock and potential death if not remedied. Initial drainage with a chest tube is needed to avoid lung collapse. Surgical intervention may be necessary.

2.6.11 Cardiac Tamponade

Blood can accumulate within the pericardium resulting in constriction of the heart, massive loss of cardiac output and cardiac arrest. Ultrasonography is often used to make this diagnosis. Drainage of the accumulated blood in necessary in some cases.

2.6.12 Flail Chest

The segmental fracture of the rib cage from trauma often leads to uncoordinated movement of the chest wall (paradoxical respiration). This affects the rhythmic variation in intra thoracic pressure leading to respiratory embarrassment, lung contusion, hypoxia, and respiratory failure. Support for the respiratory system and stabilization of the fractured fragments is needed.

2.6.13 Disruption of Tracheobronchial Tree

Disruption of the tracheobronchial tree often results from penetrating injury. Shearing forces could also lead to this injury. They are rapidly fatal if the respiration is not supported. Intubation is always required.

2.6.14 Simple pneumothorax

Pneumothorax occurs when air enters the pleural cavity, causes lung collapse and hypoxia. There is often progressive difficulty in breathing which must be noticed clinically and confirmed with an x-ray. Thoracostomy is needed in most cases.

2.6.15 Haemothorax

A haemothorax results from the accumulation of blood in the thoracic cavity. Milder cases may resolve spontaneously. Larger collections must be drained.

2.6.16 Pulmonary Contusion

When the lung tissue is traumatized it leads to inflammation and failure of gas exchange by the lung. About (50%) of patients may develop acute respiratory distress syndrome (ARDS). Mechanical ventilation and oxygen is often needed till the patient recovers.

2.6.17 Haemorrhagic Shock

This is circulatory failure from inadequate perfusion of tissues with oxygenated blood. This leads to organ damage and death from multi-organ failure. Hypovolaemic shock, secondary to haemorrhage, is the most common. As the circulating blood volume decreases, compensatory mechanisms maintain systolic blood pressure up until about 30% of blood loss in a fit patient. When blood loss continues, compensation increasingly fails until coma is followed by death at around 50% blood loss. (Solomon et al., 2010).

2.6.18 Musculoskeletal Injuries

In the absence of catastrophic bleeding, musculoskeletal injuries are not immediately life threatening, but they may be limb threatening, however. Pelvic fractures, bleeding into the pelvis and retroperitoneum can result in non-responsive shock. Potential causes are road accidents, falls from a height or crush injuries. The injury may be suspected during the primary survey as a cause of circulatory failure. Diagnostic signs are pelvic ring tenderness, leg shortening, swelling and bruising of the lower abdomen, the thighs, the perineum. Obtain an anteroposterior (AP) x-ray and/or CT scan if the patient is stable.

2.6.19 Long-Bone Injuries

Musculoskeletal injuries occur in 85% of patients sustaining blunt trauma and they present a potential threat to life and threaten the integrity and survival of the limb. Crush injuries can lead to compartment syndrome, myoglobin release and renal failure. One must examine the patient from head to toe thoroughly. It is important to assess peripheral circulation and neurological status. The physician must confirm the presence of pulses with Doppler ultrasound and obtain x-rays as soon as the patient is stable. The description of fractures and their classification have

undergone a lot of evolution. Eponyms were at a time the main method of classification this has evolved in the Muller AO Classification System. The AO classification system uses an alpa-numeric system to describe fracture and recommend the optimal management plan. It is universal and easily adopted regardless of the language of the country. (Meinberg, Agel, Roberts, Karam, & Kellam, 2018)

2.6.20 Spinal Injuries

Indirect injuries are the most commonly seen. There is an association between cervical spinal damage and all head and chest injuries. 5% of head-injured patients have an associated spinal injury; 10% of those with a cervical spine fracture have a second, non-contiguous spinal fracture. A high spinal transection will cause a vasodilatory, neurogenic shock. Diagnostic signs are hypotension, low diastolic blood pressure, widened pulse pressure, bradycardia and warm, well-perfused extremities. Spinal injuries are usually recognized during the secondary survey. If the victim is conscious, has no neck pain, has no distracting painful injury, is not intoxicated and has not received any analgesia, the cervical spine can be examined and a fracture clinically excluded. X-rays and CT scans are required for diagnosis. (Miller & Thompson, 2015).

2.6.27 Crush Syndrome

This is seen when a limb is compressed of trapped for of long time. The crushed limb is under-perfused and myonecrosis (death of muscle tissue) occurs. When the limb is freed there is release of toxic metabolites causing a re-perfusion injury and compartment syndrome, thus creating more tissue damage from more limb ischaemia. Tissue necrosis also causes systemic problems such as renal failure. If a compartment syndrome develops, then a fasciotomy is required.

Debridement must be radical to avoid sepsis. If there is an open wound then the risk of infection must be considered.

2.6.29 Multiple Organ Failure

Multiple organ failure, or dysfunction syndrome (MODS), is the clinical manifestation of a severe systemic inflammatory reaction, following a triggering event such as trauma, infection, or inflammation. It is a common cause of death. Following severe sepsis it manifests with pulmonary features of ARDS. MODS usually progresses through four clinical phases: shock – active resuscitation – stable hypermetabolism – organ failure.
In the majority of critically ill patients who develop MODS the lungs are the first organs to fail; the other organs following in a sequential fashion.

2.7 Scoring Systems in Trauma

Injury Severity Scoring is a process by which complex and variable patient data is reduced to a single number or group of numbers and letters. This value is intended to accurately represent the patient's degree of critical illness. Information is always lost in the process of such scoring. As a result a myriad of scoring systems that have been proposed, all such scores have their unique advantages and disadvantages. In order to accurately classify a casualty with a score, It is necessary to be able to accurately quantify the patient's anatomic injury, physiologic injury, and any pre-existing medical problems which negatively impact on the patient's physiologic reserve and ability to respond to the stress of the injuries sustained. The scores usually predict the outcome of the injury. This is expressed mathematically as
Outcome = Anatomic Injury + Physiologic Injury + Patient Reserve.

2.7.1 International Classification of Diseases Injury Severity Score (ICISS)

ICISS utilizes the ICD-9 codes assigned to each patient to calculate a severity of injury score. Measured survival risk ratios are assigned to all ICD-10 trauma codes. The simple product of all such ratios for an individual patient's injuries have been found to predict outcome accurately. This is mathematically expressed as :

ICISS = (SRR) injury1 x (SRR) injury2 x (SRR) injury3 x (SRR) injury4; where

SRR means Survival Risk Ratio

2.7.2 Revised Trauma Score (RTS)

The Revised Trauma Score (RTS) is a physiological scoring system, with high inter-rater reliability and demonstrated accuracy in predicting death. It is scored from the first set of data obtained on the patient, and consists of Glasgow coma scale, systolic blood pressure and respiratory rate.

Table 1 Revised Trauma Scoring (RTS) criteria used in the assessing of the severity of injury

Glasgow Coma Scale (GCS)	Systolic Blood Pressure (SBP)	Respiratory Rate (RR)	Coded value
13-15	>89	10-29	4
9-12	76-89	>29	3
6-8	50-75	6-9	2
4-5	1-49	1-5	1
3	0	0	0

RTS = 0.9368 GCS + 0.7326 SBP + 0.2908 RR

Values for the RTS are in the range 0 to 7.8408. The RTS is heavily weighted towards the Glasgow Coma Scale to compensate for major head injury without multisystem injury or major physiological changes. A threshold of RTS < 4 has been proposed to identify those patients who should be treated in a trauma centre.(Mutooro, Mutakooha, & Kyamanywa, 2010)

2.8 Hospital Management of Casualties

Randomized, controlled trials (RCT) conducted in emergency departments and intensive care units on the care of trauma patients, have set standards for the provision of evidence-based trauma care. These trials provide evidence regarding effective treatments, using protocols such as Basic Life Support (BLS), Advanced Trauma Life Support (ATLS) and Primary Trauma Care (PTC). They also provide evidence of useless and potentially harmful practices which must be discouraged. In LMICs settings, with very few surgeons, evidence suggests that clinical outcomes can be improved if non specialist physicians or non physician clinicians are trained in BLS, ATLS and PTC. These would usually be carried out by emergency physicians or trauma surgeons in centres with better resources. Many important issues remain unresolved in trauma care even in high-income countries. Debates such as the optimum time to treat patients are still on going. Early Total Care and Damage Control Surgery are two approaches each with its own pros and cons. Also there are questions about which system offers severely injured children and pregnant women the best odds for recovery and how best to evaluate the effectiveness of trauma systems. (Goniewicz, Goniewicz, Pawłowski, & Fiedor, 2016)(Singh et al., 2014).

