SOCIODEMOGRAPHIC AND ETIOLOGICAL PATTERNS OF TRAUMATIC PELVIC INJURIES AT MUHIMBILI ORTHOPEDIC INSTITUTE DAR ES SALAAM FROM SEPTEMBER 2016 – FEBRUARY 2017.

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Mmed (Radiology) Dissertation
Muhimbili University of Health and Allied Sciences
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By

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A Dissertation submitted in (Partial) Fulfillment of the requirement for the Degree of Master of Medicine (Radiology) of Muhimbili University of Health and Allied Sciences

Muhimbili University of Health and Allied Sciences
October, 2017

CERTIFICATION

The undersigned certify that she has read and hereby recommend for examination of dissertation entitled **"Socio demographic and etiological patterns of traumatic pelvic injuries at Muhimbili Orthopedic Institute from september – February 2017 Dar es salaam"** in fulfillment of the requirement for the degree of Master of Medicine (Radiology) of Muhimbili University of Health and Allied Sciences

_____

Dr. Hilda Makungu

(Supervisor)

Date: _____

DECLARATION AND COPYRIGHT

I, George Alfred Ngimba, declare that this dissertation entitled **"Socio demographic and etiological patterns of traumatic pelvic injuries at Muhimbili Orthopedic Institute from september – February 2017 Dar es salaam"** is my own original work and that it has not been presented and will not be presented to any other university for similar or any other degree award.

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I would also wish to thank the members of radiology and imaging department staffs, MUHAS, MOI, my fellow residents and all who happened to offer a useful assistance in making this study a reality

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Finally I appreciate the support of my parents, family members and my own family as have forfeited precious family time throughout my study. Special thanks to my lovely wife Leticia Emmanuel Nyaga for her patience support and prayers that led to the successful completion of this dissertation.

DEDICATION

This work is dedicated to;

My parents,

My lovely wife Leticia Emmanuel Nyaga

My wonderful daughters: Debora and Doris

ABSTRACT

Background

The traumatic pelvic injury is among the injuries that involve strong forces and may be associated with serious debilitating complication like dislocation, fractures, severe haemorrhage and neurologic deformities.

Pelvic radiograph is cheap imaging method that helps to a quick identification of patterns and types of pelvic trauma for appropriate further immediate management planning in emergency setting. The study aim was to determine the Socio demographic and etiological patterns of traumatic pelvic injuries at Muhimbili Orthopedic Institute which is the main specialized trauma centre.

Objective

To determine the socio demographic and etiological patterns of traumatic pelvic injuries at Muhimbili Orthopedic Institute Dar es Salaam from September 2016– February 2017.

Methodology

This was a prospective cross sectional hospital based study where by One hundred and thirteen (113) patients with traumatic pelvic injury referred to Muhimbili Orthopedics Institute radiology department from September 2016 to February 2017 were studied. All patients underwent pelvic radiograph evaluation, the pattern of bone injuries were documented and recorded. The structured questionnaires with close ended questions were used to collect the information.

Statistical analysis was performed using computer program Statistical Package for Social Sciences (SPSS) version 16 and P-value of <0.05 considered statistically significant.

Results

The age ranged from 2 to 80years with an overall mean age of 35.31 years. Male to female ratio was 3.5:1. The most affected age group involved was 15- 30years (38.9%) and more patients were referrals from Dar es Salaam region accounting for 73%.

About 35(26.7%) had pelvic ring fracture, 19(14.5%) presented with acetabular fractures and 10(7.6%) had hip joint dislocation.

The main causes of pelvic trauma were Motor car 32.7% and motor cycle 39.8% respectively. Others were fall from height 15.9% and 11.5% for other causes.

Conclusion

Acetabular fracture was more frequent type of pelvic trauma. Motor cycle against pedestrian's injuries was the commonest mechanism of injury for pelvic trauma. Most young adult male group was involved in pelvic trauma.

Recommendation

In emergency department setting all pelvic trauma patients should do plain X- ray as the first line of diagnostic imaging which is cheap and yet can give important clinical information instead of instant planning for more advanced and expensive imaging methods.

There is need to do more similar studies elsewhere in the country as this study was limited to Dar es Salaam; data for the country in general is lacking.

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LIST OF ABBREVIATIONS

AP	Anterior Posterior
ATLS	Advance Trauma and life Support
CT	Computed Tomography
CD	Compact Disc
EMD	Emergency Department
ESR	European Society of Radiology
Fig.	Figure
ICD-10-CM	International Classification of Diseases, 10th Revision, Clinical Modification
IRB	Institutional Review Board
ISS	Injury Severity Score
MNH	Muhimbili National Hospital
MOI	Muhimbili Orthopedic Institute
MRI	Magnetic Resonance Imaging
MUHAS	Muhimbili University of Health and Allied Sciences
PXR	Pelvic x –ray
RTA	Road traffic accident
SPSS	Statistical Package for Social Sciences
UK	United Kingdom
USA	United States of America
WHO	World Health Org

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

The pelvic rim is composed of the innominate bones, one coccyx and sacrum. The three innominate bones fuse at the acetabulum that articulates with the head of femur to form the hip joint.[1] The role of the pelvis is to provide protection of the pelvic viscera structures including major vessels, origination and insertion of muscles and transmission of weight-bearing forces from the lower extremities.[1,4]

Pelvic injuries are frequently encountered problem in casualty departments some presents with major fractures which results from very high energy force and require urgent hospital treatment. Pelvic fractures in adult account for up to 20% of all annual trauma admission with mortality variation from 8% to 50%, in contrast to children where it constitute 1% of the annual trauma admission with mortality rate of 4%.[2,3] The pelvic fractures form the high morbidity and mortality as reportedly to rank the third most common cause of death among the clash injuries. The fractures account for about 6% to 10% of bladder injuries presenting with gross haematuria. The mortality rate become even higher when major pelvic vessels are damaged resulting into severe haemorrhage.[5,6,7,8]

1.2 Etiology and mechanism of pelvic injuries

Road traffic accidents (RTAs) injuries are responsible for substantial population of deaths and disabilities. Other causes such as industrialization, house hold injuries, assaults, occupation and sports injuries contributes significantly to orthopedic admissions across the globe.[9]

According to the World Health Organization (WHO), 5.8 million people die from injuries and over 50million people sustain injuries annually. It is expected that by the year 2020 RTA will rank third in the global burden of diseases.[10,11] Tanzania like other developing countries faces a great burden of trauma patients in general. Citing Muhimbili National Hospital (MNH) alone as one of tertiary referral hospital, the

emergency department (EMD) receives approximately 100- 150 patients daily of which 25% are trauma casualty.[13]

Several classifications exist, and have been applied by different institutions to describe the mechanism of injury of the pelvis and stability status for management planning. According to Rennal et al classification pelvic injuries are radiographically classified into; Lateral compression, AP compression, Vertical shear and Complex pattern. Letournel- Judet described the acetabular fractures and classified them into six parameters including; fracture of the posterior wall, fractures of the anterior wall, fracture of the posterior column, fractures of the anterior column, fracture of the posterior column and posterior wall and fractures of both columns.[14,15,16,17]

Stable traumatic pelvic injuries includes; Avulsion injury, Insufficiency fractures (sacral fractures), Duverney fractures of iliac wing, Fracture of ischiopubic ramus and subluxations.[18] The unstable pelvic injuries include fractures or dislocations within the anterior or posterior aspects of the pelvic rim, the pelvic rim is interrupted in two places.[19]

An example of unstable pelvic injuries includes; bucket handles fracture- lateral compression injury. The sacroiliac fracture with contra lateral ischiopubic rami fractures of the superior and inferior pubic bones. Open book fracture (AP compression injury) there is disruption of the sacroiliac joints and pubic symphysis, the pelvis appear widened and flattened. Vertical shear injury- Malgaignes complex a fracture of the medial ileum or sacrum seen in conjunction with fractures of the superior and inferior rami on the ipsilateral side with superior displacement of the affected hemipelvis. The acetabular fractures involve the anterior, posterior column or centrally that may also be associated with hip dislocations. [20,21]

1.3Role of radiographs in pelvic injuries

Several imaging methods are used at different levels to diagnose the pelvic injuries. Plain pelvic radiographs when all imaging views are applied improve to significant diagnostic sensitivity. It is very effective at making diagnosis of obvious fractures that

require urgent surgical attention and is easily available up to the level of district referral hospitals. Also it is less expensive,[25] in contrast to other advanced imaging methods that are not accessible in almost all regional referral hospitals in Tanzania. Most fractures missed by plain radiography and seen with advanced imaging methods end up with conservative management.[25]

The advanced trauma life support (ATLS) set the guideline protocols that recommend PXR as the initial imaging method to be performed in evaluation of all patients with a blunt pelvic injuries.[26] The clinical findings that is indicated for plain PXR includes; Hip pain, groin pain, low back pain, tenderness to palpation over the pelvic girdle, obvious deformity and ecchymosis or abrasions around the pelvic area.[22,27]

For radiologist to make a perfect PXR evaluation, a normal anatomical pelvic land marks has frequently to be referred.[25,28] It include pubic symphysis, which is symmetrically smooth curve, within the midline edge, measures less than 5mm width and less than 3mm of vertical offset.[29] The pelvic articulation includes; the two sacroiliac joints formed between the sacrum and the ileum of the innominate bones, sacrococcygeal symphysis formed between the sacrum and coccyx.[30] Other landmarks to note include; the iliopectineal line which extends from the medial border of the iliac wing along the superior border of the superior pubic ramus to the pubic symphysis. Ilioischial line, sacral arcuate line, Line of Klein, Hilgenreiner line and Perklin line which is drawn perpendicular to the Hilgenreiner.[30]

The study was conducted to find out various pelvic trauma patterns using plain radiographs with emphasis on; socio demographic distribution, causes, mechanisms, different form of severity and types of pelvic fractures. The aims was to show different types of pelvic fractures identified by plain radiograph which is cheap imaging method and yet can offer useful information for appropriate management decision.

