



THE UNIVERSITY OF NAIROBI

**PATTERN OF HAND INJURY IN PATIENTS SEEN AT KENYATTA NATIONAL
HOSPITAL**

Research dissertation submitted in partial fulfillment of the requirement of the Masters of
Medicine in Orthopaedics Surgery at the University of Nairobi.

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I hereby confirm that this study is my original work and has not been presented elsewhere for examination or award of a degree elsewhere.

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There is no financial institution or individual who have sponsored this research and I don’t intend to receive any financial benefit from this research.

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DEDICATION

I dedicate this study to my lovely daughter Joan and son Briton. I had to deny you ample bonding time in order to work on this dissertation.

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I would finally like to thank all the patients who agreed to be interviewed and be examined to ensure I collect the desired data.

ABBREVIATIONS

PIP.....	PROXIMAL INTERPHALANGEAL JOINT
IP.....	INTERPHALANGEAL JOINT
DIP.....	DISTAL INTERPHALANGEAL JOINT
RTA.....	ROAD TRAFFIC ACCIDENT
SPSS.....	STATISTICAL PACKAGE FOR SOCIAL SCIENCES
FCR.....	FLEXOR CARPI RADIALIS
PL.....	PALMARIS LONGUS
KNH.....	KENYATTA NATIONAL HOSPITAL
UON.....	UNIVERSITY OF NAIROBI
HISS.....	HAND INJURY SEVERITY SCORE
MHISS.....	MODIFIED HAND INJURY SEVERITY SCORE

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ABSTRACT

Background: Hand injuries are common worldwide and are among the leading cause of financial loss and disability among the human population. This study's aim is to establish the pattern of hand injuries in patients seen at Kenyatta National Hospital (KNH).

Objectives: To determine the pattern of hand injuries in patients seen at Kenyatta National Hospital.

Methodology and study setting: This is a cross sectional descriptive study which was carried out at KNH casualty, wards and hand clinic in 3 months' period between March and May 2019. The target population was patients who presented with acute hand injuries and fulfilled the inclusion criteria. A sample size of 80 patients was established using the Cochrane's formula and a simple random sampling technique used to select the participants. Data collected included the cause of the injuries, nature of the injuries and the severity of these injuries was calculated using Modified Hand Injury Severity Score.

Data analysis: This research used student t- tests for interval data and Chi square for categorical data to analyze the differences in patterns of hand injuries among the patients. The data was then analyzed using SPSS version 24.

Results: Majority of the patients who suffered hand injuries were males constituting 90% of all cases compared to females at 10%. Majority of hand injuries were due to industrial machines (26.3%) followed by motorcycle accidents (20%). All patients who suffered hand injuries had not worn protective gears on the hands during the time of the injury. Fractures constituted majority of hand injuries (42.5%) followed by tendon injuries (25%) and traumatic amputations of the digits (22.5%).

Most patients suffered minor injuries (37.5%) based on Modified Hand Injury Severity Scoring system. Major injuries contributed 26%, moderate injuries 23% with the least number of patients sustaining severe injuries (14%).

Conclusions: Male gender is more prone to hand injuries compared to female gender. Hand injuries commonly occur at workplace with industrial machine related injuries being the leading cause.

Majority of hand injuries fall under the category of minor injuries with severe injuries constituting the least number of injuries.

Recommendations: Institutions need to develop clear policies on how to handle industrial machines safely. People handling industrial machines, farmyard machines should be encouraged to use protective gloves in order to minimize hand injuries. The government needs to include protective gloves as part of mandatory protective gears to all motorcyclists to minimize hand injuries among the motorcyclists.

CHAPTER ONE:

INTRODUCTION

Due to increased industrialization and machine reliance, hand injuries are on the rise worldwide in both developed and developing countries. In the USA, hand injuries constitute 5-10% of all trauma cases and 20% of workplace related injuries according to a study done in 2006 (1). In Uganda, hand injuries were noted to constitute 5.5% of all trauma cases in a study done in 2015 at a tertiary hospital (2). A survey at KNH shows that hand injuries constitute 8-12% of all trauma patients seen in the Accident and Emergency section of the hospital. However, there is no specific study which has ever been done to assess the prevalence of hand injuries in KNH. The injuries include bruises, lacerations, ligamentous injuries, tendon injuries, joint sprains, muscle strains, fractures, dislocations, crush injuries, neurovascular injuries and traumatic amputations. Although most of these injuries are not fatal, they are among the leading causes of disability and contribute to financial losses in terms of off duties, loss of jobs, and litigations (3).

Various studies have been done in other settings to determine the causes, patterns and severity of hand injuries (1-21). The objectives of each study is however different and the outcomes also differ depending on the part of the world the study is carried out. In our setting, one of the two studies which have ever been carried out assessed the causes and outcome of unilateral hand injuries using prospective descriptive study design in 2008. The other study done in 2012 assessed the causes and mechanism of industrial hand injuries, the risk factors and safety measures taken in industries also using prospective study design. Unlike the previous studies, this study seeks to establish the pattern of hand injuries in patients seen at KNH using cross sectional descriptive study design and calculate the severity of these injuries using Modified hand injury severity score between March and May 2019. The cost of treating hand injuries is high, both directly and indirectly hence understanding the pattern and severity of these injuries in our setting is essential. The result of this study will assist in policy formulation focused on reducing preventable causes of hand injuries.

CHAPTER TWO:

LITERATURE REVIEW

The hand is one of the most important parts of a human body. Understanding the hand anatomy and function, physical examination of injured hand is paramount in deciding the appropriate approach to use in formulating a management plan.

2.1: Anatomy

Hand has 27 muscles and 27 bones. The hand has 3 main creases which are related to metacarpal phalangeal (MCP) and interphalangeal (IP) joints. The distal crease corresponds to DIP joint while the middle crease corresponds to PIP joints. The thenar crease overlies the MCP joint. Carpal tunnel is formed by carpal bones dorsally and flexor retinaculum on the volar side. Ulnar nerve enters the hand through the Guyon canal between the hook of hamate and pisiform bone (4).

Thumb has 1 IP joint while the rest of the digits have PIP and DIP joints. Each MCP, PIP and DIP joints have collateral ligaments which provide lateral and medial stability and a volar plate which prevents hyperextension.

2.2: Blood supply

The main vessels which supply the hand are radial and ulnar arteries. The vessels have branches which anastomose with each other (4). Either radial or ulnar artery can serve in case one vessel is injured. Evaluation of the particular artery which is injured is done using Allen's test.

2.3: Muscles

The hand has both extrinsic and intrinsic muscles. Extrinsic muscles have their muscle bellies in the forearm. Extrinsic flexor muscles originate from the medial epicondyle of the humerus. They include FCR, PL-(absent in 14% of the population), FCU-(ulnar nerve and artery lie radial to it), FDP and FDS. Forearm extensors are composed of 11 muscles which extend the wrist and digits. They pass into the hand in 6 compartments after arising from the lateral epicondyle of the humerus. They are innervated by the radial nerve.

Intrinsic muscles include thenar muscles, hypothenar muscles and lumbricals which are innervated by branches of ulnar and median nerves (5).

2.4: Nerves

The hand is supplied by the radial, ulnar and medial nerves. The median nerve enters the hand through the carpal tunnel and supplies motor function to 3 thenar muscles and 1st and 2nd lumbricals. Ulnar nerve supplies the hypothenar muscles and 2 lumbricals on the ulnar side, adductor pollicis and interosseous muscles. The radial nerve supplies the extrinsic extensor muscles (6).

2.5: Pathology

2.5.1: Nerve injuries:

Ulnar, median and radial nerves or their branches can sustain injuries in the hand. It can either be neuropraxia, axonotmesis or neurotmesis. Ulnar nerve injury presentation ranges from transient paresthesia in the ring and small fingers to clawing and intrinsic muscle atrophy in severe cases. Median nerve injury presents with sensory loss to the thumb, index and long fingers and radial aspect of the ring finger. It also presents with weakness of forearm pronation, weakness of wrist and finger flexion and ape-hand deformity. Radial nerve injury presents with wrist or finger drops and altered sensation on the 1st dorsal web space. The three nerves can be tested using Kumar test (7).

2.5.2: Dislocations:

MCP joints are uncommonly involved in dislocations but it can occur after dorsally directed force ruptures the volar plate. PIP joint is mostly involved in dislocations because of ligamentous injuries.

Dorsal dislocations are the most common due to blow to extended digits. DIP dislocations are uncommon. The joints are stabilized by collateral ligaments and adjacent extrinsic tendons. They are mostly associated with open wounds. Thumb MCP joint is frequently injured secondary to hyperextension force damaging volar plate and dislocation (8). Thumb IP joint is very stable.

2.5.3: Ligamentous injuries:

The digits are stabilized by 2 collateral ligaments and volar plate. Either or both can be injured and can lead to dislocations. Ligamentous injuries are classified according to the severity:

1st degree-pain with stressing of the ligaments

2nd degree-joint opened slightly in ulnar or radial direction. Only one ligament injured.

3rd degree-joint opened more than 3 mm (due to damage of at least 2 of the 3 stabilizing structures).

Sprains commonly involve PIP. MCP sprains are rare (9).

2.5.4: Tendon injuries:

Extensor tendons commonly injured because of their superficial location. Flexor tendon injuries are classified in zones (zone I-V).The injuries can either be in form of lacerations, avulsions crushes or burns.

2.5.5: Fractures:

Carpal bones, metacarpal or phalanges can be fractured after a hand injury. Phalangeal fractures are the commonest followed by metacarpal bones (10).

2.6: Causes

These injuries commonly occur through occupational activities, road traffic accidents, through sports and recreational activities, assaults, ring constrictions, burns and crush injuries (11).