2.9 Rehabilitation of Injured Casualties

In 2011, the first-ever World Report on Disabilities was issued by WHO and the World Bank. The report outlined the scope of rehabilitation services available worldwide. The report also made it clear that although some rehabilitation services are supported by an evidence based medicine, the majority were not. The field is almost totally lacking in large, randomized, controlled trials. The Physiotherapy Evidence Database, which records information on more than 20,000 trials, showed that many of these trials did not provide evidence of effectiveness with

regard to major health outcomes. Information on occupational therapy and physiotherapy in the developing world (LMIC) is not readily available (Berecki-Gisolf, Collie, & McClure, 2013).

2.10 Prevention of Road Traffic Accidents

Prevention of RTAs is planned along the 3 main levels of prevention namely: Primary prevention, Secondary prevention and Tertiary prevention.

2.10.1 Primary Prevention of RTAs

Primary prevention strategies in Ghana include all measures taken by the Law Enforcement authority, Health Ministry, other governmental Ministries Departments and Agencies (MDA) and Non Governmental Organizations (NGO) in educating road users on road safety. In Ghana, some of these strategies include a commission enforcing traffic regulations by the Motor Transport and Traffic Directorate, (MTTD) and stricter vehicle inspection and licensing by the Driver and Vehicle Licensing Authority (DVLA) alongside other measures to forestall road traffic accidents in the first place.

2.10.2 Secondary Prevention of RTAs

Secondary prevention strategies in use in Ghana are similar to what is done elsewhere. The use of an efficient ambulance system, well equipped trauma centres and well trained staff to care for victims. All these measures are aimed at mitigating the effect of already occurred RTAs.

2.10.3 Tertiary Prevention of RTAs

Tertiary prevention strategies employ the use of rehabilitation centre in order to restore some function back to victims of RTAs.(Naci, Chisholm, & Baker, 2009) (Agyemang, B., 2013).

2.10.4 Haddon's Matrix as a Tool for Prevention

The Haddon Matrix is the most commonly used paradigm in the injury prevention field. A campaigner for road traffic safety William Haddon in 1970 developed this matrix. The matrix assess the following factors: personal attributes, vector or agent attributes and environmental attributes. It reviews these attributes based during 3 time frames: Pre Crash, During Crash and post crash. The Haddon matrix help to prioritize contributory factors and plan interventions. (Moghisi, Mohammadi, & Svanstrom, 2014)

Table 2. The Haddon Matrix for the prevention and management of road traffic accidents

Phase	Human Factors	Vehicles and Equipment Factors	Environmental Factors
Pre-crash	• Information • Attitudes • Impairment • Police Enforcement	• Road Worthiness • Lighting • Braking • Speed Management	• Road design & road layout • Speed limits • Pedestrian facilities
Crash	• Use of restraints • Impairments	• Occupant restraints • Other safety devices • Crash-protective design	• Crash-protective roadside objects
Post-Crash	• First-aid skills • Access to medics	• Ease of access • Fire risk	• Rescue facilities • Congestion

2.11 Other Studies on RTAs and the Profile of injuries.

Several studies globally have been done on the impact and injuries associated with road traffic accidents. In one study in India, more than half subjects (59%) were in age group of 20 to 40 years with mean age of 36.5 years. Most of the of the RTA casualties were male (84%). About sixty-seven per cent (67%) belonged to one particular religion, educated up to secondary education had been attained by 65% of the casualties. About 54% were married. There were

more rural inhabitants than urban inhabitants. Concerning the cause of the RTAs human error was the most predominant. Alcohol use was found among all types of road users. On the average a third reported of alcohol use. Out of the 68% who were using motorcycles; only about a quarter had helmets on. Regarding vehicle occupants seatbelt use was low also about a third. A review of the driving records of the casualties showed that about one third (39%) had about 10 years driving experience. About half of the accidents occurred after 1600 hrs and on weekends. (Aggarwal, Kaur, & Dhillon, 2012)

Another study done in the Middle East, involved the review of available data from the hospital, the police and other governmental institutions. It showed that reducing the risk of RTAs requires commitment and informed decision-making and a broad range of cooperative activities and interventions. The activities which when undertaken would yield the most results are: enforcement of legislation to control speed and alcohol consumption, mandatory use of seat-belts and crash helmets, safer design and use of roads. Strict vehicles inspection before licensing and public education on road safety. Morbidity and mortality can be reduced among all age groups especially in children. Children should be educated in school about road safety. Furthermore children must be separated from high-speed highways and safe playgrounds must be available. Users of two wheelers should have proper training on road safety including the mandatory use of helmets. Seat belts and similar contraptions commercial or public buses. Safe pavements must be available for pedestrians. (Flayyih, Hameed, & Fakhir, 2018) the above conclusions made from their study is not entirely new. The injury profile of other studies have led researchers to similar conclusions.

Yet another study focused on the injuries and complications of RTAs reported on the injury profile as follows: regarding patients who ended up with amputation, that over 85% of the upper

limb, and about 53% of the lower limb amputations were on victims of RTA. The researcher went further back to review the research and found that, over a 25 year period (1971 to 1997), 564,700 victims were killed or disabled in RTAs; Over 10 percent died at the accident scene. In a related study in Abha, it was recorded that RTA was the cause in more than half of patients who were dead on arrival (DOA) at the hospital. These fatalities were found to have reduced from 1999 to 2010 from 29% to 16%. Comparing police records to hospital records, the police records confirmed a significant reduction of 27% in road mortalities from 2005-2010, in contrast to hospital records that showed 8% reduction. (Mansuri, Al-Zalabani, Zalat, & Qabshawi, 2015) These figures goes to show that most countries are not winning the war on road traffic accidents. Lower and middle income countries are bearing the brunt of this situation.

CHAPTER 3

METHODS

3.1 Study Design

The study was a cross-sectional study with secondary data taken from March 2018 to March 2019. Various search words were used to obtain the folders of all patients who were involved in road traffic accidents at the Accident and Emergency department of 37 Military Hospital. Search words used were: road traffic accidents; injury and trauma.

3.2 Study Area.

The 37 Military Hospital is a government owned hospital in Accra, Ghana. It is run by the Armed Forces of Ghana. It serves all service personnel and the general public. It has been designated a national trauma centre. It is a level 3 hospital which implies it offers primary, secondary and tertiary care to all patients. It is a 500 bedded hospital which receives on the average 7 to 10 trauma cases per day. Patient information is stored and retrieved using an electronic hospital records system (EHR). The catchment area is the whole of Accra. It receives referrals from other regions in Ghana too.

3.3 Study Variables

3.3.1 Independent Variable

The independent variables were:

Age, sex, occupation, marital status and mode of payment for hospital bills.

3.3.2 Dependent Variables

The dependent variables were:

type of road traffic accident, injuries sustained, emergency investigations done and the specialty of the attending doctor.