2.0 LITERATURE REVIEW

2.1Demographic distribution

Pelvic ring and acetabular fractures occur as the result of high-energy blunt trauma from motor vehicle/cycle collisions, fall from height, assault and pedestrian injuries.

Regarding gender distribution of pelvic trauma patients most of the studies reveals that male were more affected than females. The study done in Denmark show that pelvic trauma were seen in male as compared to females (76% versus 24%)**.**In German study shows the gender distribution of 56.7% men and 43.3% women[31]**.** Similar findings were seen in USA study on which a gender distribution of 61% men and 39% women were seen[26]. In India the distribution was 78% men, 22% women[32].

The same findings were seen in African countries. In Sudan 73.6% of the patient with pelvic trauma were men and 26.4% were women[17]. Same applied in Kenya where72% of the patient with pelvic trauma were males and 28% were women[35].

In the study done in Mwanza-Tanzania on motorcycle injuries reports 69.5% of men were involved pelvic trauma versus 30.5% of females[48].

Age distributions of the patient with pelvic trauma vary from place to place. In a study done in German the commonest age group affected was between 15-30years (37%) [31] While in a study done in India and United states of America the commonest age group affected was between 18-45 years (67%)[32] and 3-82 years (60%)[26] respectively.

2.2 Aetiological distribution

Regarding the etiology of pelvic fractures, Road traffic crash injuries including; pedestrian, motorcyclist, cyclist, car driver and passenger was the commonest reportedly mechanism of traumatic pelvic injuries.[30] According to the study done in Belgium on Imaging in trauma of the pelvis and hip region, motor vehicle crashes reported to range from 37% -64%,pedestrian struck by motor vehicle was 16% - 32% and fall from height 5%- 11%.[37] The other study from UK reports road traffic collisions as highest which made 20% - 66% followed by pedestrian collisions that made 14% -

59% and other causes of pelvic fractures like fall from height ranking the lowest percentage.[36] Road traffic injuries also reported by the study from USA on Elderly Patients with Pelvis Fractures as the highest in the list.[43,17] Again findings from India by Najmul Huda et al reported that 59.72% were road traffic injuries, 23.87%of injuries were due to falls from height and other cause of injuries like assault, sport related injuries were found to be less than 5%.[44]

The findings reported from the study done in Sudan among Sudanese pelvic trauma patients, road traffic injuries made the 80% of all causes of the injuries and 9.1% was due to fall from height. With significant increase of transport means like motorcycle and cars in different parts of the country and East Africa in general, cases of traumatic injuries new admissions are persistently high.

2.3 Radiographic findings distribution

The spectrum of patients with pelvic injuries ranges from patients with isolated simple subluxation/dislocation to critically injured patients with multiple other life threatening injuries.[38] The injuries may present as subluxation, dislocations, fractures or complex trauma the more violent the force of impact to the pelvis the greater the extent of injury. Study from the multicenter group in German reported about 22.7% of pelvic injuries had radiographic iliosacral joint displacement and 5.1% of the pelvic injuries had bilateral involvement. About18.8% presented with trans iliac dislocation fractures, 10.1% had transsacral dislocation fractures and avulsion fractures of the muscle attachments reported to be 0.9%.[31] Reports from ESR/UK based studies presented an involvement of an acetabular fractures by 20% of all pelvic fractures and may be associated with or without hip dislocation. Other structure involved were visceral structures like urinary bladder injuries which was 8% among the pelvic injuries.[39] The Ireland study on fractures around the hip in athletes shows that posterior dislocation of the hip joint accounts for 70%- 80% of all dislocations and 90% of sports related dislocation.[45] According to the study done in Nigeria, posterior hip dislocation was found to make 70% -96% and anterior dislocation was 6% -16% in the study. [40]

In most cases the pelvic injuries are stable, the study from USA shows that about 55% of cases of the pelvic ring injuries were stable fractures and 25% of cases constituted the rotationally unstable fractures and unstable in translation were about 21%.In the study, acetabular fractures were found to make 16%of cases.[41] The other study in Germany on the epidemiology of pelvic ring injuries reported also the distribution of pelvic fractures based on the stability. About 54.8% were found to be stable type A fractures followed by 24.7% which was type B rotationally unstable fractures and 20.5% unstable type C fractures.[31] Findings reported from Sudan among Sudanese patients shows higher incidence of unstable fractures 40.9% when compared to stable fractures which revealed 20.9%.[17]

3.0 PROBLEM STATEMENT

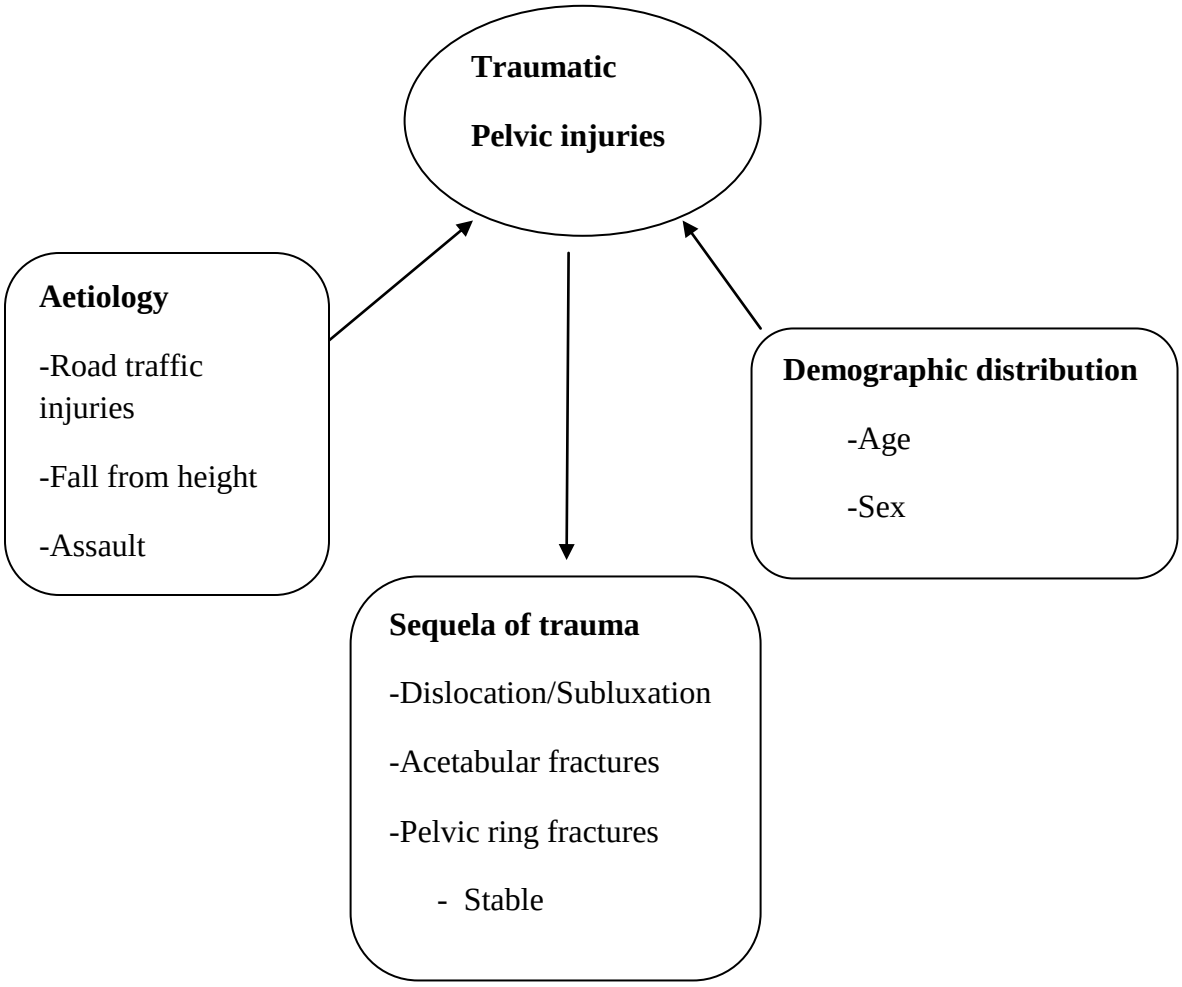
Traumatic pelvic injuries account for major severe orthopedic injuries. The morbidity and mortality among pelvic trauma patient range from 7.2 to 64% depending on age, associated injuries and complexity of the injury.[34]

Plain radiograph have been the first imaging of choice in the most of the EMD setting in the assessment of polytraumatized, haemodynamically unstable patients to identify pelvic fractures as potential source of blood loss. It is easily accessed, inexpensive and can pick gross injuries that may require urgent surgical repair.[29,31]

The pilot study done at MOI showed a persistently high incidence of new admissions due to traumatic pelvic injuries and the reasons for the incidence are not scientifically established in the facility. The socio demographic and etiological patterns of the traumatic pelvic injuries were not worked out information in Tanzania as to the scope of this study. Different pelvic trauma requires an individualized management plan and requirements, this is directly associated with prevalence and demographic distribution which is not well known in our local facility and the country as well.

Many patients sustain pelvic injury differently, the trend of aetiological factors has not been made available, and there is a need of the study to establish aetiological distribution.

4.0 CONCEPTUAL FRAMEWORK



5.0 RATIONALE

Traumatic pelvic injuries are common orthopedic surgical condition encountered as shown from MOI radiology registry. They are among the leading causes of death in trauma and also accompanied with comorbodities even for the patients that survive[12]. The radiological patterns of pelvic dislocation and fractures is less known in our country and even at Muhimbili Orthopedic Institute the tertiary orthopedic specialized facility in the country. There are good numbers of patients that sustain pelvic injuries as shown from MOI - EMD registry and the first imaging modality always requested is plain radiography.