A study done in 2006 observed that hand injuries commonly occur at workplace with the leading cause being road traffic injuries followed by machine injuries (3). This was a retrospective study in which they retrieved and analysed case files of 57 patients with hand injuries.24% of the patients had sustained bone injuries while 76% of the cases were soft tissue injuries. No determination of severity of these injuries was done in this study.

A prospective study was carried out in 2006 in Nigeria on causes of hand injuries in a developing country (12).They noted that majority of these injuries were due to road traffic accidents (29.7%) and machine cuts (18.9%). Other significant causes included gunshots, glass cut, fall and assault. Hand injuries constituted 7.2% of all trauma cases seen within a period of one year according to this study. They however did not study the outcome or severity of hand injuries.

In 2006,a prospective cross sectional study was carried out to establish the pattern and outcomes of unilateral hand injuries at KNH over a period of 3 months(13). They dwelled much on association of hand dominance to the causes, lateralization and pattern of hand injuries.

99 patients were recruited and data collected using a questionnaire with associations being investigated using student's t-test and Chi square tests. They found out that male were affected more than females.

Occupational injuries were the majority (31.3%) followed by assaults (30.3%), RTA(28%) while falls constituted 10%.Concluded that hand dominance has no influence on causes, lateralization and pattern of hand injury. This study was carried out 12 years ago and a lot of development in terms of industrialization and changes in modes of transport has happened in this country hence

the need to reevaluate the causes of hand injuries. Furthermore, no assessment of severity was done in this study.

According to a study done by Marek Trybus et al in 2006, injuries caused by mechanical equipments were the most common at 34.9% and were the most severe. Alcohol consumption was noted to be a major cause of these accidents. Up to 26.7 % of the injuries occurred after alcohol consumption according to the study (1). The severity of these injuries was not assessed.

A study on burden and early outcomes of hand injuries at a tertiary hospital in sub Saharan Africa in 2007 in Mulago Hospital,Uganda found that majority of accidents occurred at work (36%).Injuries occurring at home were 29% while RTA constituted 25% of these injuries(2). The study also assessed outcomes in term of pain, nerve functions and gross functions over a period of 5 months. They however did not calculate the severity of these injuries.

A prospective study on the cause and mechanism of industrial hand injuries, the risk factors and safety measures taken in industries analyzed 75 hand injured adult workers admitted and operated on from September 2009 to March 2012 at Avenue Hospital, Nairobi (14).

The mechanism of injury was mostly crushing ,63 (84.0%) while cut injuries were 12 (16.0%).This study's focus was on injuries occurring in industrial setting but didn't factor in injuries which happen outside workplace.

The epidemiology of isolated hand injuries in the United Arabs Emirates was studied in 2016 (15).They concluded that workplace was the most common location of injury (67.1%), followed by home injuries (17.1%) and RTA (6.2%). Machinery caused 36.2% of all injuries, followed by heavy object (20.5%) and fall (11%). They however excluded patients who stayed in the hospital for less than 24hrs and those with minor injuries who are an important cohort to be included in a study.

2.7 Nature of hand injuries:

Nature of hand injuries identifies the physical characteristics of the injuries. Hand injuries can range from soft tissue injuries like bruises, lacerations, tendon injuries, nerve and blood vessel injuries to fractures and traumatic amputations.

A retrospective study in 2011 in Nigeria observed that majority of the injuries involved lacerations (33.8%),fractures/dislocations (18.9%) followed by crush injuries at 17.6% (16).

A study in 2016 (17) involving 144 hand injury patients observed that majority of injuries involved the fingers (70.13%). Open fractures were the commonest (27%) followed by tendon injuries (19%).

According to a cross sectional study carried out in 2017 on pattern of hand injuries in a tertiary care setting of North India, traumatic amputations constituted majority of the injuries (30%) followed by tendon injuries and compound fractures (18).

The above studies focused on the nature and causes of hand injuries but did not assess the severity of the same. The nature of hand injuries is an important aspect while calculating the severity score using Modified Hand Injury Severity Score.

2.8: Severity

There is a scoring system which is used to grade severity of hand injuries.

The Hand Injury Severity Scoring System (HISS) was designed as a descriptive severity scoring system for hand injuries distal to the carpus by Campbell and Kay in 1996 (19). Each ray of the hand is assessed separately. Each ray's score is then multiplied by a weighting factor for that ray and added to the scores of the other rays to obtain a total score for the injury.

Various studies have been conducted, and the Hand Injury Severity Score (HISS) has been found to correlate with outcome of these injuries.

In 2004 a study was carried out on assessment of hand injuries using HISS and its correlation with the functional outcome (20). The study showed significant association ($r=0.7182$, $P=0.000165$) between severity of these injuries and functional outcome. The pattern of these injuries was not assessed in this study.

The predictive value of the HISS scoring system for estimation of trauma severity and the time off work after hand injuries was assessed in 2005. There was significant correlation between HISS score and time off work ($P<0.0001$, $r=0.51$) with degree of work incapacity ($P<0.0001$) (21).

There was a prospective study in 2009 on the usefulness of Campbell's hand injury severity score in predicting the functional recovery and return to work after hand injuries (22). Fifty patients were recruited and average follow up done for 7.8 years (3.1-15.3). It was found that when HISS was <50 , 11 of 12 patients returned to original jobs (92%), 50-150, 17 out of 23 were able to return (74%) while HISS >150 only 4 out of 15 were able to return to original work (24%).

They however did not study the causes or the pattern of these injuries.

F. Urso-Baiarda et al came up with a modified Hand Injury Severity Scoring System (MHISS) in 2007 which included injuries to the wrist and forearm (23). This score categorizes hand injuries in terms of integument (skin and appendages), skeletal (bones and ligaments), motor (muscles) and neurovascular (nerves and vessels) status.

INTEGUMENT			
ABSOLUTE			
Skin loss to hand or forearm	Dorsum	<1cm ²	5
		>1cm ²	10
		>5cm ²	20
	Volar	<1cm ²	10
		>1cm ²	20
		>5cm ²	40
WEIGHTED (See "Weighting Factors")			
Skin loss to digit	Dorsum	<1cm ²	2
		>1cm ²	3
	Volar	<1cm ²	2
		>1cm ²	6
	Pulp	<25%	3
		>25%	5
Skin laceration <i>If extends across more than one ray, include in both ray scores</i>		<1cm ²	1
		>1cm ²	2
Nail bed damage			1
If wound crushed, dirty or contaminated: DOUBLE the score			
SKELETAL			
ABSOLUTE			
Any forearm fracture			20
WEIGHTED (See "Weighting Factors")			
Digital fracture	Simple shaft		1
	Comminuted shaft		2
	Intra-articular DIPJ		3
	Intra-articular MCPJ		4
	Intra-articular PIPJ/IPJ/thumb		5
Dislocation	Closed		2
	Open		4
Ligament injury	Sprain		2
	Rupture/avulsion		3
If fracture is open: DOUBLE the score			

MOTOR			
ABSOLUTE			
Wrist flexor or extensor (each)			10
WEIGHTED (See "Weighting Factors")			
Extensor tendon	Proximal to PIPJ		1
	Distal to PIPJ		3
Flexor profundus (incl. FPL)	Zone 1		6
	Zone 2		6
	Zone 3		5
	Zone 4, 5, belly		3
Flexor superficialis	Distal to wrist		5
	Proximal to wrist		2
Intrinsic muscles			2
Crush or avulsion of above: DOUBLE the score			
NEUROVASCULAR			
ABSOLUTE			
Nerve	Main median n.		60
	Main ulnar n.		60
	Motor branch of median n.		30
	Deep branch of ulnar n.		30
Artery	Radial artery		10
	Ulnar artery		10
WEIGHTED (See "Weighting Factors")			
Digital nerve	One		3
	Both		4
Digital artery	One		3
	Both		6
Crush or avulsion of neurovascular bundle: DOUBLE the score			
WEIGHTING FACTORS			
The following apply to weighted scores:			
Thumb	x 6	Little	x 2
Index	x 2	Hand & forearm	x 1
Middle	x 3		
Ring	x 3		

The score categorizes hand injuries into

1. MINOR-MHISS <20 (not affecting function)
2. MODERATE-MHISS 21-50 (some functional defect/interferes with work)
3. SEVERE-MHISS 51-100 (significant function defect)
4. MAJOR-MHISS >100 (unable to use)

A study was carried out at Moriston Hospital, United Kingdom in 2006 to determine the prognostic value of MHISS (23). They found out that the number of patients who were able to return to work within an year were 88% (21/24)-mild injuries, 82% (16/20) for moderate injuries, 50 % (14/22) for severe injuries and 28% (5/18) for major injuries. The causes of these injuries were not studied.

A descriptive study in India carried out in 2016 at Sri Ramachandra medical college and research institute graded the injuries in term of severity: Mild- 31.09%, moderate-22.69%, Severe-21.8% and major-24.37% (24).

Several studies (19-24) have been conducted worldwide and have concluded that HISS and MHISS can correctly predict the outcome of hand injuries and this has been published in various medical journals. This scoring system is important because it helps in predicting the outcome of hand injuries.

2.9: Study Justification/rationale:

No single study has ever been carried out in this country seeking to assess the severity of hand injuries. This study's aim is to bridge this gap by analyzing the pattern and calculating the severity of hand injuries.

By establishing the pattern of hand injuries, the patients will be aware of common causes of these injuries and in collaboration with policy makers at their workplaces, they will identify ways of minimizing hand injuries. For the health care providers, calculating severity of hand injuries will help in predicting the prognosis of the injuries and advice the patients on the expected outcome.