3.4 Measurement of variables

3.4.1 Emergency care of casualties

The emergency care of casualties in 37 Military Hospital follows the Advanced Trauma Life Support protocol. (Table 3)

Table 3. Advanced Trauma Life Support protocol: showing diagnostic investigations done at different stages (Ministry of Health, 2011)

Advanced Trauma Life Support Protocol		
Primary Survey	**Resuscitation / Activity** Rapid clinical assessment: airway, breathing, circulation, disability and exposure and temper	**Investigations** **X-ray**: spine, chest and pelvis **Laboratory test**: Full blood count, grouping and cross matching, Renal and liver function test **Ultrasound**: Focused assessment with sonography in trauma
Secondary Survey	**Resuscitation/ Activity** Head to toe examination for occult injuries.	**Investigations** X-ray MRI CT Scan
Definitive Care	**Resuscitation / Activity** Directed specialist procedures	**Investigations** Angiogram (on table) Endoscopy

The protocol can be grouped into three main stages: primary survey, secondary survey and definitive care. Each stage can be grouped into Resuscitation and Investigations. The performance of resuscitation is done in a standard way for all patients regardless of their ability to pay. The activity of resuscitation ensures the immediate stabilization of the patient and does not focus on making a diagnosis. The investigations ensure that a diagnosis is made. The diagnosis made would guide further care. The investigations performed is used as an index of the level of care. The factors that may influence the performance of investigations are listed in Table 4.

Table 4 . The factors that may influence the execution of investigations (Smith, Russell, & Horne, 2011)

Factors Influence the Execution of Investigations	
Patient Factors	**Health Facility Factors**
Clinical stability of patient for investigations: determined by severity of injury and quality of resuscitation process.	Trauma management protocol used by health facility: eg ATLS, PTC etc: determined by national policy and local hospital policy.
Acceptance of diagnosis by patient and willingness to undergo investigation: determined by good communication between care givers and patients	Availability of functioning hospital diagnostic equipment with the expertise to operate them: determined by the financial standing and access to resources (material and manpower) by the health facility
Ability of patient to pay for investigations either by insurance or out of pocket: determined by socio economic status of patient and the financial standing of the health facility	Delays in making a diagnosis: determined by expertise of attending doctor
	Delays in executing a requested investigation due to bureaucratic delays in the A & E: determined by efficiency of communication among health workers
	Availability of expertise to interpret and make decisions based on investigations

According to the ATLS protocol, 48 hours after the arrival of a patient, there should be a definitive plan for the patient. The attending physician must decide if the patient would be discharged, admitted to the ward, admitted to the ICU or HDU, needs surgery or if transfer to another hospital would be most appropriate. Thus in examining the emergency care given, 48 hours after arrival is the recommended optimum period for patients to stay at the A&E (Fig 2) (Suter, 2012). In assessing the emergency investigations done, information on all investigations and the specialist doctor in charge was extracted from the patients' folder.

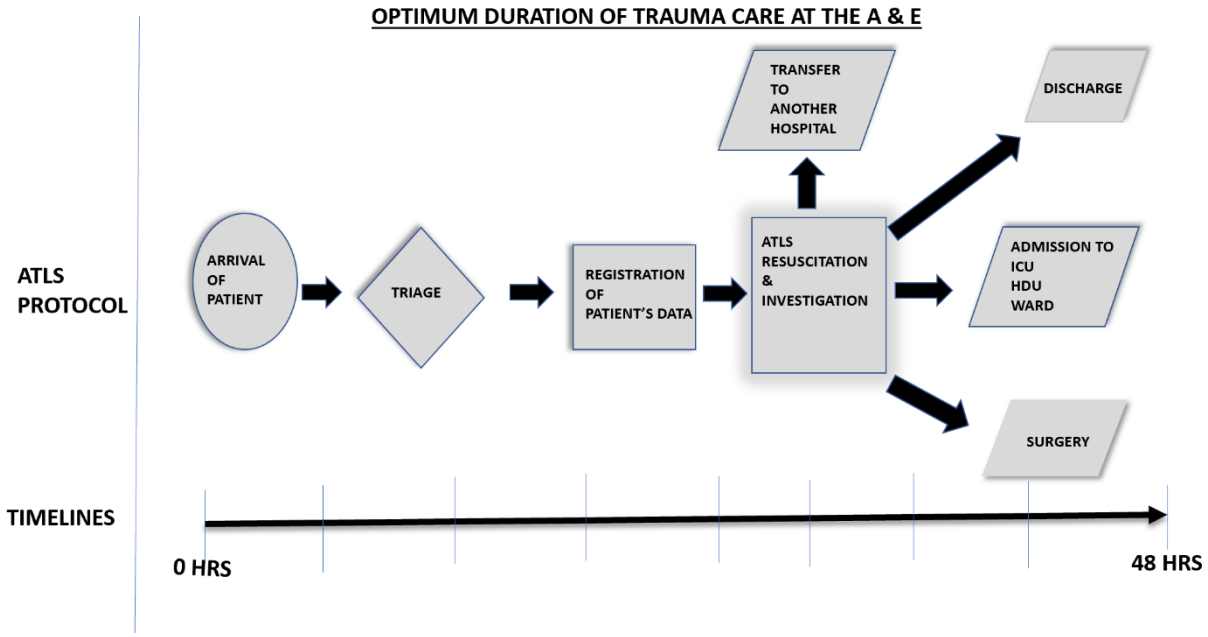

Figure 2. Timelines for optimum patient care at the A & E

3.4.2 Injury profile of all RTAs

In assessing the profile of injuries information on all diagnosis made and the types of RTA sustained in each patient was extracted from the patients' folder.

3.4.2 Socio-demographic motorcycle RTAs

In assessing the socio-demographic profile of motorcycle RTAs, the ages, sex, occupation and type of RTA (mechanism of injury) for each case of motorcycle RTA was extracted from the records.

3.5 Study Population

All RTA casualties that were seen at the Accident and Emergency Department of 37 Military Hospital.

3.5.1 Inclusion Criteria

All patients seen at the accident and emergency department of 37 Military Hospital who were involved in road traffic accidents within the time period March 2018 to March 2019 were recruited into the study.

3.5.2 Exclusion Criteria

Trauma cases that were not RTA related. Cases with incomplete data such as no general diagnosis, no presenting complaint or inadequate basic patient information were excluded. RTAs involving emersion (drowning of vehicle and occupants) and incineration were excluded. RTA cases that were outside the time frame March 2018 to March 2019 were also excluded.

3.6 Sampling

A census was done to recruit all RTA casualties seen at the A&E department of 37 Military Hospital from 1st March 2018 to 1st March 2019.

3.6.1 Sample Size

A total of 430 casualties were eligible for the study after the inclusion and exclusion criteria was applied.

3.6.2 Sampling

Initial 517 folders were obtained using the search words " Trauma"; "Injury" ; "Road traffic accident"; "Motor vehicle accident" and "Motor vehicle collision". After taking out all non RTA cases of trauma and cases with incomplete data, 430 folders were left. These 430 folders were carefully reviewed and all relevant information extracted using an extraction tool