Studies on radiologic patterns of pelvic injuries in Tanzania and other places outside our country are so scarce although pelvic plain radiographs has been done everywhere from the remote to tertiary health facilities and majority can afford as an immediate imaging modality

The study is also going to establish baseline data to be used in future research planning in Radiology, Orthopedic and traumatology fields.

CHAPTER TWO

6.0 OBJECTIVES

6.1 Broad objective

To determine the socio demographic and etiological patterns of pelvic injuries among trauma patient at Muhimbili Orthopedic Institute Dar es Salaam from September 2016 to February 2017

6.2 Specific Objectives

1. To determine the demographic distribution of patients with traumatic pelvic injuries at Muhimbili Orthopedic Institute from September 2016 to February 2017.
2. To determine the cause of traumatic pelvic injuries at Muhimbili Orthopedic Institute from September 2016 to February 2017.
3. To determine the radiographic distribution of traumatic pelvic injury at Muhimbili Orthopedic Institute from September 2016 to February 2017.
4. To determine the radiographic distribution of pelvic fractures according to fracture stability at Muhimbili Orthopedic Institute from September 2016 to February 2017.

7.0 METHODOLOGY

7.1Type of study

The study type was prospective cross sectional hospital based

7.2 Study duration

The study was conducted for a period of six months from September 2016 to February 2017

7.3 Study area

The study was held at radiology and emergency departments of Muhimbili Orthopedic Institute (MOI).

MOI is the only public orthopedic specialized tertiary national referral hospital in Tanzania. The hospital receives orthopedic, neurologic and traumatic referral from almost all over the country where, majority of patient being referred from the surrounding nearby hospitals and it is located in Dar es Salaam, Tanzania.

The hospital among other departments has Radiology and Emergency casualty department. The emergency casualty department receives patients from hospitals within Dar es Salaam city and from other regions of Tanzania.

Radiology department is located in same emergency building receives an average of one hundred twenty to one hundred and forty (120 – 140) patients a day for plain radiography.

7.4 Study population

All patients referred to MOI radiology department with history of traumatic pelvic injuries for plain pelvic radiograph during the study period were included into the study.

7.5 Inclusion criteria

1. All new patients referred to MOI radiology department with history of traumatic pelvic injury.

2. All patients accepted and signed the consent or whose close relative or legal guardians signed consents.

7.6 Exclusion criteria

1. All unconscious patients without close relative to sign consent.

2. The under 18year patients without legal guardian to consent.

3. The patient presenting with serious debilitating condition like open pelvic injuries, hemodynamic instability which need emergency care were excluded

4. The other exclusion criteria were those patients coming with pathological fractures with a known chronic debilitating disease.

7.7 Sample size

The sample size was calculated from Fisher's formula;

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

Where;

N = sample size

Z= (1.96)

P=Prevalence of pelvic injuries 8% from the study done in Kenya on patterns of pelvic trauma[35]

E= Margin error 5%

Therefore;

$N = (1.96)^2 \times 0.08 \times (1-0.08) / (0.05)^2$

N = 113

So the minimum sample size N was approximated to 113.

7.8 Sampling method

Convenience sampling technique was used. All patients with history of traumatic pelvic injury were consecutively recruited in Emergency department and later evaluated to see

whether they fulfill the inclusion criteria. Those who fulfill the criteria Images were done on the same day at radiology department and later evaluated and reported.

7.9 Data collection

Data collection done through structured questionnaires with close ended questions.

Data information included socio- demographics, causes of the injuries, clinical symptoms, type of bone injury like subluxation/dislocation and fracture findings.

7.10 Imaging and evaluation

Patient in the study underwent AP view pelvic radiograph at MOI radiology department using a digital x ray machine: Phillips, DR/712310, Eindhoven-Best, and Netherland. The field collimated to the pelvis with a focus film distance of about 100cm with a patient lying in supine position and oblique position.

Tile's, Letournel- Judet classifications and tables were referred to characterize the pelvic trauma[5,6]

The patient defined to have fracture of pelvis when the radiograph presented with cortical discontinuity of one or more bones of the pelvic ring which are sacrum and innominate pelvic bones.[41]

Dislocation defined as the loss of anatomical congruence of bones in a joint or a complete disruption of a joint following trauma. When it is incomplete or partial dislocation of a bone in a joint is referred to as subluxation.[40]

The stable fracture referred to as single break of pelvic ring or peripheral fractures such as avulsion fractures, duverney fracture of iliac wing or fracture of ischiopubic rami.[16,18]

Unstable fracture were again defined as any involvement of pelvic ring interrupted in two places[16,18]

7.11 Quality control

All X ray images were acquired by a trained radiographer then stored in computer data system and soft copy file. The image findings were reported by investigator and radiologist to reduce bias in observation and ensure quality.

To ensure the validity of study investigation tool, questions designed were pretested and modified to suit the objectives one month prior to commencement of the study. The reliability of tools based on the international standard classification and tables in which different pelvic dislocation and fractures has been defined.[21,22,23.,29,33]

7.12 Data analysis

All filled questionnaires were daily checked for completeness and accuracy by the investigator and then coded before entering the data into the computer. Data were analyzed using the statistical package for social sciences (SPSS) version 16 for window evaluation. Frequency distribution and cross tables were used to tabulate data. Variables were expressed in percentage and comparison between independent and dependent variables were done by Chi squire and Fishers test. P- Value of less than 0.05 considered statistically significant.

7.13 Ethical consideration

Ethical clearance was obtained from MUHAS- IRB (Institution Review Board) under Prof. S. Abood and permission to conduct the study at MOI was obtained from Executive Director Office. Informed consents both written and verbal were obtained from the patients prior to recruitment for the study. Confidentiality was observed during the whole process of the research. Patient who were eligible but refuse to participate in the study were not in any way deprived of their right to receive medical attention.

7.14 Results and treatment

All results obtained from the study were immediately available to the Orthopedics surgeons looking after the patients to continue with standard care as per MOI management guidelines.

CHAPTER THREE

8.0 RESULTS

During the study period a total of One hundred and fifty eight (158) traumatic pelvic injury patients were seen at EMD. Twenty (20) patients did not fulfill the inclusion criteria. 138 patient fulfill the criteria, however 25 patient were excluded from the study as they were unconscious could not consent, hemodynamic instability were (10) and other 10 had pathological fractures. Complete data was available for 113 patients and these formed the basis for analysis.

Of the study patient eighty eight 88(77.9%) were males and twenty five 25(22.1%) were females. The mean age was 35.31 years old with range of (2-80) and standard deviation of 17.68. Most age group involved was from 15 to 50 years.

Most of patients 83(73.5%) were from within Dar es Salaam and about one hundred and four 104 (92%) were referrals from other hospital, as shown in the table 1 below.

Table 1 : The demographic and baseline characteristic for study population. N= 113

Variables		**n**	**Percentage (%)**
Sex	Male	88	77.9
	Female	25	22.1
	M:F Ratio	**3.5:1**	
Age group (years)	0-14	12	10.6
	15-30	44	38.9
	31-50	36	31.9
	51-70	17	15
	71-90	4	3.5
	Mean age	**35.31**	
Address	Dar es Salaam	83	73.5
	From other regions	30	26.5
Referral	Self-referral	9	8
	Referral from other hospital	104	92

The different groups of pelvic trauma patients were seen in image findings. The groups identified includes normal pelvic radiograph which were 23(20.4%), pelvic fractures involving the pelvic ring as classified according to Tile's classification 35(31%). Acetabular fractures 19(14.5%), hip dislocations 10(7.6%) and other participants had fractures of other bones as tabulated below.

Table 2: Frequency distribution of radiographic findings of pelvic trauma among patients attending MOI

	Frequency	
Radiographic Image findings	n	Percentage (%)
Trauma with no fractures	23	20.4
Pelvic ring fractures –Tile's	35	31.0
Acetabular fractures	19	17.0
Hip dislocation	11	9.7
*Other injuries	44	38.9

*Stands for extra pelvic fractures

The proportional distribution of pelvic ring fractures shows different variation among age group and sex. The table below shows most of pelvic ring fractures were seen in the age group of between15-30. With respect to sex difference male 24 (21.3%) were more involved in pelvic ring fractures as opposed to female 11(9.7%).

The age group range was adopted from the study done by Gänsslen A. at el.[31]

Table 3: Pelvic ring fracture distribution by age group and sex among trauma patient attending MOI.

Age group	Pelvic ring fractures	Percentage%
0-14	5	14.3
15-30	15	42.9
31-50	9	25.7
51-70	5	14.3
71-90	1	2.8
Total	**35**	**100**
Sex		
Male	24	68.6
Female	11	31.4
Total	**35**	**100**

The findings indicated that motor cycle injuries was the leading cause of pelvic trauma 45(39.8%) followed by motor car injuries 37(32.7%) as shown in the table 4.

Table 4: Shows the causes of traumatic pelvic injuries

Causes of pelvic trauma	n	Percentage (%)
Motor car injury	37	32.7
Motor cycle injury	45	39.8
Fall from Height	18	15.9
Other causes	12	10.7

The table 5 below shows that relation between causes of traumatic pelvic injuries and sex are not statistically significant, however males were the most affected group by all pelvic trauma causes and motor cycle injuries was the highest 36(80%) followed by motor car 27(73%) among the causes.