2.10: Literature review conclusion:

Several studies on hand injuries have been done in different parts of the world. The results in terms of the pattern of these injuries differ depending on the setting where the study is carried out. Though HISS and MHISS have been used by different researchers to determine the severity of hand injuries, majority of these studies focus in assessment of severity without determining the causes of these injuries. Those studies which focus on causes and nature of hand injuries do not assess the severity of the same using HISS or MHISS.

CHAPTER THREE:

OBJECTIVES

3.1: Broad objective

To study the pattern of hand injuries in patients seen at KNH.

3.2: Specific objectives

1. To determine the causes of hand injuries in patients seen at KNH.
2. To determine the nature of hand injuries seen at KNH.
3. To determine the severity of hand injuries using Modified Hand Injury Severity Score.

CHAPTER FOUR:

METHODOLOGY AND METHODS

4.1: Research Design/setting

This was a cross sectional descriptive study. The setting was at KNH casualty, wards, theatre and hand clinics for duration of three months. This setting was selected because being a referral facility with hand surgeons, KNH serves patients with hand injuries ranging from minor to the most severe cases.

4.2: Study Population

Any patient who presented with acute hand injuries at the emergency department of KNH was eligible for recruitment in this study. The patients were interviewed through face to face structured interview. Data from admission files and operations notes was utilized and participants were examined to document the pattern and calculate severity of the injuries. Informed consent was sought from the patients before commencement of data collection. The questionnaire included questionnaire's number, patients' particulars: age, occupation, nature of the injury, hand involved (dominant or non-dominant), was the injury sustained at workplace or elsewhere.

The data was analyzed in SPSS version 24.

4.3: Inclusion and Exclusion Criteria

4.3:1 Inclusion criteria

Patients who presented with acute hand injuries within 48hours post injury were included. Those injuries which presented more than 48hours after injury were excluded. After 48hrs, wound enters into proliferative phase which involves wound contraction and this reduction of wound size would have affected the results when calculating severity score. Accurate wound size was measured during phase 1(haemostasis phase) and phase 2 (inflammatory phase) which occurs between 0-48 hrs.

4.3:2 Exclusion criteria

Injuries proximal to the wrist joint and patients with non-traumatic hand pathology were excluded.

Patients who declined to give consent were also excluded.

4.4: Sample size calculation

According to a study done in Uganda in 2015 (2), the prevalence of hand injuries in a tertiary hospital similar to KNH was 5.5% of all trauma cases. Using the Cochran's formula;

$$n = \frac{Z^2 pq}{e^2}$$

Where

n..... Sample size

Z..... Standard deviation of 95th percentile (1.96)

p expected proportion of hand-injured patients among patients seen at A&E department (0.055).

q.....(1-p)

e..... confidence interval (0.05)

$$n = \frac{1.96^2 \times 0.055 \times (1 - 0.055)}{0.05^2}$$

$$n = 79.87$$

The sample size for this study was 80 patients.

4.5: Sampling Procedure/Technique:

The sampling frame for this research was the emergency department/admission register of all patients who presented with acute hand injuries at Kenyatta National Hospital during the period this research was carried out.

The study used a simple random sampling technique since the method is appropriate for an infinite population where the researcher intended to choose an unbiased sample. This sampling method involved identification of 80 random participants by allocating numbers to all the available hand injury cases seen at KNH. An unbiased table of random numbers was used to identify participants in the study with each having an equal chance of being selected. The researcher navigated and selected numbers randomly on the table in any direction (up, down, right, left). The participant corresponding to the selected number was chosen to be part of the sample in this research.

The aim of this approach was to ensure that the sampling process was not affected by biased selection of the participants. The selected participants who gave written informed consent were included.

The orthopedic residents and Medical officers working at accident and emergency section of KNH informed the principal investigator when there was a patient with hand injury. The principal investigator also recruited patients in the orthopedics wards and outpatient clinics.

4.6: Recruitment, Consenting and Data Collection:

Those patients with acute hand injuries presenting within 48 hours were recruited. This is after detailed explanation on what the study entails was given and written consent sought from the participants. The principal investigator was the sole data collector. The details were filled in a questionnaire which had the patients' age, sex and occupation. Other information sought included the cause of injury, setting and time of the injury. The site of the injury was also assessed and documented.

Wound size was measured using Sliding jaw Vernier calipers. The data was collected by the principal investigator between March and May 2019 through face to face interviews as well as utilizing data from admission files, operation notes where clarification was needed and examining participants to document the pattern and calculate severity of hand injuries using MHISS.

4.7: Data analysis and Presentation

This research used student t- tests for interval data and Chi square for categorical data to analyze the differences in patterns of hand injuries.

The pattern of hand injuries was determined through descriptive analysis of the data collected from the respondents. The analysis allowed the researcher to investigate the number of participants in the research falling under each of the established categories. SPSS software was used to generate charts. The analysis of the quantitative data aimed at identifying patterns in the data and the relationship between variables through correlation analysis and the analysis of variance (ANOVA).

4.8: Ethical considerations

Written consents were sought from patients after being informed on the purpose of the study. Utmost confidentiality of the patients' details was maintained.

Those who declined to give consent were not prejudiced and their decision was fully respected.

Ethical approval was sought from the department of orthopedic surgery, UoN and ethics review committee of KNH/ UoN. Authorization from KNH administration prior to data collection in relation to this study was also sought.

4.9: Limitations

Patients who declined to give consent.

Lack of automation of records and improper categorization of patients with different surgical conditions at KNH casualty and orthopaedics clinic.

4. 10: Delimitations:

Patients and relatives were encouraged to give the correct information and were assured there will be no victimization whatsoever.

The principal investigator liased with the surgeons operating on the patients to ensure accurate intraoperative findings were noted and documented.

Records in casualty and in orthopaedics clinic were scrutinized manually and participants who qualified for inclusion recruited.

4.11: Dissemination and utility

The outcome of this study will be published in orthopaedics and surgical journals and will be useful in policy making in this country.

This is after it is established the causes, associated severity and expected outcomes of hand injuries of our patients.

4.12: Conflict of interest

None to declare.

CHAPTER FIVE

RESULTS

The pattern of hand injuries in 80 participants who met the inclusion criteria was analysed. The participants were recruited from the accident and emergency section of KNH, orthopaedics wards and orthopaedic clinic of KNH.

5.1: Sex

Males were predominantly involved in hand injuries (72 patients) constituting 90% while there were 8 female patients constituting 10%.

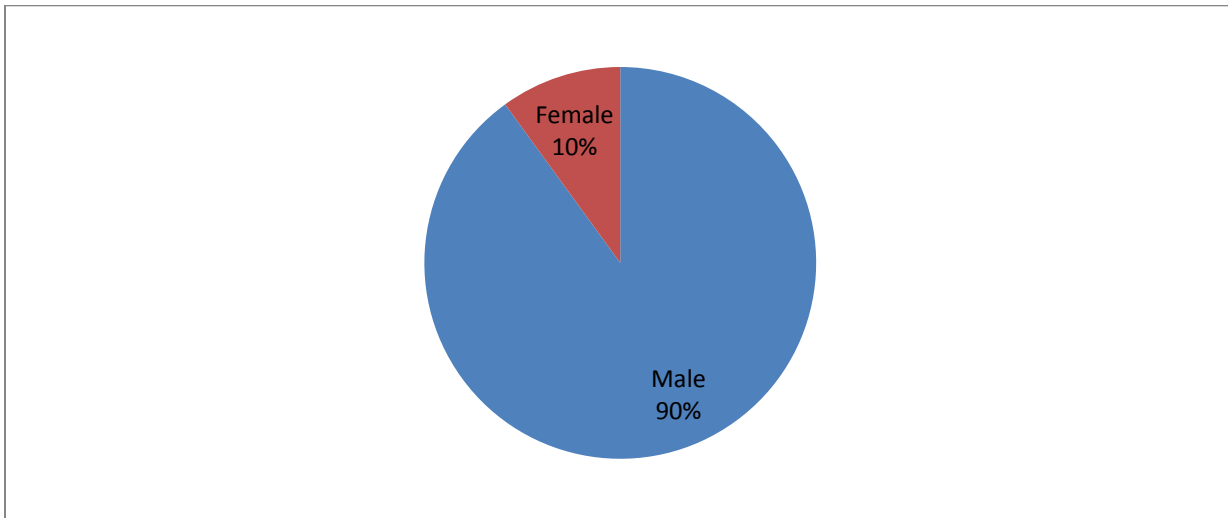


Figure 5.1: Gender of the Patients

5.2: Age

The participants were classified according to their ages in decades. Majority of the patients who suffered hand injuries were in their third decade (27 patients) constituting 33.8% followed by those in the fourth decade (25 patients) at 31.3%. Children below 10 years were 4 constituting 5% while those above 60 years were the minority with just 2 patients constituting 2.5%.

Children in the first decade who sustained injuries through door crush constituted 80% while 20% sustained the injuries while playing. For those in the second decade, sports injuries constituted the highest number (55%) followed by door crush injuries at 35%. Majority of the patients in the third and fourth decades sustained injuries at workplace (65%).