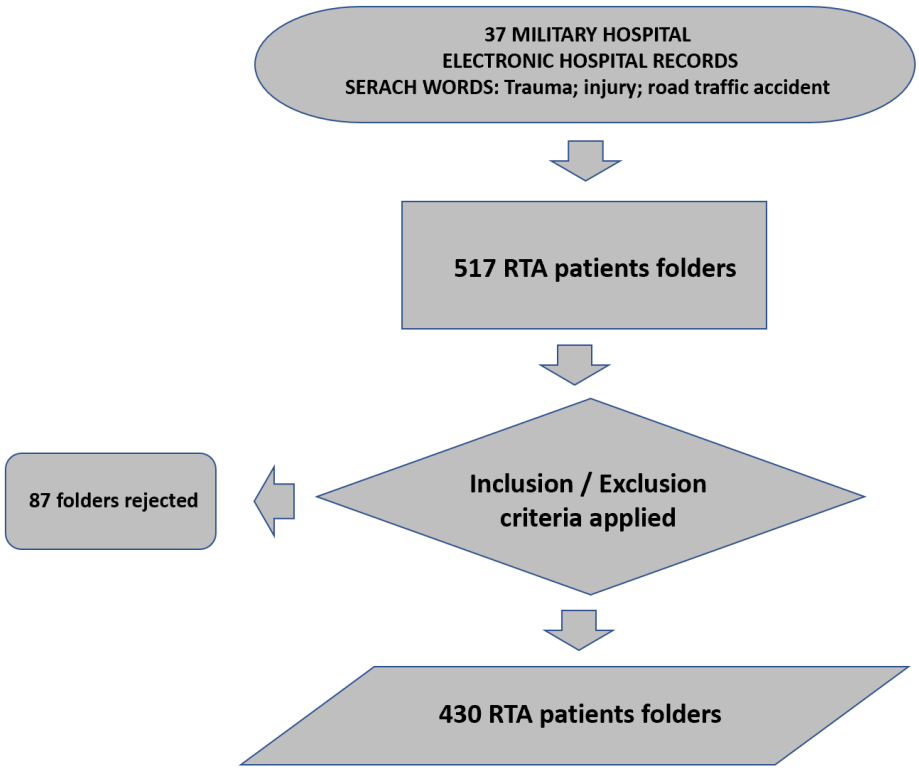

Figure 3. Schematic of sampling process

3.7 Questionnaire/ Extraction tool

A structure extraction tool (Appendix B) was used as a guide to obtain data from the electronic records of the patients.

3.8 Quality Control

Two research assistants (nurses) who assisted in the extraction of data were well trained and worked under strict supervision from the principal investigator (MPH student). This was to limit errors. Random cross checking of extracted data was done to ensure the accuracy of data collected.

3.9 Data Analysis

A Microsoft Excel spreadsheet was created. All the different variables were coded.

3.9.1 Sociodemographic Profile of Casualties

Regarding the sociodemographic characteristics of the population under study, frequency tables were created for age, sex, occupation, marital status and mode of payment for hospital bills. Measures of central tendency (mean) and dispersion (range , standard deviation) were calculated for the ages.

3.9.2 Casualty Emergency Care

In examining the emergency care received by casualties, a frequency table of the investigations performed was drawn and the percentages compared to the ATLS recommended percentages to

assess compliance. The specialists in charge of the cases were also noted and the relative percentages found.

3.9.3 Injury Profile of All Casualties

In assessing the injuries sustained by all RTA casualties, The Chi-square test and a Fisher's-exact test with a p-value at 0.05 was used to find the statistical significance of any association between the different mechanism of injury (type of accident) and the types of injury (diagnosis).

3.9.4 Sociodemographic Profile of Motorcycle RTA Victims

In exploring the socio-demographic profile of those involved in motorcycle RTAs, the SATA-15 software was used to conduct a logistic regression analysis having motorcycle related RTA and non motorcycle related RTA as the dependent variables. Age, sex and occupation were the independent variables. This was done to determine if those variables could help predict the likelihood of occurrence of motorcycle RTAs.

3.10 Ethical Considerations

Approval was sought from the Institutional Review Board of 37 Military Hospital. Patient confidentiality was ensured by using folders numbers only.

3.10.1 Informed consent

The IRB approval implied that consent for the use of secondary data was given.

3.10.2 Confidentiality.

Information was obtained strictly for use only in this research. No other unauthorized use was ensured. No names were included in the extracted data.

3.10.3 Compensation

No financial remuneration was given or promised to the subjects whose data was used.

3.10.4 Risk and Benefit

As secondary data was used, this study did not pose any risk to the study population. Information obtained from this study would be used to guide the treatment protocols already in use in 37 Military Hospital and beyond.

3.10.5 Pre-test and Pilot study

Data from previous months were reviewed to assess the quality of the secondary data. It also helped to determine the information that could be obtained in this study.

3.10.6 Data storage and usage

Data from this study is stored electronically and password protected.

3.10.7 Declaration of conflict of interest

The researcher is a surgeon in 37 Military Hospital where the study was done. The researcher has no known biases.

3.10.9 Funding for the study

This study was self -sponsored.

CHAPTER 4

RESULTS

4.1 Socio-demographic characteristics of casualties

A total number 430 casualties were studied. RTAs were most common in the 35-44 years age group. This was followed by the 25-34 years age group. Together the 25-44 age group accounted for 53.95% of all RTAs. In addition, 66.05% of all RTAs were male. The male to female ratio was approximately 2: 1. Fifty-five percent (54.88%) of casualties were involved or employed in blue-collar jobs. Twenty-seven per cent (26.98%) of casualties did not disclose their occupations. Casualties were mostly married (45%). About the that same number (42.33%) were single. (Table 5)

A majority of casualties (60.47%) paid by cash for their hospital bill compared to a cumulative total of 26.05% who paid either by national or private health insurance (Table 6).

In summary most RTA victims were male, within the 25-44 years age group, a majority were employed in blue collar jobs and paid cash for the hospital charges incurred due to their accidents.

Table 5. Socio-demographic characteristics of all casualties involved in road traffic accidents

Variable	Frequency	Percentage (%)
Age		
<12	12	2.79
12-17	10	2.33
18-24	50	11.63
25-34	102	23.72
35-44	130	30.23
55-54	60	13.95
55-64	38	6.98
65-74	26	6.05
>75	2	0.47
Mean age	30 years	
Range	5years – 75 years	
Standard Deviation	10.5 years	
Sex		
Male	284	66.05
Female	146	33.95
Occupation		
Unemployed	12	2.70
Student	26	6.05
White Collar	40	9.30
Blue collar	236	54.88
Unknown / missing data	116	26.98
Marital status		
Single	182	42.33
Married	195	45.35
Widowed	13	3.02
Divorced	14	3.26

Not disclosed	26	6.05

Table 6. Mode of payment for trauma care received at the hospital

Mode of payment	Frequency	Percentage (%)
NHIS	110	25.58
Private Insurance	10	2.33
Entitled employee	38	8.84
Cash	260	60.47
Unknown / missing data	12	2.79
Total	430	100

4.2 Types of Emergency Investigations done for RTA Casualties in the First 48 hrs of Admission.

The total number of investigations done in the first 48 hours (723) was more than the total number of casualties (430). This shows the multiplicity of investigations done for some casualties. Eighty-seven per cent (87.01%) had x-rays and laboratory investigations done in the first 48 hrs of reporting to the Accident and Emergency room. This was 57.38% for x-rays and 38.31% for laboratory investigations such as Full blood count, Renal function test, Liver function test and Typing and Cross-matching of blood (an essential investigation before blood transfusion is done). Laboratory investigations and x-rays serve as an assessment tools to determine further care to be given to a casualty after initial resuscitation. (Table. 7) All patients that report to the emergency room with moderate or severe injury must have basic laboratory investigations done. Mild injuries are often discharged without any laboratory investigation. X-rays and Laboratory investigations in 37 Military Hospital are seldom done on credit. They must be paid for either by insurance or out of pocket. There are other factors that may influence the performance or otherwise of investigations. (Table 4).

Fifty-six (56.34%) percent of the RTA casualties were managed by the Orthopaedic surgeons. Neurosurgeons were the next highest with 12.6%. Ear, Nose and Throat Surgeons managed 0.34% of the trauma cases within the period studied. (Table 8)

Table 7. Investigations done in first 48 hrs at the A& E.