Table 5: Shows the causes of pelvic trauma and gender distribution

Variable	Sex	Yes (%)	No (%)	Total	P. Value
Motor car	Male	27(73)	61(80.3)	88	
	Female	10(27)	15(19.7)	25	
Total		37(100)	76(100)	113(100)	0.260
Motor cycle	Male	36(80)	52(76.5)	88	
	Female	9(20)	16(23.5)	25	
Total		45(100)	68(100)	113	0.420
Fall from height	Male	14(77.8)	74(77.9)	88	
	Female	4(22.2)	21(22.1)	25	
Total		18(15.9)	95(100)	113(100)	0.602
Other causes	Male	10(83.3)	78(77.2)	88	
	Female	2(16.7)	23(22.8)	25	
Total		12(100)	101(100)	113	0.477

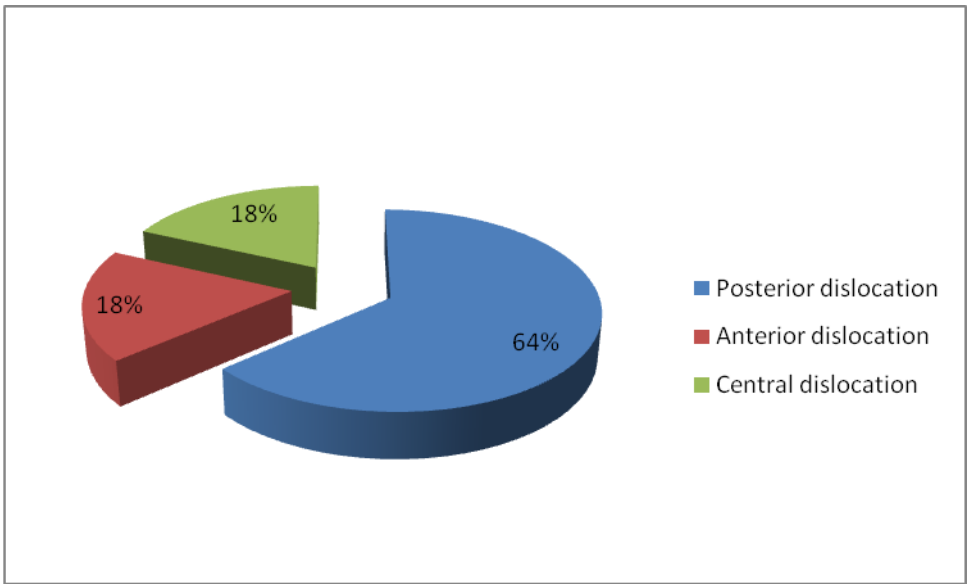
Different pelvic trauma patterns were radiographically identified as indicated in table 6 below. Acetabular fracture was more frequently seen accounting for the 12.4% of the pelvic trauma.

Table 6: The radiographic distribution patterns of traumatic pelvic injuries

Type of fracture	n	Percentage (%)
Ischiopubic rami fractures	15	13.3
Acetabular fractures	19	17
Straddle fractures	3	2.7
Malgaigne fractures	4	3.5
Pubic diastasis	8	7.0
Hip dislocation	11	9.7
Iliac bone fractures	5	4.4

The dislocation of hip joint shows the direction of dislocation have variable frequency. Table 7 shows the posterior hip joint dislocation was high accounting for the63% compared to central and posterior dislocation.

Table 7: Shows types of Hip joint dislocation distribution



From table 8 below, shows different radiographic patterns of pelvic fractures based on Tile's classification. The severity of pelvic ring trauma involvement determines stability of the pelvis. The study shows partially stable pelvic ring fractures were more prevalent 17(47.2%) followed by unstable pelvic ring fractures 10(27.8%) and the stable pelvic fractures were 8(22%) patients.

Table 8: The radiographic distribution of pelvic fractures based on stability

Classification	n	Percentage (%)
STABLE FRACTURES	8	22.2
A1 avulsion fractures	6	16.7
A2 Iliac wing fractures	2	5.6
A3 Anterior arch fracture-Duverney	0	0
A4 Transverse sacrococcygeal fractures	0	0
PARTIALLY STABLE FRACTURES	17	47.2
B1 Open book fractures	4	11.1
B2 Lateral compression fractures	1	2.8
B3 Ipsilateral anterior and posterior fractures	10	27.8
UNSTABLE FRACTURES	10	27.8
C1 Unilateral malgaigne fractures	5	13.9
C2 Straddle fractures (both obturator rings	3	8.3
C3 Associated with acetabular fractures	3	8.3
C4 Associated with dislocation unilateral or bilateral	0	0

The stability of pelvic ring fracture was further determined for its relation with its causes of trauma. The table 9 below shows the distribution of fracture stability and different causes. There was statistically not significant between different causes of pelvic fracture and the fracture stability.

Table 9: The distribution of pelvic fracture stability in relation to the causes

Type of fracture stability				
Cause	STABLE FRACTURES			
Variable	Yes (%)	No (%)	Total(113)	P-Value
Motor cycle injury	5(5.4)	40(94.6)	45	0.479
Motor car injury	2(5.4)	35(94.6)	37(100)	0.162
Fall from height	1(5.6)	17(94.4)	18	0.626
Other causes	0	13	13	
	PARTIALLY STABLE FRACTURES			
Motor cycle injury	5(11.1)	40(88.9)	45	0.140
Motor car injury	8(21.6)	29(78.4)	37	0.250
Fall from height	2(11.1)	16(88.9)	18	0.465
Other causes	2(15.4)	11(84.6)	13	0.570
	UNSTABLE FRACTURES			
Motor cycle injury	5(10.8)	40(88.9)	45	0.358
Motor car injury	4(10.8)	33(89.2)	37	0.420
Fall from height	0	18(100)	18	
Other causes	1(7.7)	12(92.3)	13	0.713

The stability of traumatic pelvic ring fractures was further evaluated for any significant statistical relationship with the mechanism of injury. Table 10 below shows distribution of fracture stability and the mechanism involved. There was no statistical significance between the mechanism of injury and the type of fracture stability

Table 10: The radiographic distribution of pelvic fracture stability in relation to mechanism of injury

Type of fracture stability

Mechanism of injury	STABLE FRACTURES			
Variable	Yes (%)	No (%)	Total	P-Value
Driver	1(4.5)	21(95.5)	22	0.260825
Passenger	4(16)	21(84)	25	
Pedestrian	2(5.6)	34(94.4)	36	
Others	1(3.3)	29(96.7)	30	
	PARTIALLY STABLE FRACTURES			0.392896
Driver	1(4.5)	21(95.5)	22	
Passenger	5(20)	20(80)	25	
Pedestrian	7(19.4)	29(80.6)	36	
Others	4(13.3)	26(86.7)	30	
	UNSTABLE FRACTURES			0.959707
Driver	3(13.6)	19(86.4)	22	
Passenger	3(12)	22(88)	25	
Pedestrian	4(11.1)	32(88.9)	36	
Others	0	0	0	

RADIOGRAPHIC IMAGES

Image 1to 5 represents some of the various pelvic fractures and dislocations

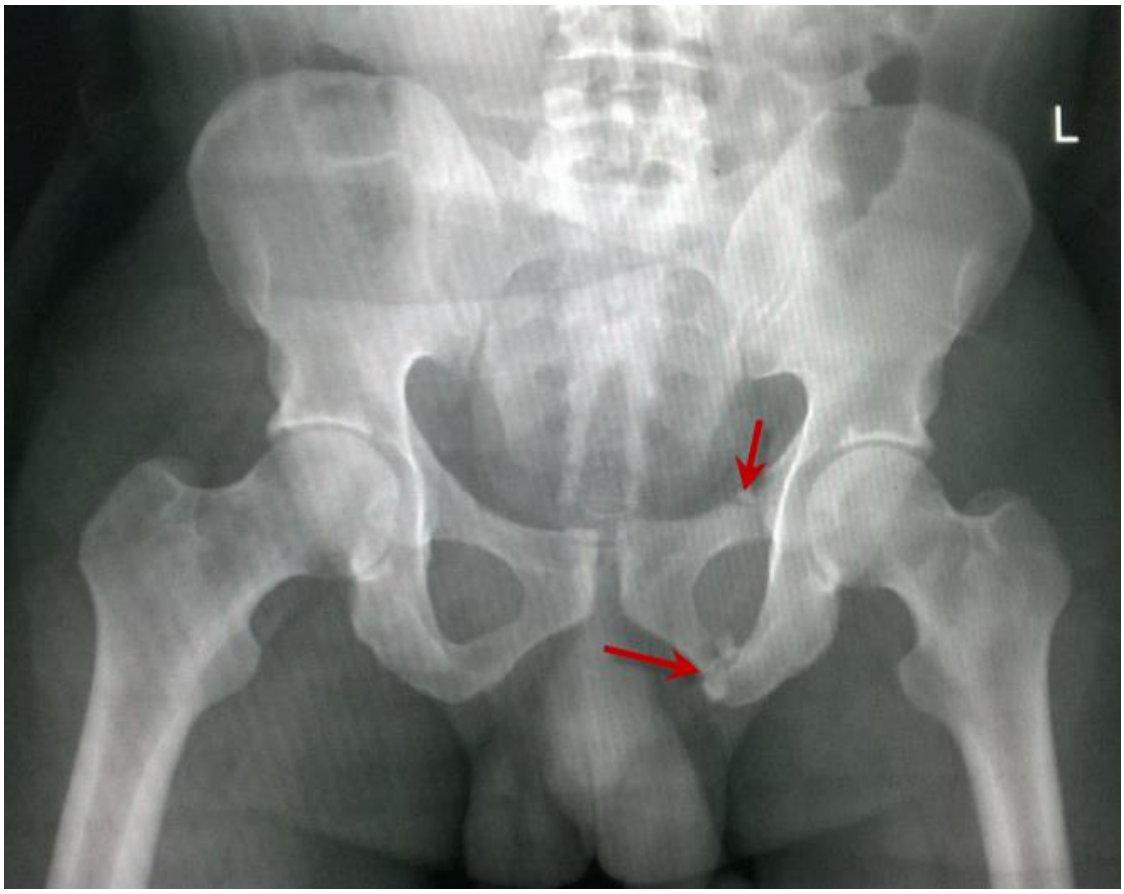


Figure 1: A 47year old man, pedestrian involved in Motor cycle injury and sustained a Left Ischiopubic rami fracture.