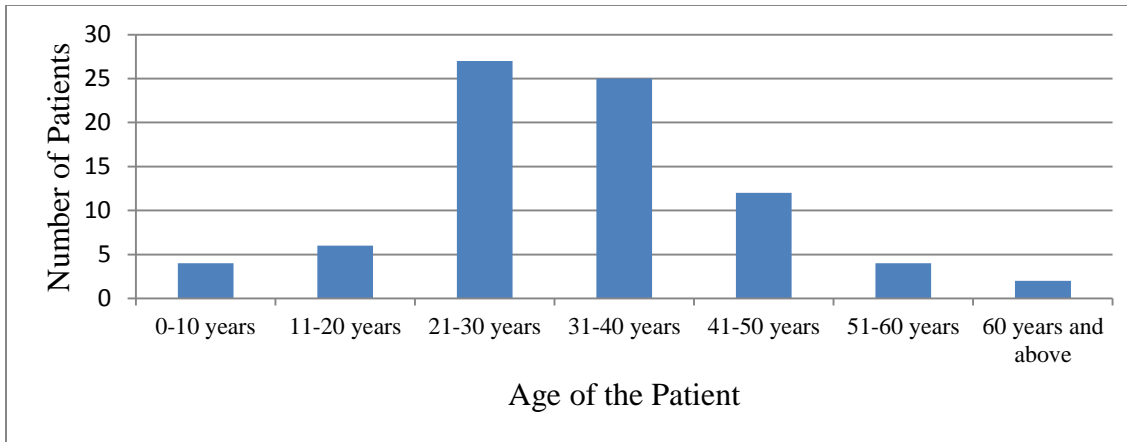


Figure: 5.2 Age of the Patients

5.3: Hand dominance

Those patients who sustained injuries on the dominant hand were 43 (53.8%) while those who were injured on the non-dominant hand were 35 (43.8%).

There were 2 patients who sustained injuries on both hands constituting 2.5% of all patients assessed.

Count		Hand dominance			Total
		Dominant	Non dominant	Both hands	
Cause of the injury	Industrial Machine	6	15		21
	RTA	9	6	1	16
	Assault	8	4		12
	Farmyard equipment	4	8		12
	Door crush injury	8	1		9
	Sports injury	4	1		5
	Falls	2		1	3
	Others	2	0		2
Total		43	35	2	80

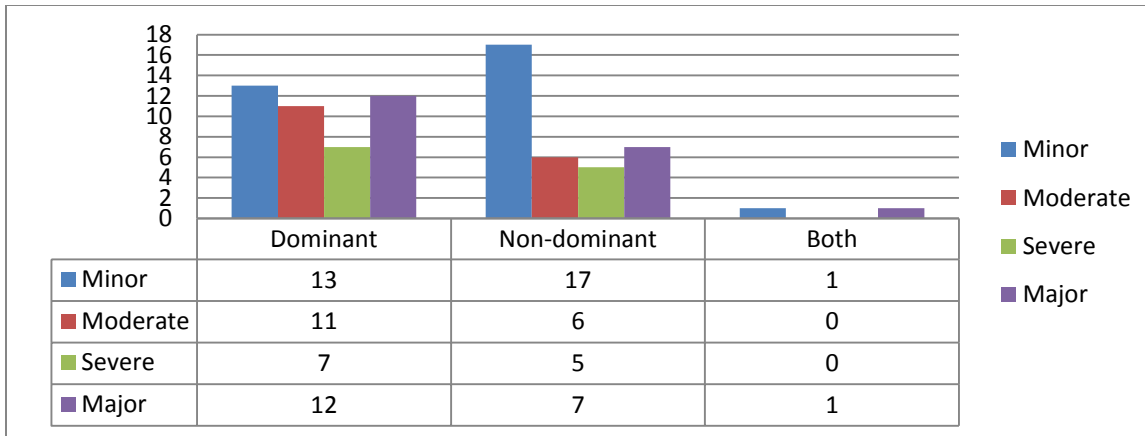


Figure 5.3: Hand Injured and Severity Score

5.4: Causes of the injuries

Industrial machine injuries constituted majority of hand injuries. There were 21 patients (26.3%) who were injured by industrial machines. RTA was the second commonest cause with 16 patients (20%), majority being motor cycle accidents followed by assaults with 12 patients (15%). Farmacyard equipment injuries also constituted 15% of all hand injured patients. Door crush injuries 9 patients (11.3%) while sports injuries contributed 6.3% with 5 patients. Patients who sustained injuries from falls were 3 (3.8%). There were 2 patients (2.5%) whose injuries could not be classified in any of the above categories, one being injured by a clothing line while the other one was accidentally cut by a glass bottle.

Table 5.1: Cause of the injury * Score of the injury Cross-Tabulation

Count		Severity of the injury				Total
		Minor	Moderate	Severe	Major	
Cause of the injury	Industrial Machine	8	3	3	7	21
	RTA	7	4	3	2	16
	Assault	5	2	2	3	12
	Farmacyard equipment	1	3	2	6	12
	Door crush injury	5	2	1	1	9
	Sports injury	3	2	0	0	5
	Falls	1	1	1	0	3
	Others	1	0	0	1	2
Total		31	17	12	20	80

The Chi-Square test for the relationship between the cause of the injury and the severity score. The relationship between these factors was not significant ($P>0.05$) showing that there was no association between the factors.

Table 5.2: Chi-Square

	Value	df	P-Value
Pearson Chi-Square	22.876	21	0.351
N of Valid Cases	80		

Majority of the patients were injured at their workplace 56.25% while 43.75% were not at their workplace during the time of the injury. All those patients who sustained injuries at workplace had not worn protective gears on the hands like gloves.

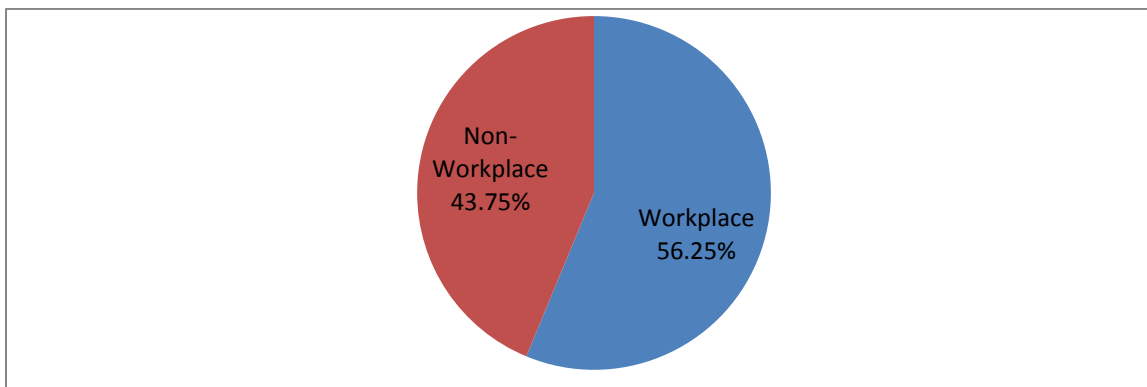


Figure 5.4: Setting of the Injury

The independent sample t-test statistic (student t-test) was calculated to determine how workplace injuries affected the score of the injury. The findings show that there is no significant relationship between the setting of the injury and the severity of the hand injury ($P>0.05$).

Table 5.3: Independent Samples Test for Setting of the Injury and Score

t-Value	df	P-Value	Mean Difference	Std. Error Difference
1.454	78	0.150	0.39683	0.27293

Majority of these injuries occurred during morning hours. There were 31 patients injured during morning hours (38.75%) followed by night injuries with 22 patients (27.50%). Those who sustained injuries in the afternoon and evening time were 18 (22.50%) and 9 (11.25%)

respectively. Majority of night injuries were as a result of assaults while daytime injuries were work related.

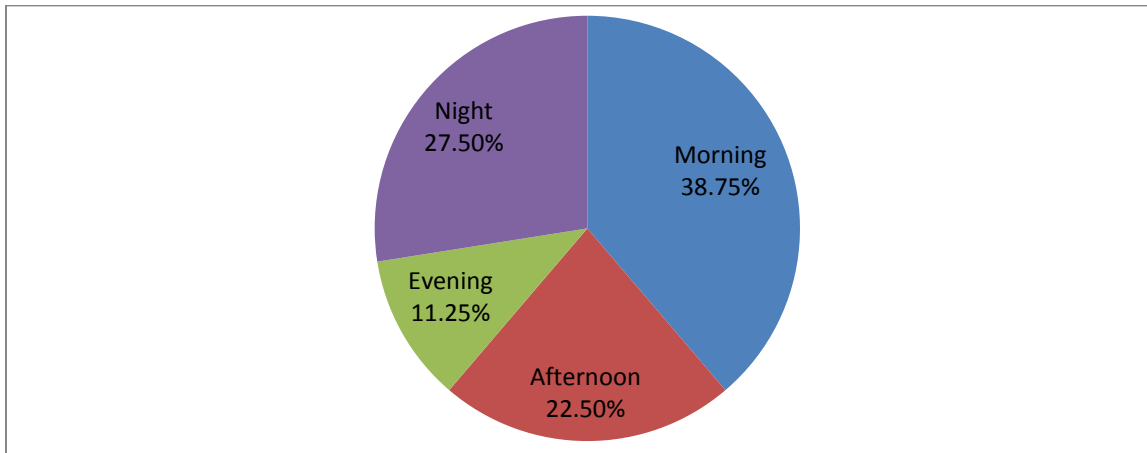


Figure 5.5: Time of Injury

Sixty nine (86.3%) of the patients interviewed denied being intoxicated at the time of the injury. Those who admitted being intoxicated were 9 constituting 11% while 2 patients declined to respond to that question.

5.2: Occupation

Majority of hand injuries involved skilled industrial workers i.e. 26 patients representing 32.5%.Farmers who were injured at workplace were 14 (17.5%) while students constituted 10%(8 patients).Drivers involved were 4 (5%) who were all injured through RTA. Business people constituted 8.8% and majority of them were injured as a result of assault. Children patients were 4(5%) majority of whom were as a result of door crush injuries.