Investigations in first 48 hrs	Frequency	Percentage (%)
X-ray	346	57.38
Laboratory	231	38.31
MRI, CT Scan	8	1.32
None	8	1.32
Other	10	1.65
Total number of **investigations** done	603	100

Table 8. Specialty of doctors rendering definitive care to RTA casualties

Management in the first 48 hrs	Frequency	Percentage (%)
Neurosurgery	71	12.16
ENT surgery	2	0.34
Cardio thoracic surgery	25	4.28
General surgery	25	4.28
Genito-urinary surgery	13	2.23
Orthopaedic surgery	329	56.34
Medical management	3	0.51
Psychotherapy/ Psychiatric	0	0
Casualty	51	8.73
MFU	35	5.99
Plastic Surgery	30	5.14
Total number of **consultations**	**584**	100

4.3 Injuries sustained by all RTA casualties.

Forty-five percent (44.67%) of injuries sustained were to the lower limb. With 15.90% being to the leg (ie Tibia and Fibula). The second and third most common injuries were upper limb and head injury(23.74%) and (13.48%) respectively. (Table 9). About a fifth (20%) of all the casualties had more than one system injured (Multiple injuries). Eighty percent had solitary injuries. Solitary injuries are injuries in which only one organ system of the body is affected. For example a casualty may have only chest injury or only lower limb injury. The head and neck is considered as one system in trauma. Multiple injuries are when more that 1 organ system is injured. (Table 10). The incidence of RTAs was highest among vehicle occupants (35.12%) followed by motorcycle related (30.93%) and pedestrians (25.34%). (Table 11)

Table 9. Injuries sustained by RTA casualties

Diagnosis	Frequency	Percentage (%)
Head and neck injury	68	13.48
Chest injury	31	5.23
Abdomen injury	9	0.80
Pelvis injury	14	2.21
Spine injury	6	1.01
Lower limb injury (unspecified)	70	14.08
Femur	40	8.05
Tibia and fibula	79	15.90
Foot and ankle	33	6.64

Upper limb injury (unspecified)	30	6.04
Humerus and shoulder	43	8.65
Forearm	41	8.25
Hand and wrist	4	0.80
Soft Tissue Contusion	27	5.43
Musculoskeletal pain	17	3.42
		100

Table 10. Casualties with multiple and solitary injuries

Injury / Diagnosis	Frequency	Percentage (%)
Multiple injuries	83	19.30
Solitary injuries	347	80.70

Table 11. Various mechanisms of injury (Type of accident sustained by casualties)

Mechanism of Injury	Frequency	Percentage %
Pedestrian	109	25.34
Vehicle Occupant	151	35.12
Motorcycle user	133	30.93
Unknown Mechanism	37	8.61

Using a Chi square test and a Fishers exacts test where appropriate. A significant association was found between the following injuries and the mechanism of injury (type of accident): head and neck injury; chest injury; abdominal injury; lower limb injuries; soft tissue contusion and musculoskeletal pain. There was however no significant association between the mechanism of injury and the type of injury in pelvic, spine and upper limb injury. (Table 12)

The injuries sustained were found to be more predominant in particular types of accidents. Head and neck injuries: about a quarter (24.77%) of the injuries were from pedestrians. Chest injuries:

18 % of chest injuries were vehicle occupants (drivers and passengers). Lower limb injuries: most lower limb injuries were from motorcycle RTAs (63.91%). Generalized soft tissue contusion and musculoskeletal pain were mostly sustained by car occupants (13.91%) and (9.27%) respectively. (Table 12). There are various confounding variables that determine the type of injury sustained aside the mechanism of injury used in table 12.

Table 12. Association between the type of RTA and the type of injury sustained. Chi-square (+) was used for cells with all values ≥ 5. Fisher's -exact test (*) was used for cells with values < 5

Diagnosis/ Injury	Mechanism of Injury and Associated P-values					
	Pedestrian (N=109)	p-value	Vehicle Occupant (N=151)	p-value	Motorcycle user (N=133)	p-value
Head &Neck						
Yes	27 (24.77)	0.011	23 (15.23)	0.013	16 (12.03)	0.015
No	82 (75.23)		128 (84.77)		117 (87.97)	
Chest						
Yes	3 (2.75)	0.028	18 (11.92)	0.018	9 (6.77)	0.020
No	106 (97.25)		133 (88.08)		124 (93.23)	
Abdomen						
Yes	1 (0.92)	0.014	2 (1.32)	0.011	2 (1.50)	0.010
No	108 (99.08)		149 (98.68)		131 (98.50)	
Pelvis						
Yes	4 (3.67)	0.772	4 (2.65)	0.781	4 (3.01)	0.790
No	105 (96.33)		147 (97.35)		129 (96.99)	
Spine						
Yes	2 (1.83)	0.999	2 (1.32)	0.981	2 (1.50)	0.975
No	107 (98.17)		149 (98.68)		131 (98.50)	
Lower limb						
Yes	57 (52.29)	<0.001	56 (37.09)	<0.001	85 (63.91)	<0.001
No	52 (47.71)		95 (62.91)		48 (36.09)	
Upper limb						
Yes	32 (29.36)	0.271	45 (29.80)	0.282	29 (21.80)	0.290
No	77 (70.64)		106 (70.20)		104 (78.20)	
Soft Tissue						
Yes	2 (1.83)	0.020	21 (13.91)	<0.001	4 (3.01)	0.010
No	107 (98.17)		130 (86.09)		129 (96.99)	
Musculo-skeletal pain						
Yes	4 (3.67)	<0.001	14 (9.27)	<0.001	0 (0.00)	<0.001
No	105 (96.33)		137 (90.73)		133 (100.00)	

4.4 Socio-demographic profile of casualties at involved in motorcycle RTAs.

Using a logistic regression analysis, there was a significant association between motorcycle injury with the age and sex of casualties ($p< 0.001$) and ($p< 0.001$) respectively. Occupation however did not have a significant association with motorcycle injury (Table 13). Most of the confounding variables are not available in hospital data used for this study. For example the speed of vehicles at the time of the accident is key in determining the injuries sustained but this is absent from hospital data. It would therefore be inconclusive to adjust the odds ratio calculated.

Lower limb injuries (hip, thigh, knee, tibia, fibula, foot and ankle) were the most predominant injury in motorcycle riders with a cumulative percentage of (56.30%). Out of this category tibia and fibula injuries predominant. Upper limbs followed with a cumulative percentage of (19.20%), the most common of these injuries were forearm injuries. (Table 14)

Table 13. Logistic regression analysis: independent variables: age; sex and occupation dependent variables: motorcycle RTA and non-motorcycle RTA

Variable	Motorcycle RTA, N=133 n (%)	NON Motorcycle RTA, N=297 n (%)	OR (95% CI)	p-value
Age				
<25 years	22 (16.54)	50 (16.84)	2.97 (1.44 - 6.14)	0.003
25-44 years	95 (71.43)	139 (46.80)	4.61 (2.57 - 8.29)	<0.001
45 years and above	16 (12.03)	108 (36.36)	1 (Ref)	
Sex				
Male	117 (87.97)	167 (66.23)	5.69 (3.22 - 10.07)	<0.001
Female	16 (12.03)	130 (33.77)	1 (Ref)	
Occupation of casualty				
Commercial motor taxi	10 (7.52)	22 (7.41)	1 (Ref)	
White Collar	14 (21.21)	52 (78.79)	0.59 (0.23 - 1.54)	0.281
Blue collar	73 (35.78)	131 (64.22)	1.23 (0.55 - 2.73)	0.618
Unemployed	0 (0.00)	12 (4.04)	-	
Unknown / missing data	36 (27.07)	80 (26.94)	0.99 (0.43 - 2.30)	0.981

Table 14. Injuries sustained by only motorcycle users

Diagnosis	Frequency	Percentage (%)
Head and neck injury	16	10.51
Chest injury	9	5.96
Abdomen injury	2	1.32
Pelvis injury	4	2.65
Spine injury	2	1.32
Lower limbs injury (unspecified location)	30	19.87
Femur	12	7.95
Tibia and fibula	25	16.56
Foot and ankle	18	11.92
Upper limbs injury (unspecified location)	1	0.66
Humerus and shoulder	12	7.95
Forearm	14	9.27
Hand and wrist	2	1.32
Soft Tissue Contusion	4	2.65
Musculoskeletal pain	0	0
unknown	0	0
Total of Diagnosis made at the A &E	151	100

CHAPTER 5

DISCUSSIONS

This study was a cross-sectional study spanning a year. It studied all RTA casualties that reported to the accident and emergency department from March 2018 to March 2019. The aim of the study was as follows: to examine the injury pattern and emergency care given to road traffic accidents victims. This broad aim was further divided into specific ones which were as follows: to examine the emergency ATLS investigations done for RTA victims in the first 48 hrs of admission, to find out the injuries sustained by all victims of road traffic accidents and to explore the socio-demographic profile of those involved in motorcycle related RTAs.