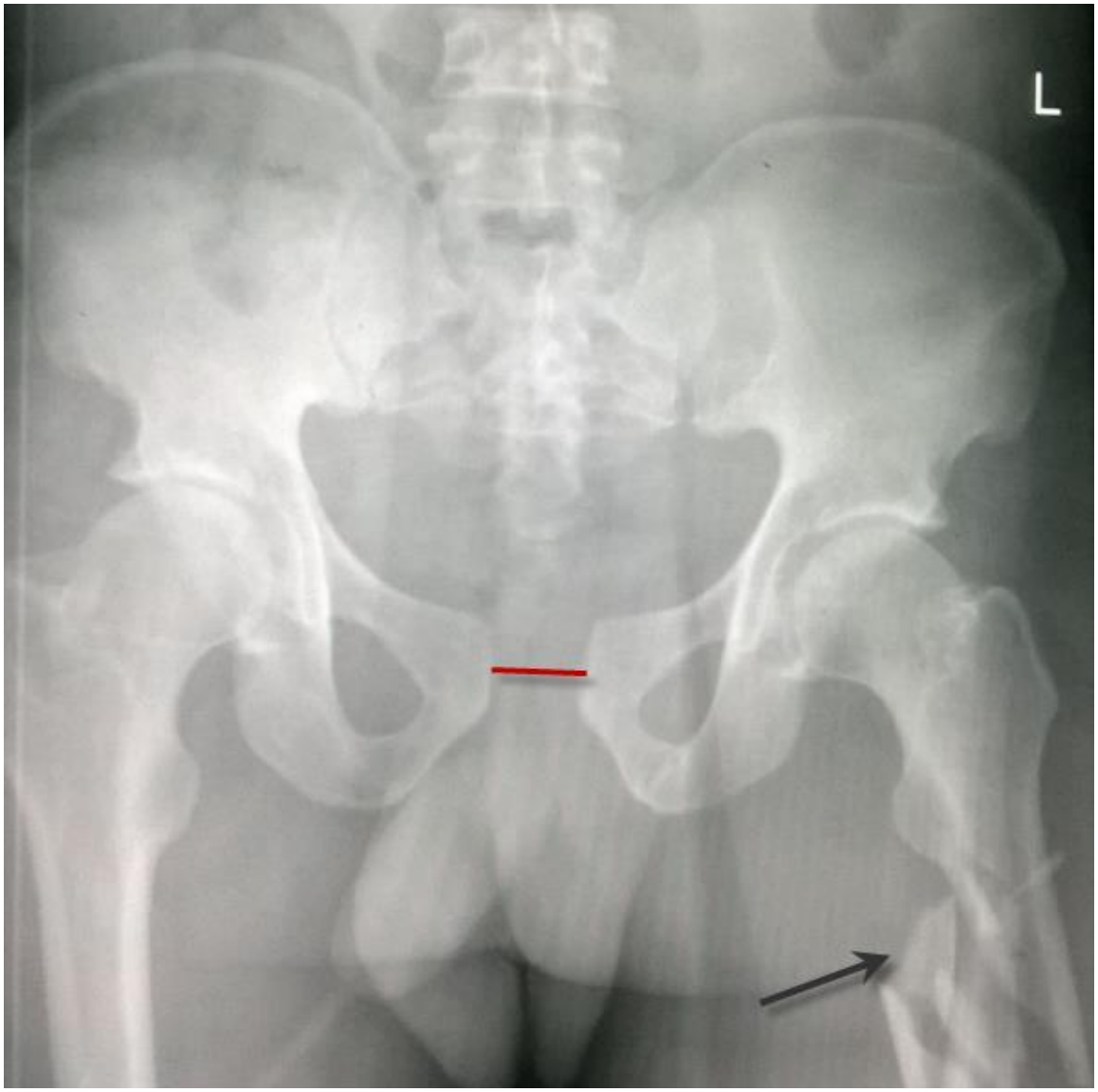


Figure 2: A 39 Year old man was knocked by a falling wall at the building site. The AP view radiograph shows pubic diastasis and left proximal 3rd femoral comminuted fracture.

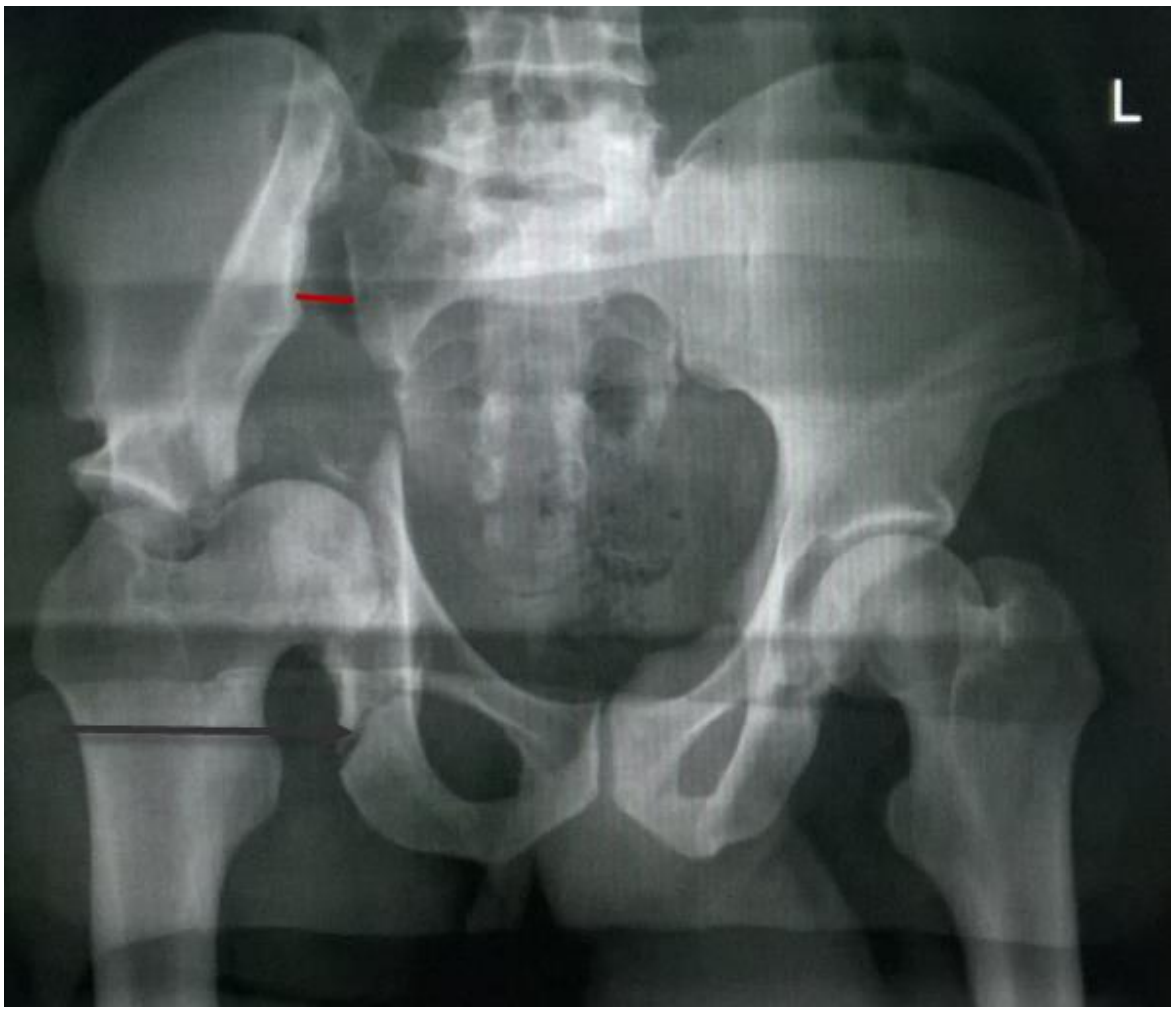


Figure 3: A 46year old man involved in motor car injury as passenger. The AP view radiograph shows a complex fracture of iliac wing, acetabular and ischiopubic rami this is consistent with Malgaigne fracture