Table 5.4 Occupation * Score of the injury Cross-Tabulation

Count		Score of the injury				Total
		Minor	Moderate	Severe	Major	
Occupation	Skilled industrial workers	12	4	2	8	26
	Unskilled industrial workers	3	3	4	5	15

	Farmers	6	3	1	4	14
	Students	5	0	1	2	8
	Drivers/cyclists	2	2	0	0	4
	Businessmen	3	3	1	0	7
	Children	0	2	2	0	4
	Others	0	0	1	1	2
Total		31	17	12	20	80

An analysis of variance was conducted to investigate the relationship between occupation and the severity of hand injuries. The findings indicate that there is no significant relationship between occupation and severity of hand injuries ($P>0.05$).

Table 5.5: ANOVA for Occupation of the patient and the Score of Injury

	Sum of Squares	df	Mean Square	F	P-Value
Between Groups	18.257	7	2.608	1.892	0.083
Within Groups	99.231	72	1.378		
Total	117.488	79			

5.6: Injury characteristics:

The injuries were classified according to the structures injured.

5.6.1: Skin lacerations:

12 patients had skin lacerations or skin loss without any other injury. This constituted 15% of all cases studied.

5.6.2: Tendon injuries:

20 patients (25%) were noted to have sustained tendon injuries. Majority of the patients who had tendon injuries had sustained the injuries on the flexor hand tendons. This involved 14 patients (70.00% of tendon injuries) compared to 6 patients (30.00%) who had injuries on the extensor tendons.

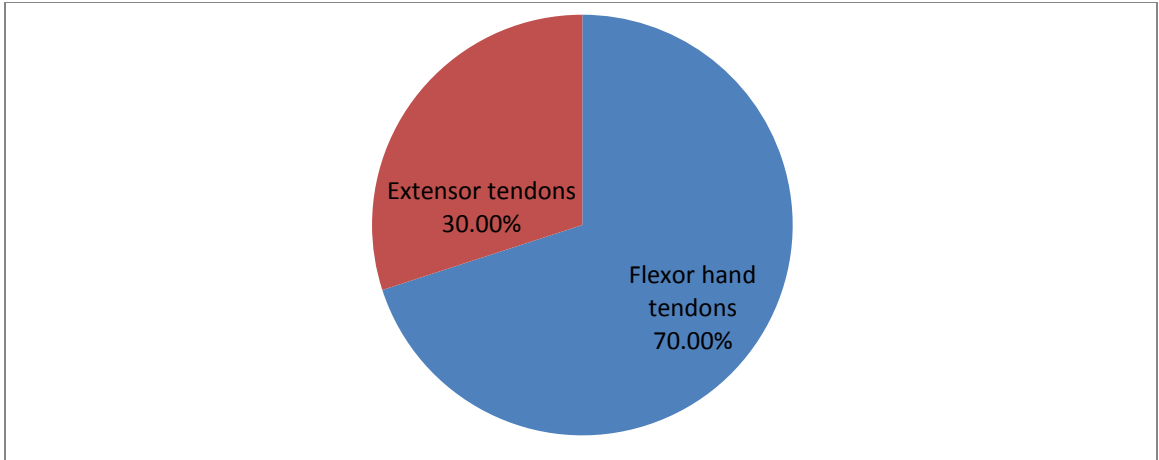


Figure 5.6: Tendon Injuries

5.6.3: Fractures

34 patients (42.5%) of the 80 participants had sustained fractures. Phalangeal fractures were the commonest involving 24 patients which constituted 70.6% of all fractures. There were 8 patients with metacarpal fractures constituting 23.5% while carpal bone fractures were 2 (5.9%). Of the phalangeal fractures, 15 cases constituting 62.5% were open fractures while 9 cases constituting 37.5% were closed fractures. In contrast, majority of metacarpal bone fractures were closed at 75% compared to 25% which were open fractures. All carpal bone fractures were closed and involved the scaphoid.

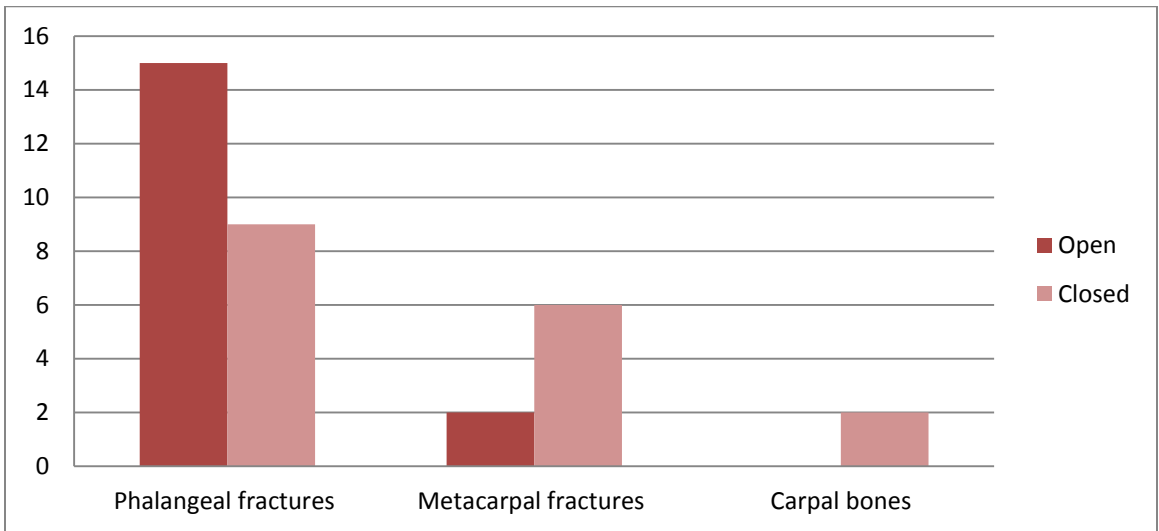


Figure 5.7: Fractures

5.6.4: Traumatic amputations

18 patients had suffered traumatic amputations on the hand. This constituted 22.50 % of hand injuries studied. Majority of the amputations occurred through the thumb (33.33%). Amputations

involving more than one phalanx constituted 27.78% and were mostly as a result of industrial machine cuts and farmyard machine cuts (chaff cutters). There were 2 patients with traumatic amputations through the metacarpal bones (11.11%) with similar number involving index and middle finger phalanges only. There was 1 patient who suffered traumatic amputation through the little finger (5.56 %).

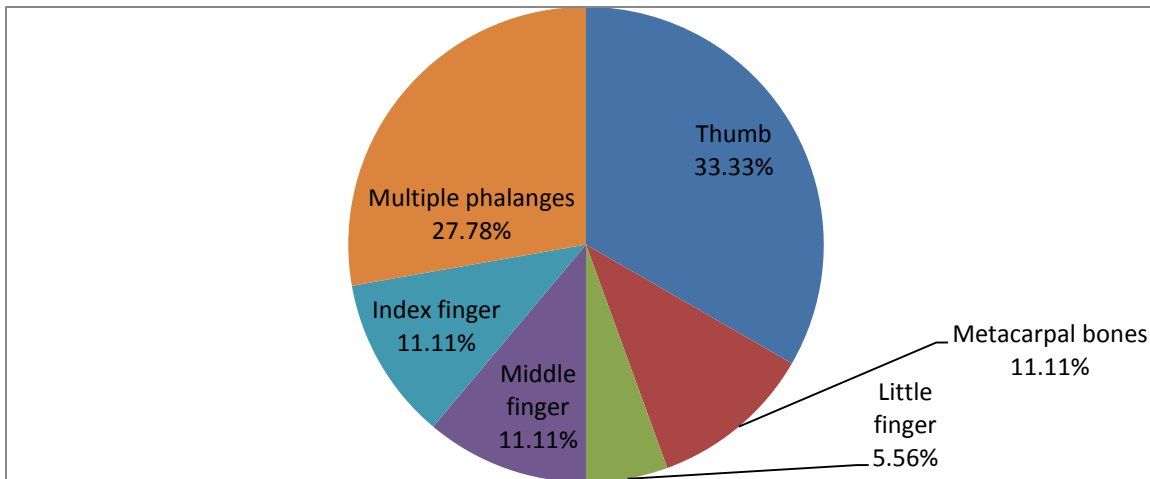


Figure 5.8: Traumatic Amputations

5.6.5: Joint dislocations

There were 8 patients who suffered joint dislocations. Majority of these dislocations involved proximal phalangeal joints and distal inter phalangeal joints of the index and middle fingers (75%). All joint dislocations were open.

5.6.6: Nerve injuries

There were 2 patients who sustained median nerve injury (2.50%). Those who suffered injuries to the digital nerves were 12 (15.00%) with all having sustained open injuries to the digits. None of the patient examined had suffered ulnar nerve injury.