5.1 General characteristics of the casualties

Most of the casualties were within the 25-44 years age group. The importance of this age group (i.e. 25-45) is in terms of employment. The Ghanaian population has a mean age of 20.4 years. This describes a youthful population. Also, the employed labour force increases with increasing age till 49 years where it starts to decline. The proportion of the employed, increases from about 24 % for ages 15-19 through to ages 45-49 where it peaks at about 88 percent. The employed population then starts decreasing from age group 50-54 to age 65 years and older. (Ghana Statistical Service, 2016). Thus the age group with the most casualties describes the active labour force in Ghana. Furthermore, Ramadani et al in a study of RTAs from 2010 to 2015 in Kosovo found that victims above 19 years old were mostly injured with a statistically significant difference ($p = 0.001$) (Ramadani et al., 2017). In addition, Celine et al studied retrospectively RTAs over 5 years (2005-2010) in India and similarly found that the highest incidence was in

the age group of 15-44 years. Within the aforementioned group, the peak age group was 25-34 years. (Celine & Antony, 2014) This age group represents the economically active age group as stated earlier. The morbidity and mortality associated with RTAs in this age group has far reaching effects beyond the affected individual. Ghana currently has a dependency ratio of 71.58%. this implies that a large number of people depend on the economically active population. All these dependent people tend to lose their source of livelihood due to RTAs.

A large proportion of RTA casualties were male (66.05%). In a study in a tertiary care hospital in Garhwal Region of Uttarakhand, India a total of 3431 victims involved in RTAs studied revealed that, males comprised of a total of 83.2% and females, only one sixth (16.8%) (Kandpal, Vyas, Deepshikha, & Semwal, 2015). This male preponderance is of interest because according to the 2015 Ghana Labour Force Report, in urban area like Accra, the proportion of males employed (71.4%) is higher than females (64.6%), (Ghana Statistical Service, 2016). Thus more men are out and about due to work leading to a higher risk of RTA (ILO, 2010). However, occupation alone cannot account for this trend. A possible reason could be due to the perceived high risk taking behaviour of male road users. Katolik et al in 2016 studied 141 motorcyclist in Indonesia and concluded that young males with riding experience were very likely to take high risks resulting in errors and accidents (da Costa, Malkhamah, & Suparma, 2016).

A majority were employed in blue collar jobs. Blue collar jobs refer to workers whose job entails largely physical labour, such as factory workers and artisans. The working age group in Ghana includes all persons 15 years and older. (ILO, 2010). About 74% of the currently employed persons are in the non formal sector, that is, they operate their own economic enterprise, or engage independently in a trade. Just about 19% are paid employees (public or private

employees who receive remuneration in wages, salary or commission). Thus this observation ties in with the general employment characteristics of Ghana.

About sixty per cent (60.47%) of the casualties paid cash for the hospital bills incurred due to their accidents. As of 2014 in Ghana, the NHIS covered 10.5 million people. Which is about 40 percent of Ghana's eligible population. This leaves 60% of the population on private insurance and out of pocket payment (Schieber, Cashin, & Saleh, 2012). However from this study less that 40% had either private, national health insurance or institutions that footed the bill for them. Such a trend posses challenges on the ability of patients to foot their bills when they are eventually discharged since majority of such casualties are in the informal sector without regular salaries. A study in Chile found that people of lower socioeconomic background resorted more to out of pocket payment (OOP) compared to insurance. This was partly because people in this category often utilized alternate medicine (traditional medicine) in addition to modern medicine. Those of a higher socioeconomic status often had insurance (either state owned of private). This group to a larger extent relied mostly on modern medicine (Mondaca & Chi, 2017). With about 55% of the casualties in blue collar jobs and about 60% of them paying cash in this study, it may suggest that a similar association exists between socioeconomic status and the mode of payment for hospital trauma care.

5.2 Emergency care of all RTA casualties

The Investigator sought to answer these questions: what was done for casualties on reporting aside the standard resuscitation that is required by law; who (type of doctor) was responsible for the service rendered.

According to the Ghana Health Service (GHS) policy on accident and emergency care: “An area in the health facility shall be designated as the Accidents and Emergency Department/Unit (A&E). The A&E department/unit shall operate a 24-hour service and provide initial treatment for a broad spectrum of illnesses and injuries, which may be life threatening and require immediate attention. Financial consideration should not be a barrier to the initial treatment of the patient” (Policy And Guidelines For Accident & Emergency Department, 2011). Thus all patients that are brought to the A & E must be resuscitated in a standard way using the ATLS protocol under strict supervision from a specialist doctor. Therefore all victims in this study are thought to have received the standard care needed, the difference however was in the other services such as radiology, laboratory services and other investigations. These service are not always done as they should be. The reasons for this is varied. The performance of theses investigations serves as an index of the quality of care given since it directs the path of further definitive care needed. In this study it was found that, a majority of casualties (87.01%) had x-rays and laboratory investigations done in the first 48 hrs of reporting to the A & E. A small percentage had advanced imaging such as MRI and CT scans done within the first 48 hours of reporting to the A & E. The remaining percentage who had no investigations done could have been due to the fact that their injuries did not warrant it or there were delays in the execution of the investigation. Delays in investigations are usually either due to factors related to the patient or factors related to the health facility. Factors related to the patient are usually inability to pay for the investigations. Factors related to the health facility are delays in diagnosis; equipment that are out of order and bureaucracies associated with clinical and administrative work in the hospital. Some studies have revealed in-hospital delays in obtaining diagnostic investigations. Preoperative imaging such as x-rays, full blood counts, blood chemistry and blood grouping and

cross matching are often requested in order to make definitive diagnosis and guide further care. However major delays usually occur and the reasons usually fall within the factors mentioned above (Maine et al., 2019). The satisfactory level of investigations done by casualties in this study may indicate fairly efficient running of the A&E department in 37 Military Hospital. This may also indicate that either casualties had ready money to pay for investigations or it was done on credit. Whatever the case may be, it resulted in a satisfactory level of initial investigation.

Almost fifty-six percent (56.34%) of the RTA casualties were managed by or with the orthopaedic surgeons. Neurosurgeons were the next highest with (21%). Ear, Nose and Throat Surgeons managed only 0.34% of the trauma cases within the period studied. This implies that a lot of the of the injuries involved the musculoskeletal system and the central nervous system. This observation also enforces the need for healthcare facilities to at least have some core specialties at the accident and emergency (A & E). In LMIC the situation where all specialist are available in one health facility is rare. Usually there are a few specialists who manage all varieties of cases. Hardcastle et al in 2011 noted that the emergency care of trauma patients in Africa was a challenge due to many factors notable among them was the training and availability of specialists. The use of traumatologist and emergency medicine physicians was found to help facilitate the multidisciplinary management of trauma patients (Hardcastle & Oteng, 2011). Traumatologist are specialist doctors who are trained to do the work an orthopaedic, neuro-, and general surgeon is required to do in the management of casualties. The observations made in this study provides information on the core specialties that must be available in a trauma centre if not all specialists can be available. There are currently about 60 orthopaedic surgeons (this makes 1% of the 5384 permanently registered doctors in Ghana) in active service in the major cities in Ghana (Nontaa et al., 2019). The number of neurosurgeons and general surgeons are less than 1

% and about 7 % respectively. The number of these aforementioned specialists are not enough to fill all regional and tertiary hospitals to serve a population of approximately 30 million people in Ghana (Ghana Statistical Service, 2016). Ghana like all most LMIC are plagued with the triple burden of disease. That is infectious communicable diseases (group 1), Non communicable diseases (group 2) and Trauma (group 3) (Frenk & Gómez-Dantés, 2011) thus trauma contributes heavily to the DALYs of Ghana. As such a decentralized trauma care system would require the presence of some core trauma specialist (Orthopaedic Neuro- and General surgeons) stationed at key locations all over Ghana.