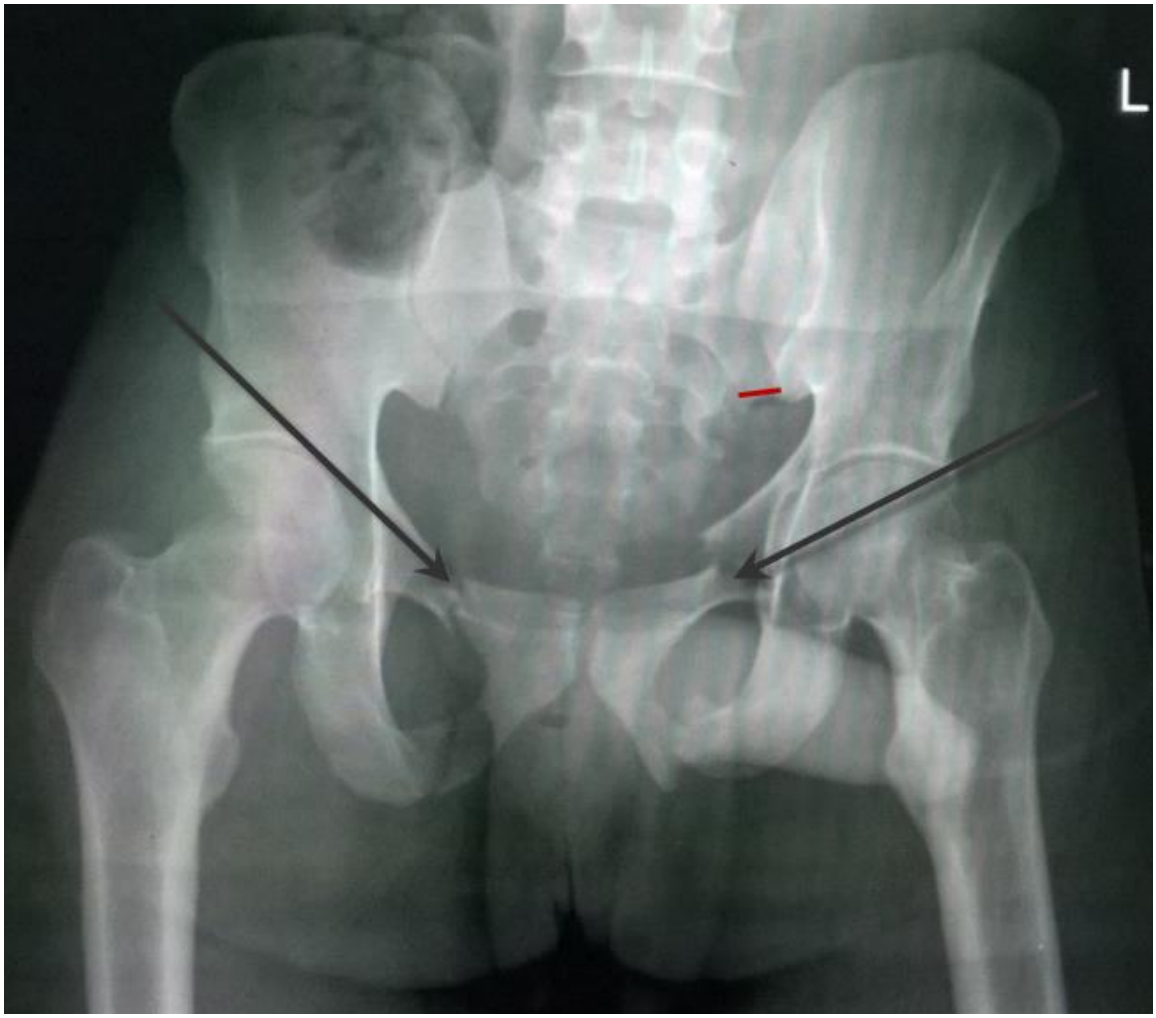


Figure 4: A 29 Year old man pedestrian involved in motor car injury. The AP view radiograph shows a bilateral ischiopubic rami fracture - The Straddle fracture

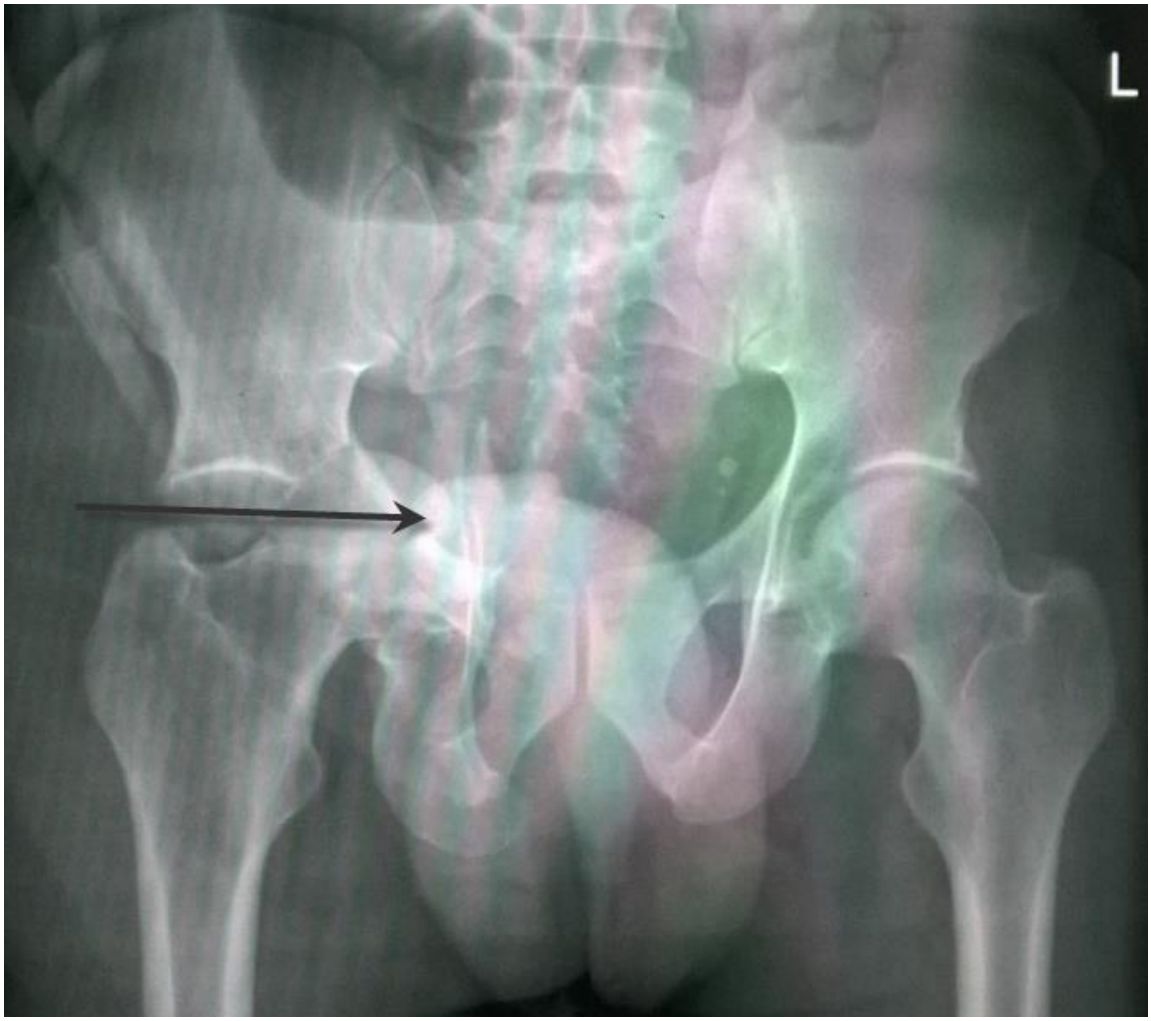


Figure 5: A 54 Year old Female pedestrian involved in motor cycle injury and sustained a fracture of acetabulum, inferior pubic ramus and central dislocation of femur (Acetabular protrusio)

CHAPTER FOUR

9.0DISCUSSION

This was hospital based cross sectional study which included 113 patient of all age group who were referred to MOI radiology department due to history of pelvic trauma for plain pelvic radiograph

In this study male were more involved in pelvic traumatic injury (77.9%) than female (22.1%) . The finding appears to corroborate reports of earlier studies that have higher incidence of males than females. The study done in Israel showed more male (71.9%) involved in pelvic trauma than females (28.1%)[44] . The other previous study done in Mwanza- Tanzania also supported similar male pre direction (69.5%) than female(30.5%)[47]. The predominance of male attributed to their greater exposure to traffic and other risk behavior than female.

Largest proportions of patients presented with pelvic trauma were of the age group between15-30 (38%) and 31- 50 (31.9%) which means there were decrease in frequency as age changed by decrease or increase. This finding is reported in other previous studies elsewhere. Studies in German, India and Nigeria agreed with the finding[25,31, 34] This explains the involvement of the most energetic age group to outdoor activities and thus they are at high risk for trauma than younger and most elderly age groups.

The current study showed a significant increase in frequency (31%) of pelvic ring fractures as defined by the International Classification of Diseases, 10th Revision, Clinical Modification (ICD-10-CM)[46]. The study done in Brazil by Pereira GJ, et al[51] reported the prevalence of 20- 25% also studies from India by Keche N. at el 2014[32,] and Finland by Lindahl J at el[20] showed the prevalence of pelvic ring fractures was 25% in polytrauma setting. The higher prevalence in the current study can possibly be due to exclusion of the low force energy pathological fractures which were included in the previous studies. Also prevalence of pelvic ring fracture tend increase with level of trauma care health facility as the current study was done within the tertiary health facility.

Regarding the causes of pelvic injuries, previous study mentioned a close relationship between young age group and traffic injuries this was also observed in this study.

The leading cause of pelvic trauma in the study population was RTA which included, Motorcycle injuries accounting for the 39.8% .This was in line with the report from Mwanza by Chalya PL at el 2010[48]. The trend is higher than the 19.6% reported in Brazil [51]. The difference in sample size, methodology population studied would explain the discrepancy. The growing commercial motor cycle ride as an alternative employment in most cities and towns should an alarm for the increased prevalence. The collective RTA was 72.5% this is comparably low from the other studies done in Nairobi Kenya 80.9% by Fallis A. at el[35] and Khartoum -Sudan 80% by Mohammed OB. At el[17] respectively. The prevalence in this study was mildly high when compered with the 62.9% reported in UK by Giannoudis P V. at el 2007[7] The apparent difference of prevalence rate in Dar es salaam as compared to other previous studies can possibly be stated by increased awareness about road traffic accident, improvement of roads and new driving regulations among the cities.

Fall from height in this research was 15.9% relatively similar findings (16.1%) from previous study in Egypt were reported by Vukotíc D. at el[50].The other causes included in this research were like, being knocked by falling heavy objects and others which accounted for the 11.5%.