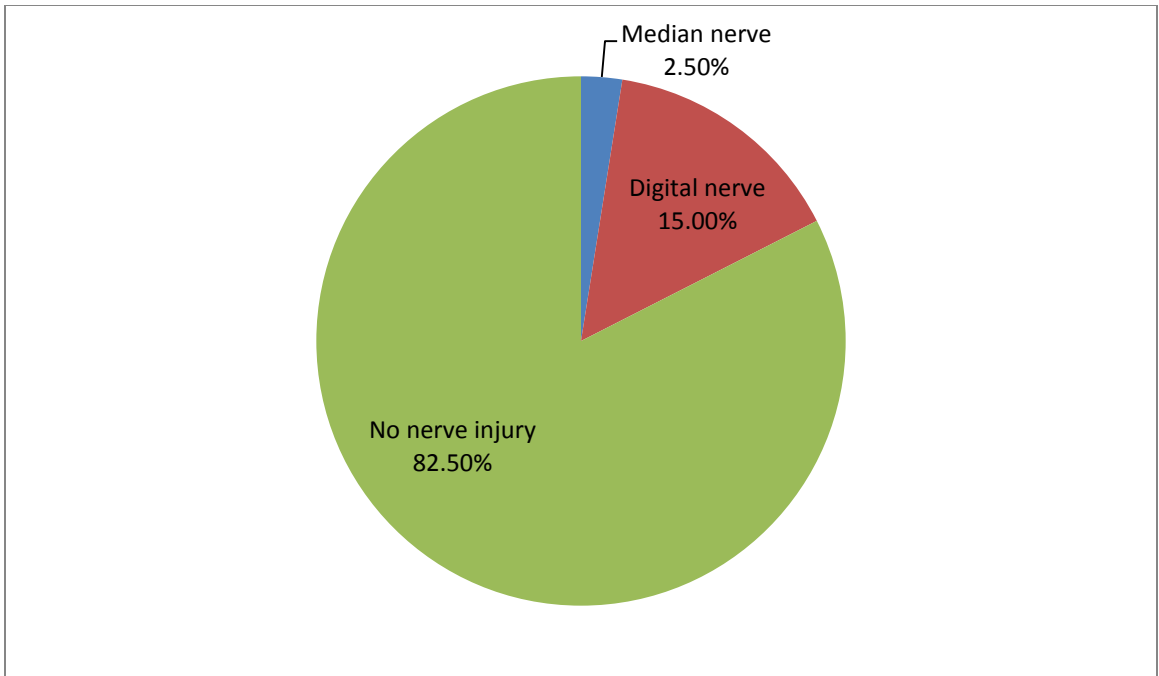


Figure 5.9: Nerve Injuries

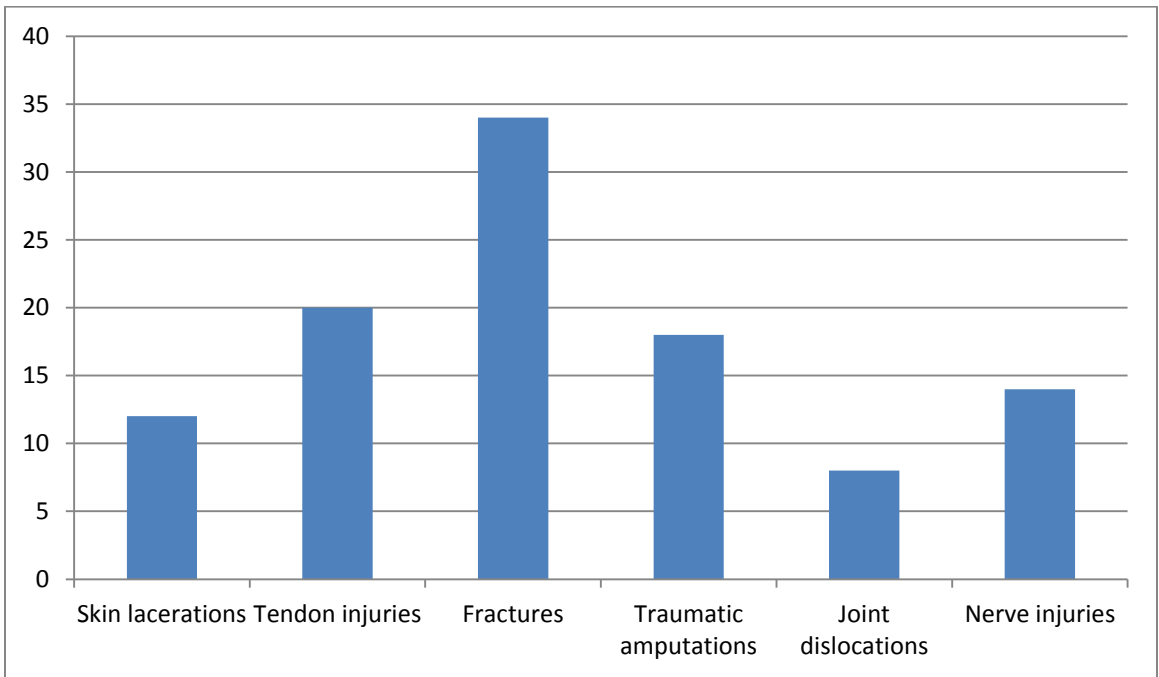


Figure 5.10: Summary of Injuries

5.7: Severity

The severity score of hand injuries was calculated for every patient using MHISS. Majority of the patients had minor injuries (30 patients) constituting 37.50%. This was followed by patients

with major injuries who were 21 constituting 26.25%. Those patients who suffered moderate injuries were 18 (22.50%) while those who were categorized to have suffered severe injuries were the least (11) constituting 13.75% of all cases.

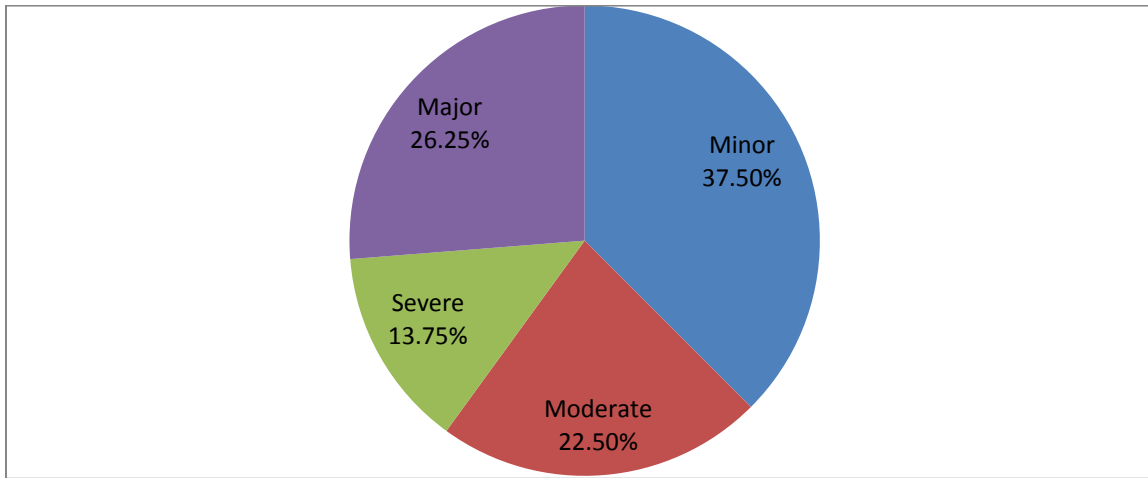


Figure 5.11: Severity of the Injuries

CHAPTER SIX

DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

The purpose of this study was to determine the causes, nature and severity of hand injuries in patients seen at Kenyatta National Hospital.

6.1: Causes

Industrial related injuries were found to be the commonest cause of hand injuries (26.3%). This was also the findings of Kaisha et al (13) 12 years ago who noted that machine associated injuries constituted 31.3% of all hand injuries. The second commonest cause in this study was RTA (20%) followed by farmyard and assault related injuries (15%). This differs from Kaisha's findings whose results found that assaults were the second commonest cause (30.3%) with RTA being the 5th commonest cause at 8.1% compared to this study's findings of 20%. This could be because of the increased number of motorcycles on our roads, a leading cause of RTA related hand injuries.

The results also differ with ogemdi Ihekire et al's findings (12) which found out that RTA was the leading cause of hand injuries in Nigeria (29.7%) followed by machine cuts at 18.9%. This demonstrates that causes of hand injuries differ in different countries depending on the occupation of people in the region under study.

Majority of the injuries were found to occur during morning hours (38.8%) followed by night injuries (27.5%). This differ from the expectation that workers are more alert during morning hours but could be explained by the fact that there are more people working during morning hours compared to afternoon or evening hours. Majority of the night injuries were as a result of assaults. This is because assault cases are more likely to occur at night and less people are working at night hence a decline in the number of work related injuries at night.

Those people who were not intoxicated during the time of injury were significantly higher (86.3%) than those who were intoxicated (13.7%). It was assumed that the 2 participants who declined to respond to this question were intoxicated. This finding differs from Marek Trybus' (1) study which found that alcohol consumption is a major cause of hand injuries at 26.7%.

6.2: Sex

Significantly large number of men (90%) compared to women (10%) sustained hand injuries. This could be explained by the fact that men are more involved in manual work in industries, in the farms and are the majority in the commercial motorcycle industry also known as boda bodas.

6.3: Hand dominance

Majority of the injuries through RTA, assault, sports and falls involved the dominant hand. This demonstrates that during assault, one is likely to defend himself/herself with the dominant upper limb. One is likely to fall on the dominant hand during a fall from a height, RTA or during sports. Injuries which occurred through industrial machines, farmyard machines and door crush mostly involved the non-dominant hand. Overall, there was slightly higher number of injuries on the dominant hand (53.8%) compared to non-dominant hand (43.8%) which was not statistically significant. This correlates with Kaisha et al's study (13) of 2006.

6.4: Nature of the injuries

6.4.1: Fractures

Fractures constituted majority of the injuries sustained at 42.5%. Of all fractures, phalangeal fractures were the commonest at 70.5%. This collaborates with Kaisha et al's findings (13) which found that phalangeal fractures constituted 72.4% of all hand injuries with carpal fractures constituting 2.6% against our findings of 5.9%. This could be attributed to the fact that phalanges are the most distal and mobile bones of the hand, have poor soft tissue coverage, hence prone to injuries compared to other bones of the hand.

6.4.2: Tendon Injuries

Flexor tendons were more affected (70%) compared to extensor hand tendons (30%). Majority of flexor tendon injuries occurred through assaults (45.6% of flexor tendon injuries) and RTA (32.8%). Door crush injuries, farmyard machine cuts, industrial machine injuries mostly involved the extensor tendons. This explains that the mechanism of injury determines the tendons injured.