5.3 Injury profile of RTA casualties

The principal investigator sought to answer the question: What sort of injuries are road users in Accra sustaining and are the variations in the injury pattern based on the mechanism of injury?

About fifty-six percent (56.30%) of injuries sustained casualties in this study were to the lower limb, with 16.56% of the these being to the leg (i.e. Tibia and Fibula). The second most common type of injury was upper limb injury (19.20%) and then head and neck injury (10.51%). Madhuvardhana et al studied 781 cases of road traffic accidents and found the distribution of injuries as follows; abrasions were the commonest type of injuries (42.4%), then lacerations (30.0%). This was followed by soft tissue contusion (14.2%) and fracture was found in 13.4% of cases (Madhuvardhana, Naveen, Arun, Balakrishna, Rao., 2015). In addition, Mirza et al, in 2013 studied autopsies done on RTA victims in Karachi, India and found that majority of the casualties had head injury (66.4%), then chest injury (14.5%), multiple traumatic injuries in (8.6%) , and pelvis injuries in (2.9%) of the cases (Mirza, Hassan, & Jajja, 2013). Another study done in Lasi, Romania, showed that the highest non-fatal injuries were; head injury

(60.8%) and abdomen/pelvis contusions (50%). These were followed by a lesser number of open wounds (23.2%), fractures (17.8%) and occult injuries (2.04%). The study showed that lower limb (17.8%) fractures were the most common, then upper limb (8.9%), head and maxillofacial injury (3.9%), and pelvis (3%). Also in this same study done in Romania, it was found that about 85% of children presented with multiple trauma (> 2 systems in the body injured) (Duma et al , 2009). On balance the evidence suggests that there is no strong trend of injuries that RTA victims sustain. Any form of injury could be sustained by any mechanism of injury. However further analysis of the data this study revealed that certain mechanisms of injury (type of accident) had a higher odds of having a particular type of associated injury.

There was a statistically significant association between the mechanism of injury and the following injuries: Head and neck injury, chest injury abdominal injury, lower limb injuries, soft tissue contusion and musculoskeletal pain. There was no statistically significant association between the mechanism of injury and the type of injury in pelvic, spine and upper limb injury.

In head and neck injuries, about a quarter (24.77%) of the injuries were from pedestrians and 12.03% among motorcycle users. Applying principles of mechanism of injury to the patho-anatomy of injuries it can be suggested that the relatively lower incidence of head injury in he motorcycle group could be attributed to widespread use and enforcement of helmet wearing in motorcycle users. Pedestrians on the other hand had no protection for the head.

Regarding chest injuries, 18 % of chest injuries were vehicle occupants (drivers and passengers) and 2.27% were pedestrians. A suggested reason for this is because car occupants are prone to colliding with seats, the steering wheel, the dashboard or other passengers with whom they are in close proximity.

Most cases of abdominal injury (10.81%) was from an unknown mechanism. Less than 1 per cent (0.92%) were from pedestrians. Proposed reasons for this trend is that when pedestrians are involved in RTAs there is often translocation of the whole body from one location to the other the head and the limbs often make impact of the fall first before the trunk does. This predisposes the head and the limbs to injury more than the chest and abdomen.

Majority of lower limb injuries were from motorcycle RTAs (63.91%). Motorcycles riders are virtually unprotected (except for the head in helmeted riders) road users moving at high velocities. The lower limbs are most vulnerable by virtue of its proximity to other vehicles, the ground and the motorcycle being ridden by the user (who eventually becomes the casualty).

Generalized soft tissue contusion and musculoskeletal pain were mostly sustained by car occupants (13.91%) and (9.27%), respectively. The injuries represent the lower spectrum of the severity of injuries that can occur. It goes to show that vehicle occupants are prone to the full spectrum of injuries from very mild to very severe and even fatal. This may also apply to other road users but to a lesser extent. That is, any pedestrian or motorcyclist that reports to the ER with an injury is likely to have an injury ranging from moderate (not mild) to severe.

Numbers of injuries in all (512) exceeded the total number of victims (430). This indicated the multiplicity of injuries in some casualties. From our study almost 20% of the casualties had multiple injuries. This is a condition called polytrauma where more than one system in the body is injured. Such injuries often require more than one specialist in the definitive management. The multiplicity of injuries to a some extent indicates the severity of injuries and the complexity of the needed management. In a study of children involved in RTAs in Romania, it was found that 85.1% of children presented with multiple injuries (Duma et al, 2009). The factors that influence

multiplicity of injuries are not well established. The association between multiple injuries and the severity of injuries is also not well established. The mechanism of injury has also not been found to have a bearing on whether the casualty sustains solitary or multiple injuries (Singh, Singh, Gupta, & Kumar, 2014)

5.4 Socio-demographic profile of motorcycle RTA casualties

The principal investigator sought to answer the question: what type of people are usually involved in motorcycle RTAs and what sort of injuries are sustained by motorcycle users.

Of the casualties resulting from motorcycle accidents, persons aged between 25 and 44 were the most common victims with a cumulative frequency of 70.15%. Motorcycle RTA casualties were 5 times more likely to be in the 25-44 years age group. The possible reasons for this are similar to those mentioned during the demography discussion. In addition, the unofficial use of motorcycle taxis contributed to this trend. Motorcycle RTA casualties were almost 6 times more likely to be males (OR 5.69). Male to female ratio for all the casualties in this study was 1.9 : 1 (approximately 2:1) compared to that for only motorcycle injuries it was 7.3:1 (Approximately 7: 1). This difference in the male preponderance in motorcycle related RTAs may be explained by various theories. A similar trend was found in motorcycle users in Nigeria where males were in overwhelming majority of casualties involved in RTAs (Adogu et al., 2011). Firstly it is possible that some of the casualties were actually motorcycle taxi riders but did not disclose their true occupation on admission since commercial motorcycles are illegal in Ghana. Empirical evidence suggests that most motorcycle riders in Ghana are male. Secondly, as stated earlier males are thought to have a predisposition to risky behaviour during driving.

Blue-collar workers (e.g. manual labourers, factory hands, petty traders, etc.) were the predominant casualties in motorcycle accidents in this study (35.78%). Only a few casualties admitted to being a commercial motor taxi rider. A notable number of casualties (27.07%) had no occupation documented. It was noticed that the occupation of casualties did not increase their odds of having a motorcycle RTA (p=0.618). Perhaps a prospective study with verified documentation of the occupation of casualties may yield some interesting trends.

With regards to Injury profile of motorcycle RTA casualties, lower limb injuries (hip, thigh, knee, tibia, fibula, foot and ankle) were the most predominant injury in motorcycle riders with a cumulative percentage of 63.91%. Out of this category tibia and fibula injuries were predominant. Upper limbs followed with a cumulative percentage of 21.80%, the most common of upper limb injuries were forearm injuries. A study done in Ogbomoso, Nigeria on 156 motorcycles related RTA found about 38.5% had injuries involving the head and neck. The most frequent injury in the head and neck region was cerebral concussion (35%). This was followed by cerebral contusions and scalp lacerations; cervical fractures (5%). Just over a quarter (26.3%) had maxillofacial injuries involving abrasions and lacerations. Maxillofacial fractures amounted to (19.5%) (Ojeniyi A., Olusayo I., Adenike A., Olufemi T., & Ojeniyi A., 2015). The pattern of injury in this study is at variance with the reported study in Nigeria further enforcing the theory that there is no strong trend in the injuries sustained based on the mechanism of injury.

CHAPTER 6

CONCLUSIONS

The emergency care was compliant with the accepted ATLS protocol which ensures best practices. Various specialists were involved in the emergency care of casualties at the A&E. The management of most cases involved the Orthopaedic surgeon.

All mechanism of RTAs occurred during the period of study. Some injury patterns significantly differed across different mechanisms of injury. Lower limb injuries were the most predominant.