Pedestrians were more commonly involved than car occupants. In this study there was about 44.4% of pedestrian s involved in the motorcycle injuries followed by the 22.2% motor cycle passengers. The finding agreed with other previous study done in Egypt by Vukotic D. at el in which pedestrians were most affected group and accounted for the (45.2%) [50]among all trauma mechanisms. Also these findings disagreed with the previous descriptive retrospective study on Motorcycle injuries done in Mwanza Tanzania which reported motorcycle passengers were 33.9% and pedestrians were 10.9%.The abrupt changes can be explained by possibly high population density and decrease in road safety awareness in Dar es Salaam among motorcycle riders and pedestrians.

The study showed equal distribution of pelvic trauma caused by motor vehicle accident between the passengers and pedestrians as both accounts for the forty percent (40.5%). There was several variations seen from one study and the other; Gänsslen A. at el 2012[21] study in German on pelvic ring injuries in pediatric passengers was 17.8% and pedestrians was 51.25%. The other study by Yair Barzilay. At el in Israel found 51% were motor vehicle and 20% pedestrians victims. The variation in study population and area could possibly explain the difference.

Pelvic trauma imaging findings as been classified by different authors in various ways[49] .From this study the common pelvic fractures seen were; Ischiopubic rami fractures (9.8%), acetabular fractures (12.4%),straddle fractures(2%), malgaigne fractures (2.6%), pubic diastasis (5.2%), iliac bone fractures (3.3%) and Hip joint dislocation (6.5%).

The study in Kenya reported the 51.3% of patients had ischiorami frctures, where 11.8% of similar fractures were reported by Vukotic D. at el and this was more comparable with the current study. Other fractures in the previous research by the former authors were; straddle fractures (4.2%), malgaigne fractures (2.1%), Hip dislocation (7.9%), pubic diastasis (10.1%) and iliac bone fractures (7.9%). The difference in approach and classification of pelvic trauma is likely to explain the discrepancy.

The posterior Hip joint dislocations were the other common conversional radiographic finding in this study. The most common type of hip joint dislocation found in the study was posterior direction seen in 7(63.6%), central dislocation seen in two patients (20%) (illustration. 5) and one (10%) patient presented with anterior hip dislocation[14]. The distribution of the hip dislocations agreed with study in Denmark, Iran and Egypt [14,50,52].

From the study, the distribution of pelvic ring fracture stability based on Tile's classification was seen in the frequency trend of ; 47.2% type B(Partially stable fractures), 27% type C (Unstable fractures) and 22% type A(Stable fractures). This finding appear to agree with the report of previous study done Uzbekistan[8] which showed type A stable fractures were less frequent than type B&C and disagreed with the study done in USA which showed that stable fractures (type A) were more frequently

seen as compared to type B&C[12].However, the data on mechanism of injury and type of fractures stability were not statistically significant(P-Value more than 0.05), the distribution shows most patients were pedestrians involved in motorcycle injuries followed by pedestrians and passengers involved in motor car injuries. Possibly this could explain the socio economic similarities between people from Dar es salaam and Uzbekistan that they are frequently subjected to high risk of mechanical force injuries than in USA where road safety regulations are strictly observed.

9.1 STUDY LIMITATIONS

This was hospital based study and therefore the results obtained cannot be generalized to suit the general population. However it can be used in secondary and tertiary hospitals.

9.2 CONCLUSION

In this descriptive cross sectional hospital based study at MOI among traumatic pelvic injury patients. Different radiographic patterns of pelvic injuries frequency were determined based on gender, age, causes and mechanism of injuries. It was found that the injury pattern, mechanism and demographic distribution are comparable to previous reported data from Tanzania, Kenya, Nigeria and other continents[7, 25, 35 &48].

Males dominated the majority of subjects in this study with M: F ratio of 3.5:1. The most involved age group was 15- 30 year – old. Road traffic accident especially motor cyclist and pedestrians were most involved mechanism of pelvic injuries.

The first line of investigation for pelvic trauma is mainly plain radiographs this was mentioned by majority of literatures reviewed. The frequent type of pelvic fracture, noted in this study were acetabular fractures followed by ischiopubic rami fractures.

9.3 RECOMMENDATIONS

In emergency department setting all pelvic trauma patients should do plain X- ray as the first line of diagnostic imaging which is cheap and yet can give important clinical information instead of instant planning for more advanced and expensive imaging methods.

The study had limitation of time and resources therefore; there is a need for similar study to be done involving large sample size and possible multicentre extension. Again the study was limited to MOI Dar es salaam more country representing data is still lacking.

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Appendix I(a): Informed Consent Form (English version)

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES-MUHAS

DIRECTORATE OF HEALTH AND PUBLICATIONS

INFORMED CONSENT FORM

ID –NO_____

Consent to participate in a study

Greetings! My name is Dr. George Ngimba I'm working on this research with an objective of determining the radiographic patterns of traumatic pelvic injury from september 2016 to march 2017

Purpose of the study

The study is conducted in partial fulfillment of the requirements for the degree of masters of radiology Muhimbili University of Health and Allied Sciences.

It will also help to quantify the common pelvic fractures and dislocation associated with traumatic pelvic injuries and pattern of injury causes. From this study, institutional bases on protocol setting for imaging approach in patient with traumatic pelvic injuries will be established.

What participation involved

If you agree to participate in this study you will be interviewed in order to respond to a series of questions in the questionnaire prepared and radiographs will be imaged to evaluate the trauma

Confidentiality

Information obtained from you will be kept confidential. Your name will not appear on any questionnaire or in any report/documents that might let someone identify you. All information collected on forms will be entered into computers with only the study identification number. None of the unauthorized person will assess to the data collected as this will be kept confidential document

Right to withdraw and Alternatives

Taking part in this study is voluntary. You can stop participating in this study at any time even if you have already given your consent.

Refusal to participate or withdrawal from the study will not involve penalty

Benefits

This study will help you and me find out severity of your pelvic trauma, whether you sustained dislocation or fractures. Whatever degree of trauma identified will guide to decide for further investigation and immediate management in collaboration with your doctor.

Whom to contact

If you ever have questions about this study you should contact the principal investigator, Dr. George Ngimba of Muhimbili University of Health and Allied sciences P. O. BOX 65001 Dar es Salaam, Telephone number 0755577072**.** If you ever have questions about your rights as a participant you may call the chairperson of the senate research and publications committee **Prof. S. Abood, P.O.BOX 65001 Dar es Salaam, telephone**

+255 22 2152489 and Dr. H. Makungu who is the supervisor of this study telephone number 0767296463.

Signature

Do you agree?

Participant agrees……..Participant disagree……

I……have read the contents in this form.

My questions have been answered. I agree to participate in this study

Signature of participant……..

Signature of research assistant……...

Date of signed consent……

Appendix I (b): Informed Consent Form (Kiswahili version)

CHUO KIKUU CHA AFYA NA SAYANSI SHIRIKISHI YA TIBA MUHIMBILI

KURUGENZI YA TAFITI NA UCHAPISHAJI

FORM YA RIDHAA

Namba ya utambulisho……

Ridhaa ya kushiriki kwenye utafiti

Kwa majina naitwa Dr. George Ngimba nafanya utafiti wenye lengo la kuchunguza jinsi na muonekano mbalimbali kwenye kipimo cha (x-ray)kwa watu waliopata ajali ya nyonga unao fanyika kuanzia mwenzi septemba 2016 hadi Machi 2017

Madhumuni ya utafiti

Utafiti huu unafanyika ikiwa ni sehemu ya kutimiza matakwa ya kukamilisha shahada ya uzamili ya tiba- kitengo cha vipimo vya mionzi (Radiology) chuo kikuu cha afya na sayansi shirikishi ya Tiba.

Matokeo ya utafiti huu yatasaidia kujua namna mbalimbali nyonga inavunjika na au kuteguka pamoja na visababishi vyake kwa kutumia kipimo cha (x-ray) ya kawaida.Taasisi pia itapata mwanzo na msimamo katika kuandaa mwongozo wa jinsi gani au mgonjwa yupi aliye umia nyonga atanufaika na kipimo cha mionzi cha kawaida.

Jinsi ya kushiriki

Ikiwa utaridhia na kukubali kushiriki katika utafiti huu, usaidiwa ili kuweza kujibu maswali toka kwenye dodoso lililoandaliwa.

Usiri

Taarifa nitakazozipata toka kwako zita baki kuwa siri. Majina yako hayatatokea kwenye dodoso wala katika taarifa zote na hakuna mtu yeyote asiyehusuka atakayeweza tambua muhusika hizo taarifa. Pia taarifa zote zitaingizwa kwenye komputa na kutuzwa kwa siri bila mtu asiyehusika kuzifikia.

Uhuru wa kushiriki na haki ya kujitoa

Kushiriki kwenye utafiti huu ni hiari. Unaweza kushiriki au kuto kushiriki na hii haikuondolei haki ya kupata matibabu yako.

Manufaa ya kushiriki utafiti huu

Kutokana na utafiti huu wote tutanufaika kwa kugundua uwepo na ukubwa tatizo la kuumia, pia kulingana na kipimo kitakavyo onesha itatusaidia kuamua kama kuna haja ya kipimo kingine zaidi au utanufaika kwa matibabu gani zaidi.

Nani wa kuwasiliana naye

Kama unamaswali kuhusiana na utafiti huu wasiliana na mtafiti mkuu wa utafiti huu, Dr. George Ngimba wa chuo kikuu cha afya na sayansi shirikishi ya tiba Muhimbili S.L.P 65001, Dar es Salaam simu +255755577072.

Kama una maswali juu ya haki za mshiriki wa utafiti wasiliana na mwenyekiti wa kamati ya utafiti na uchapishaji S. L. P 65001Dar es Salaam, simu: 255 22 2152489 au msimamizi wa utafiti huu Dr. H. Makungu simu +255767296463

Mshiriki nimekubali…….

Mimi……nimesoma maelezo katika fomu hii,nimeelewa na nimekubali kushiriki katika utafiti huu.