6.4.3: Traumatic Amputations

Significant number of patients suffered traumatic amputations (22.5%) with the thumb amputations leading with 33.3%. The non-dominant hand suffered the majority of traumatic amputations (60%) compared to dominant hand (40%). Industrial machine cuts and animal feed chaff cutters are the major causes of these amputations. This collaborates Rishabh Gupta et al's

study of 2017 (18) which observed that traumatic amputations constituted 30% of all hand injury cases majority being thumb amputations due to machine cuts.

6.5: Severity

Majority of the patients suffered minor injuries (37.5%). These are injuries which would not affect their function. This was followed by patients who sustained major injuries (26.2%). These patients with major injuries meant they sustained life changing injuries which will limit them from using the affected hand. Majority of patients with major injuries suffered traumatic amputations or multiple hand bone fractures and severe soft tissue injuries. Those who suffered severe injuries (13.8%) will also have significant limitation towards usage of the affected hand according to F.Urso Baiarda et al's study (23). Patients who suffered moderate injuries (22.5%) will have some functional interference with work but their overall prognosis is good according to Matsuzaki H et al (22).

6.6: Conclusions

1. Hand injuries commonly occur at workplace. Industrial related injuries constitute majority of hand injuries followed by motorcycle road traffic accidents. All the patients who sustained hand injuries at workplace had not worn any protective gear on the hands.
2. Flexor hand tendons are more prone to injuries than extensor hand tendons. Of all the hand bones fractures, Phalangeal fractures are the commonest followed by metacarpal fractures. Carpal bone fractures have the least occurrence and are likely to occur after a fall. Traumatic amputations constitute a significant part of hand injuries with thumb and multiple digit amputations being the commonest. Animal feed chaff cutters and industrial machines are the commonest causes of traumatic amputations
3. Majority of hand injuries fall under the category of minor injuries with severe injuries constituting the least number of injuries.

6.7: Recommendations

1. Institutions should have policies of training workers on how to handle industrial machines appropriately to minimize industrial machine injuries which are the leading cause of hand injuries.

2. Those handling industrial machines, chaff cutter users should always put on protective gloves to minimize the occurrence and severity of hand injuries.
3. Government should enact laws which will require motorcyclists to wear protective gloves in addition to other protective gears in order to minimize cases of motorcycle related hand injuries.
4. Recommendations on further studies:
 - (i) Burden of motorcycle associated hand injuries.
 - (ii) Advocacy level of industrial workers regarding safe handling of industrial machines.
 - (iii) Long term outcomes of hand injuries.

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Appendices

Appendix i: Work plan

APRIL 2018-SEPTEMBER 2018

Proposal writing and submission

Proposal presentation to the department of orthopedic surgery, UoN.

OCTOBER 2018

Submit to ethical committee for approval

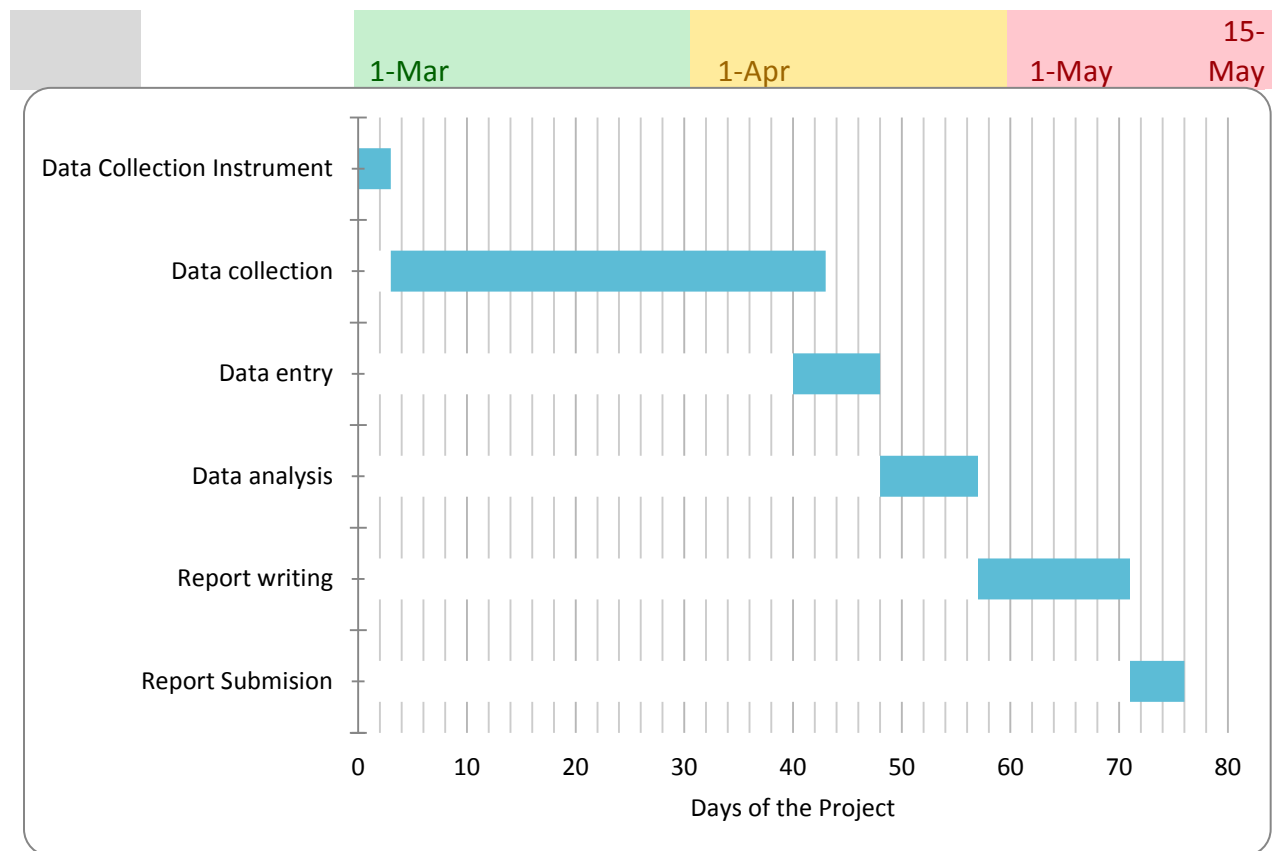
MARCH-MAY 2019

Data collection and analysis

MAY 2019

Thesis writing and presentation of results

Work Schedule Gantt Chart



Appendix ii: Budget

Data collection forms.....	2,400/=
Consent forms.....	1,200/=
Dissertation printing and binding.....	2,000/=
Other stationeries.....	2,000/=
Statistician	25,000/=
Ethical approval fees.....	2,000/=
Vernier calipers.....	5,000/=
Assistants	30,000/=
TOTAL.....	69,600/=

Appendix iii (a): CONSENT FORM

TITLE OF STUDY: PATTERN AND SEVERITY OF HAND INJURIES IN PATIENTS SEEN AT KENYATTA NATIONAL HOSPITAL

PRINCIPAL INVESTIGATOR: WAIREGI AMOS NDUNGU

INSTITUTION: THE UNIVERSITY OF NAIROBI

Introduction:

The purpose of this consent form is to give you the information you will need to help you decide whether or not to be a participant in the study. Feel free to ask any questions about the purpose of the research, what happens if you participate in the study, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. When we have answered all your questions to your satisfaction, you may decide to be in the study or not. This process is called 'informed consent'.

Once you understand and agree to be in the study, I will request you to sign your name on this form. You should understand the general principles which apply to all participants in a medical research:

- i) Your decision to participate is entirely voluntary.
- ii) You may withdraw from the study at any time without necessarily giving a reason for your withdrawal.
- iii) Refusal to participate in the research will not affect the services you are entitled to in this health facility or other facilities.

This study has approval by The Kenyatta National Hospital-University of Nairobi Ethics and Research Committee protocol No.....

The researcher listed above is interviewing individuals who have hand injuries presenting at Kenyatta National Hospital. The purpose of the interview is to find out the severity of these injuries and establish the causes of the same.

Participants in this research study will be asked questions about their age, cause, time and state of mind when the injury occurred.

There will be approximately 82 participants in this study randomly chosen. We are asking for your consent to consider participating in this study.

WHAT WILL HAPPEN IF YOU DECIDE TO BE IN THIS RESEARCH STUDY?

If you agree to participate in this study, you will be interviewed by a trained interviewer in a private area where you feel comfortable answering questions. The interview will last approximately 10 minutes.

ARE THERE ANY RISKS, HARMS DISCOMFORTS ASSOCIATED WITH THIS STUDY?

One potential risk of being in the study is loss of privacy. We will keep everything you tell us as confidential as possible. We will use a code number to identify you in a password-protected computer database and will keep all of our paper records in a locked file cabinet.

However, no system of protecting your confidentiality can be absolutely secure, so it is still possible that someone could find out you were in this study and could find out information about you. Also, answering questions in the interview may be uncomfortable for you. If there are any questions you do not want to answer, you can skip them. You have the right to refuse the interview or any questions asked during the interview. We will do everything we can to ensure that this is done in private. Furthermore, all study staff and interviewers are professionals with special training in these examinations/interviews. You may feel some discomfort when examining the wounds.

In case of an injury, illness or complications related to this study, contact the study staff right away at the number provided at the end of this document. The study staff will treat you for minor conditions or refer you when necessary.

ARE THERE ANY BENEFITS BEING IN THIS STUDY?

You may benefit by receiving free counseling and any health information you may need to ask the researcher. We will refer you to a hospital for care and support where necessary. Also, the information you provide will help us better understand the nature of your injuries. This information is a contribution to science and will play a part in policy making in private and public institutions of this country.

WHAT IF YOU HAVE QUESTIONS IN FUTURE?