The socio-demographic profile of motorcycle related RTAs showed working age (25-45 years) males with no special trend in their occupation.

RECOMMEDATIONS

Orthopedic, neuro- and general surgeon must be well placed in the health facilities managing trauma. The use of the ATLS protocol must be encouraged in all health institutions in Ghana. Health Insurance must be promoted among blue collar workers in the non-formal sector to cover trauma care. Update courses on the improved management of limb injuries must be made available for middle level health personnel like nurses and physician assistants since most injuries sustained were to the lower limb. The number of available Orthopeadic, Neuro- and General surgeons must be increased to ensure efficient trauma care in Ghana.

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APPENDIX A

Relevant Tables and Figures from Results

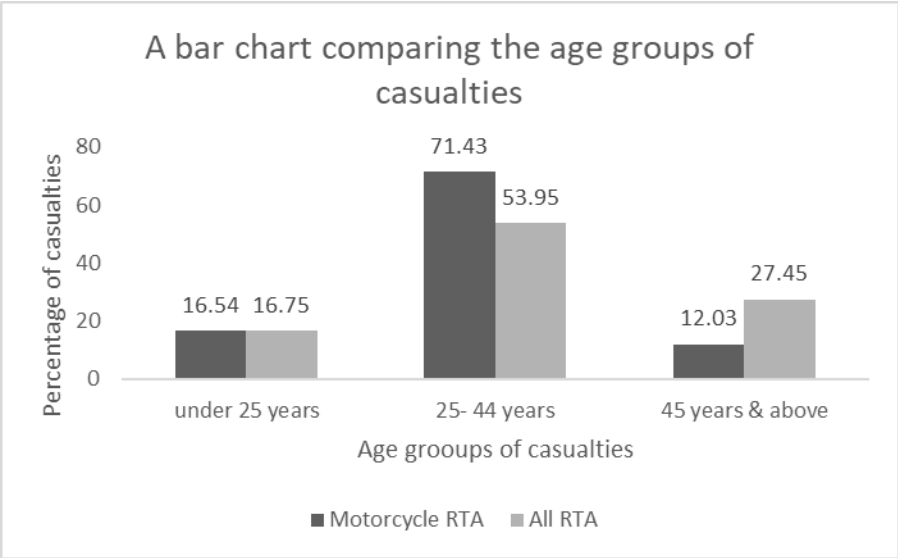

Figure 4. A bar chart comparing the age groups of casualties based on mechanism of injury

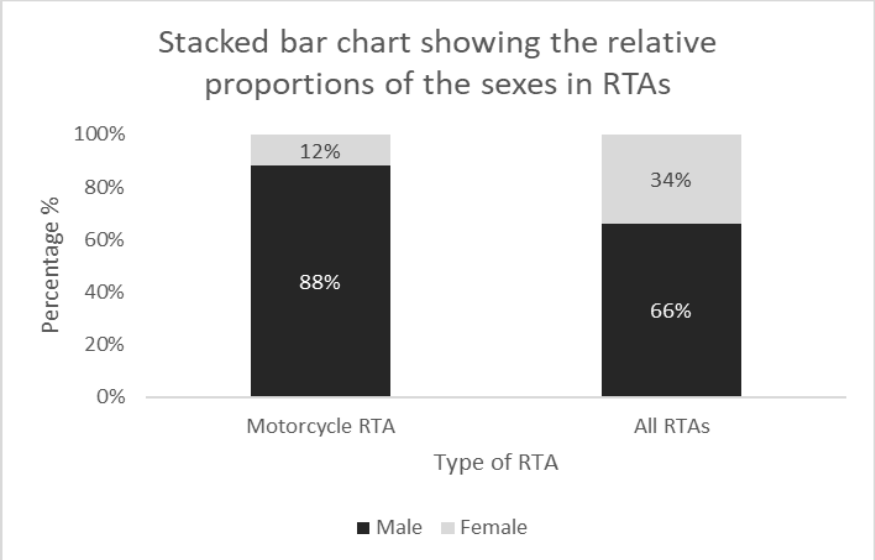

Figure 5. A bar chart comparing the age groups of casualties based on mechanism of injury

Appendix B

Extraction Tool

Injury Patterns and Emergency Care in Motorcycle Related Road Traffic Accidents in Accra.

Serial #:…… Folder No:……

1. Initials:……

2. Age: ……..

[ ]<12 [ ] 12-17 [ ] 18-24 [ ] 25-34 [ ] 35-44 [ ]45-54 [ ]55-64 [ ]65-74 [ ] 75 and <

3. Sex: [ ] Male [ ] Female

4. Occupation:

[ ] Unemployed [ ] Student [ ] White collar worker [ ] Blue collar worker [ ] Commercial motor taxis rider [ ] Other

5. Marital Status

[ ] Single [ ] Co habiting [ ] Married [ ] Widowed [ ] Separated [ ] Divorced

6. Location of Residence:……..

<u>Details About Road Traffic Accident</u>

7. Time of accident (24 hour GMT format)

[ ] 0000 to 0700 HRS [ ] 0700 to 0900 HRS [ ] 0900 to 1400 HRS [ ] 1400 to 1700 [ ] 1700 to 20 00 HRS [ ] 2100 to 00 00HRS

8. Location of Road Traffic Accident:……

9. Mode of transport to the hospital

[ ] Motorcycle [ ] Taxi [ ] Private Vehicle [ ] Commercial bus [ ] Ambulance [ ] Other please specify:……..

Details About Emergency Hospital Care

10. Time of arrival to A&E

[ ] 0000 to 0700 HRS [ ] 0700 to 1400 HRS [ ] 1400 to 1700 [ ] 1700 to 20 00 HRS [ ] 2100 to 00 00HRS

11. Mode of payment: [ ] NHIS [ ] Private Insurance [ ] Entitled employee [ ] Cash [ ] None [ ] Other ……..

12. Service provided in first 48 hrs in the A&E

[ ] Resuscitation [ ] Laboratory [ ] X-ray [ ] Minor Surgery [ ] Major surgery

[ ] Endoscopy [ ] CT Scan [ ] MRI

13. Injuries / Diagnosis

[ ] Head and neck injury [ ] Chest injury [ ] Abdomen injury [ ] Pelvis injury

[ ] Spine injury

[ ] Lower limbs injury: *[ ] hip and femur [ ] knee, tibia fibula [ ] foot and ankle*

[ ] Upper limbs injury: *[ ] shoulder and humerus [ ] elbow and fore arm [ ] hand and wrist*

[ ] Others

14. Details of Injury:

Revised Trauma Score:

International Classification of Diseases Injury Severity Score :

15. Specialist rendering definitive care

[ ] Neurosurgery [ ] ENT surgery [ ] Cardio thoracic surgery [ ] General surgery

[ ] Genito-urinary surgery [ ] Orthopaedic surgery [ ] Medical management [ ]

Psychotherapy/ Psychiatric

APPENDIX C

Institutional Review Board Approval

Institutional Review Board
37 Military Hospital
Neghelli Barracks
ACCRA

Tel: 0302 769667
Email:irbmilhosp@gmail.com

18 June 2019

ETHICAL CLEARANCE

37MH-IRB IPN/313/2019

On 17 June 2019, the 37 Military Hospital (37MH) Institutional Review Board (IRB) at a Board Meeting reviewed and approved your protocol.

TITLE OF PROTOCOL: Injury patterns and Emergency care in Motor Cycle related road Traffic Accidents in Accra

PRINCIPAL INVESTIGATOR: James Aggrey-Orleans

Please note that a final review report must be submitted to the Board at the completion of the study.

Please report all serious adverse events related to this study to 37MH-IRB within seven (7) days verbally and fourteen (14) days in writing.

This certificate is valid until 08 June 2020.

DR EDWARD ASUMANU
(37MH-IRB, Vice Chairman)

INSTITUTIONAL REVIEW BOARD
DATE 18 - 06 - 19

Cc: Brig Gen MA Yeboah-Agyapong
Commander, 37 Military Hospital