If you have further questions or concerns about participating in this study, please call or send a text message to the study staff at the number provided at the bottom of this page. For more information about your rights as a research participant you may contact the Secretary/Chairperson, Kenyatta National Hospital-University of Nairobi Ethics and Research Committee Telephone No. 2726300 Ext. 44102 email uonknh_erc@uonbi.ac.ke. The study staff

will pay you back for your charges to these numbers if the call is for study-related communication.

WHAT ARE YOUR OTHER CHOICES?

Your decision to participate in research is voluntary. You are free to decline participation in the study and you can withdraw from the study at any time without injustice or loss of any benefits.

CONSENT FORM (STATEMENT OF CONSENT)

I have read this consent form or had the information read to me. I have had the chance to discuss this research study with a study counselor. I have had my questions answered in a language that I understand. The risks and benefits have been explained to me. I understand that my participation in this study is voluntary and that I may choose to withdraw any time.

I freely agree to participate in this research study. I understand that all efforts will be made to keep information regarding my personal identity confidential.

By signing this consent form, I have not given up any of the legal rights that I have as a participant in a research study.

I agree to participate in this research study:

Participant printed name: _____

Participant signature / Thumb stamp _____ Date _____

Researcher's statement

I, the undersigned, have fully explained the relevant details of this research study to the participant named above and believe that the participant has understood and has willingly and freely given his/her consent.

Researcher's Name: _____

Researcher's signature _____ Date _____

Appendix iii (b): CHETI CHA KUKUBALI

UTAFITI:UKALI WA MAJERAHA YA MIKONO KATIKA WAGONJWA

WANAOTIBIWA KATIKA HOSPITALI KUU YA KENYATTA

MTAFITI MKUU: WAIREGI AMOS NDUNGU

CHUO: CHUO KIKUU CHA NAIROBI

Utangulizi:

Sababu ya cheti hiki nikukupatia maelezo unayohitaji ili kuamua kwamba ungetaka kushiriki katika utafiti huu au la.

Kuwa huru kuuliza swali lolote kuhusu utafiti huu.

Utakapokubali kushiriki katika utafiti huu,nitakuuliza utie jina lako na sahihi katika cheti hiki.

Ni vyema uelewe maelezo kadhaa yanayohusu utafiti wa kifya:

i)uamuzi wakushiriki katika utafiti huu ni hiari yako.

ii)unaweza kujiondoa katika utafiti huu wakati wowote bila kupeana sababu yeyote.

iii)kukosa kushiriki katika utafiti hakuwezi kufanya kukosa uhudumu katika kituo cha afya.

Utafiti huu umekubaliwa na kamati ya maadili ya hospitali kuu ya Kenyatta na chuo kikuu cha Nairobi nambari.....

Sababu ya utafiti huu ni kujua sababu na ukali wa majeraha ya mikono.

Kutakuwa na washiriki themanini na wawili (82).Tunaomba ruhusa yako kushiriki katika utafiti huu.

NI NINI KITAFANYIKA UNAPOAMUA KUSHIRIKI KATIKA UTAFITI HUU?

Unapokubali,utaulizwa maswali na mtafiti faraghani na maswali yatachukua takriban dakika kumi.

KUNA MADHARA YEYOTE YATAKAYOHUSIANA NA UTAFITI HUU?

Madhara yanayoweza kutokea kwenye utafiti huu ni kukosa ubinafsi.Tutahakikisha cheti tutakachokijaza kitawekwa pahali salama ambapo ni mtafiti mkuu pekee ataweza kukipata.

Ni vizuri uelewe ya kwamba hata kama tutajaribu kuweka majibu yako salama,mtu mwingine anaweza akapata majibu hayo. Unaweza ukaruka yale maswali ambayo hutaki ama unaona haya kujibu.

Unaweza hisi uchungu kiasi tunapoangalia kidonda chako lakini tutahakikisha tutakuwa wapole tunapochunguza majeraha yako.

KUNA MANUFAA YEYOTE KUHUSIKA KATIKA UTAFITI HUU?

Unaweza faidika na kujibiwa maswali unayoweza kuwa nayo kuhusu majeraha yako.

Utafiti huu utatusaidia kuelewa zaidi kuhusu majeraha ya mikono na itasaidia nchi kutengeneza njia mwafaka ya kukabiliana na majeraha ya mikono.

UAMUZI MWINGINE UNAOWEZA KUWA NAO NI UPI?

Uamuzi wa kushiriki kwenye huu utafiti ni wa hiari.unaweza kataa kushiriki au ujiondoe kwenye utafiti wakati wowote bila kudhulumiwa na mtu yeyote.

UAMUZI WA KUKUBALI

Nimejisomea ama nimesomewa cheti hiki cha kukubali na nimeelewa madhara na manufaa ya utafiti huu.

Nimekubali kwa hiari yangu kushiriki kwenye utafiti huu na nimeelewa mtafiti atafanya njia zote kuhakikisha majibu nitakayopeana yatawekwa salama bila kuenezwa.Pia nimeelewa yakwamba jina langu au kampuni ninayofanyia kazi hazitaandikwa pahali kwenye cheti cha majibu.

Nimekubali kushiriki kwenye utafiti huu:

Jina la mshiriki.....

Sahihi..... tarehe.....

.....

KAULI YA MTAFITI

Nimeelezea mshiriki juu ya utafiti huu na ninaamini ameelewa na amekubali kwa hiari yake kushiriki kwenye utafiti huu bila kushinikizwa.

Jina la mtafiti.....

Sahihi..... tarehe.....

.....

Appendix iv: QUESTIONNAIRE

PART I:Background information

- i.Participant no.....
- ii.Gender: Male [] Female []
- iii.What is your Age?
- iv.What is your occupation?.....
- v.Which hand is injured? Dominant [] Non dominant [] Both []
- vi.What was the cause of the injury? Road traffic accident [] Assault [] Falling from a height [] Industrial machine injury [] Farm yard Machine/ Equipment injury [] Others [] (Specify whether you had worn protective gloves).....
.....
.....
.....
- vii. What was the setting of your injury? Workplace injury [] Non workplace injury []
If workplace injury, had you worn any protective gear on the hands? Yes [] No []
- ix. Were you under the influence of alcohol or any other drug during the time of the injury? Yes [] No []
- x. At what time were you injured?

PART II:Nature of the injuries (to be examined by the investigator)

Part injured specify

1.Are there skin lacerations? (If yes, indicate the site and size)
.....
.....
.....
.....
.....

2 .Is there skin loss? (If yes, indicate the site and size)
.....

.....
.....
3. Is there nail bed damage? yes { } No { }. If yes, specify which
ones.....
.....
.....

4. Is the wound crushed, dirty or contaminated? yes { } No { }

5. Are there tendon injuries? (specify which tendons, zone of injury and whether the tendon is
crushed or avulsed)
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.....
.....
.....
.....
.....
.....
.....

6. Are there any carpal bones fractured? (specify which
ones).....
.....
.....
.....

7. Are there Metacarpal bones fractured? (specify which ones and whether the fracture is open,
closed, simple, communitated or
intraarticular).....
.....
.....
.....
.....

8. Are there fractured phalanges? (specify which ones and whether the fracture is open, closed,
simple, communitated or intraarticular).....
.....

.....
.....
.....
.....

Dislocations

9. Is there any metacarpopharyngeal joint dislocation? (specify)

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.....
.....
.....

10. Is there any proximal interpharyngeal joint dislocation?
(specify).....

.....
.....

11. Is there any distal interpharyngeal joint dislocation?
(specify).....

.....
.....
.....

Ligamentous injury

12. Is there laxity of metacarpalpharyngeal joint of between 1 millimeter to 3 millimeters? (specify which digit)

.....
.....

13. Is there laxity of metacarpalpharyngeal joint of more than 3 millimeters? (specify which digit)

.....
.....

14. Is there laxity of between 1 millimeter to 3 millimeters of interpharyngeal joint? (specify which digit)

.....
.....
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.....
.....

15. Is there laxity of more than 3 millimeters of interpharyngeal joint?(specify which digit).....

.....
.....
.....

16. Has the patient suffered a traumatic amputation?(If yes, state the exact level of the amputation).....

.....

Nerve injuries

17. Is the main ulnar nerve injured? Yes { } No{ }

18. Is the main median nerve injured? Yes { } No{ }

19. Is the motor branch of median nerve injured? (Not applicable if the main nerve is injured)

Yes { } No{ }

20. Is the deep branch of ulnar nerve injured? (Not applicable if the main nerve is injured)

Yes { } No{ }

21. Is the digital nerve injured? (specify the digit and whether one or both).....

.....
.....
.....
.....

Arterial injuries

22. Is the ulnar artery injured? Yes { } No{ }

23. Is the radial artery injured? Yes { } No{ }

24. Is there injury to digital arteries? (If yes, specify the digit and whether one or both arteries of the stated digit)

.....
.....
.....

PART III:TOTAL SEVERITY SCORE (refer to the modified hand injury severity scoring chart)

STRUCTURES INJURED **SCORE**

1.INTEGUMENT INJURIES

Skin loss to the hand

Skin loss to the digits

Skin lacerations

Nail bed damage

2.SKELETAL INJURIES

Fractures

Dislocations

Ligamentous injuries

3.MOTOR INJURIES **SCORE**

Extensor tendon injuries

Flexor profundus tendons injuries

Flexor superficialis tendons injuries

Intrinsic muscles injuries

4.NEUROVASCULAR INJURIES

Main median nerve injury

Main ulnar nerve injury

Motor branch of median nerve injury
Motor branch of ulnar nerve injury
Ulnar artery injury
Radial artery injury
TOTAL MHISS

SEVERITY(Tick appropriately)

		Reference
MILD	{ }	< 20
MODERATE	{ }	21-50
SEVERE	{ }	51-100
MAJOR	{ }	>100