Sahihi ya mshiriki……Tarehe …….

Sahihi ya mtafiti/ msaidizi……Tarehe……

AppendixII(a): Questionnaire (English version)

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCINCES

DEPARTMENT OF RADIOLOGY

P.O.BOX 65001

DAR ES SALAAM – TANZANIA

FIRST SECTION

Registration number……

Tick (√) in appropriate position

1. Social demographic information
    a. Age…….
    b. Gender Male (……) Female (……)
    c. Residence
        i. Within Dar'……
        ii. Other regions…….
    d. Date of injury……
    e. Mode of referral
        i. Self referral…1. Yes…2. No….
        ii. Referred from other hospital 1. Yes…2. No….
2. Cause of trauma
    a. Motor vehicle 1. Yes…2. No….
    b. Motor cycle 1. Yes…2. No….
    c. Fall from height 1. Yes…2. No….
    d. Sports involvement 1. Yes…2. No….
    e. Other causes mention 1. Yes…2. No….
3. Mechanism of injury
    a. Driver/ motor cyclist 1. Yes…2. No….
    b. Passenger 1. Yes…2. No….
    c. Pedestrian 1. Yes…2. No….
    d. Sports injury
    e. Others mention 1. Yes…2. No…..……..

4. Clinical presentations
    a. Haematuria
        i. Yes…..
        ii. No……

SECOND SECTION: PLAIN RADIOGRAPHS INTERPRETATION

1. Normal pelvic radiograph findings
        i. Yes…
        ii. No…..
2. Pelvic fractures based on Tiles classification
    a. **Type A**; Stable fractures (posterior arch intact) 1. Yes…2. No….
        i. Avulsion injury 1. Yes…2. No….
        ii. Iliac wing fractures 1. Yes…2. No….
        iii. Anterior arch fractures- duverney 1. Yes…2. No….
        iv. Transverse sacrococcygeal fractures 1. Yes…2. No….
    b. **Type B**; Partially stable (Incomplete disruption of posterior arch) 1. Yes…2. No….
        i. Open book fracture – external rotation 1. Yes…2. No….
        ii. Lateral compression injury – Internal rotation 1. Yes…2. No….
        iii. Ipsilateral anterior and posterior fracture 1. Yes…2. No….
        iv. Contra lateral –bucket handle injuries 1. Yes…2. No….
    c. **Type C**; Unstable (Complete disruption of posterior arch) 1. Yes…2. No….
        i. Unilaterally- Malgaigne fractures 1. Yes…2. No….
        ii. Straddle fractures (involving both obturator rings) 1. Yes…2. No….
        iii. Bucket handle fractures 1. Yes…2.No…
        iv. Associated with acetabular fractures 1. Yes…2. No….
        v. Associated with unilateral or bilateral dislocations 1. Yes…2. No….

3. Acetabular fractures based on Judet- Letournel classifications 1. Yes…2. No….
    a. Fracture of the anterior column- iliopubic 1. Yes…2. No….
    b. Fracture of the posterior column- ilioischial bone1. Yes…2. No….
    c. Transverse fracture of both columns 1. Yes…2. No….
    d. Complex acetabular fractures with T- shaped or stellate 1. Yes…2. No….
4. Pelvic subluxation/Dislocation present? 1. Yes…2. No….
    a. Dislocation of the symphysis pubis1. Yes…2. No….
    b. Subluxation or dislocation of sacro iliac joint 1. Yes…2. No….
    c. Dislocation of the hip joint 1. Yes…2. No….
5. Hip dislocation patterns
    a. Posterior dislocation1. Yes…2. No….
    b. Anterior dislocation1. Yes…2. No….
    c. Central hip dislocation (Protrusio) 1. Yes…2. No….
6. Involvement of other appendicular and axial bone fractures 1. Yes…2. No….
    a. Femur fractures 1. Yes…2. No….
    b. Tibial/ Fibula fractures 1. Yes…2. No….
    c. Humeral fractures 1. Yes…2. No….
    d. Radial/ Ulna fractures 1. Yes…2. No….
7. Type of pelvic injuries checklist
    a. Ischiopubic rami fracture 1. Yes…2. No….
    b. Acetabular fractures 1. Yes…2. No….
    c. Straddle fractures 1. Yes…2. No….
    d. Malgaigne fracture 1. Yes…2. No….
    e. Sacral fractures 1. Yes…2. No….
    f. Bucket handle fractures 1. Yes…2. No….
    g. Hip dislocation 1. Yes…2. No….
    h. Pubic diastasis 1. Yes…2. No….
    i. Iliac bone fracture-avulsions and duverney 1. Yes…2. No….
    j. Radiographically normal pelvic1. Yes…2. No….

Appendix (IIb): Questionnaire (Swahili version)

CHUO KIKUU CHA AFYA NA SAYANSI SHIRIKISHI YA TIBA MUHIMBILI

KITIVO CHA TIBA –IDARA YA RADIOLOGIA

S.L.P 65001

DAR ES SALAAM- TANZANIA

Namba ya dodoso…….

SEHEMU YA KWANZA

Weka alama(√) sehemu inayohusika

1. Taarifa za mshiriki
    a. Namba ya usajiri hospitalini……..
    b. Umri wa mshiriki…….
    c. Jinsia Me (….), Ke (…..)
    d. Sehemu unakoishi Dar (…), Out of Dar (…) Namba ya simu…….
    e. Tarehe ya ajali……
    f. Umefikaje hospitali hii; Nimekuja bila rufaa(…..),Nimepata rufaa ya hospitali nyingine(….)
2. Sababu ya kuumia
    a. Ajali ya gari 1. Ndiyo…2.Hapana….
    b. Ajali ya pikipiki 1. Ndiyo…2.Hapana….
    c. Kuanguka kutoka juu1. Ndiyo…2.Hapana….
    d. Michezoni 1. Ndiyo…2.Hapana….
    e. Nyinginezo Taja…….
3. Uhusika wako kwenye ajali
    a. Dereva/muendesha pikipiki 1. Ndiyo…2.Hapana….
    b. Abiria 1. Ndiyo…2.Hapana….
    c. Mtembea kwa miguu 1. Ndiyo…2.Hapana….

d. Mchezaji(…..)1. Ndiyo…2.Hapana….

e. Mengineyo taja……

4. Dalili anazolalamika mgonjwa;

a. Kutoka mkojo uliochanganyika na damu? Ndiyo(….) ,Hapana(…..)

b. Kuvunjika na au majeraha sehemu nyingine za mwili kama; Kichwa(…..) Tumbo(……),Kifua(…..), Mikononi (……), Miguuni(…….).

c. Uwepo wa kuvunjika sehemu nyinginezo: Taja mfupa uliovunjika……

d. Maumivu mengineyo kama yapo taja ……

SECOND SECTION: PLAIN RADIOGRAPHS INTERPRETATION

1. Normal pelvic radiograph findings
    i. Yes…
    ii. No…..
2. Pelvic fractures based on Tiles classification
    a. **Type A**; Stable fractures (posterior arch intact) 1. Yes…2. No….
        i. Avulsion injury 1. Yes…2. No….
        ii. Iliac wing fractures 1. Yes…2. No….
        iii. Anterior arch fractures- duverney 1. Yes…2. No….
        iv. Transverse sacrococcygeal fractures 1. Yes…2. No….
    b. **Type B**; Partially stable (Incomplete disruption of posterior arch) 1. Yes…2. No….
        i. Open book fracture – external rotation 1. Yes…2. No….
        ii. Lateral compression injury – Internal rotation 1. Yes…2. No….
        iii. Ipsilateral anterior and posterior fracture 1. Yes…2. No….
        iv. Contra lateral –bucket handle injuries 1. Yes…2. No….

c. **Type C**; Unstable (Complete disruption of posterior arch) 1. Yes…2. No….
    i. Unilaterally- Malgaigne fractures 1. Yes…2. No….
    ii. Straddle fractures (involving both obturator rings) 1. Yes…2. No….
    iii. Bucket handle fractures 1. Yes…2.No…
    iv. Associated with acetabular fractures 1. Yes…2. No….
    v. Associated with unilateral or bilateral dislocations 1. Yes…2. No….

3. Acetabular fractures based on Judet- Letournel classifications 1. Yes…2. No….
    a. Fracture of the anterior column- iliopubic 1. Yes…2. No….
    b. Fracture of the posterior column- ilioischial bone1. Yes…2. No….
    c. Transverse fracture of both columns 1. Yes…2. No….
    d. Complex acetabular fractures with T- shaped or stellate 1. Yes…2. No….
4. Pelvic subluxation/Dislocation present? 1. Yes…2. No….
    a. Dislocation of the symphysis pubis1. Yes…2. No….
    b. Subluxation or dislocation of sacro iliac joint 1. Yes…2. No….
    c. Dislocation of the hip joint 1. Yes…2. No….
5. Hip dislocation patterns
    a. Posterior dislocation1. Yes…2. No….
    b. Anterior dislocation1. Yes…2. No….
    c. Central hip dislocation (Protrusio) 1. Yes…2. No….
6. Involvement of other appendicular and axial bone fractures 1. Yes…2. No….
    a. Femur fractures 1. Yes…2. No….
    b. Tibial/ Fibula fractures 1. Yes…2. No….
    c. Humeral fractures 1. Yes…2. No….
    d. Radial/ Ulna fractures 1. Yes…2. No….
7. Type of pelvic injuries checklist
    a. Ischiopubic rami fracture 1. Yes…2. No….
    b. Acetabular fractures 1. Yes…2. No….

c. Straddle fractures 1. Yes…2. No….
d. Malgaigne fracture 1. Yes…2. No….
e. Sacral fractures 1. Yes…2. No….
f. Bucket handle fractures 1. Yes…2. No….
g. Hip dislocation 1. Yes…2. No….
h. Pubic diastasis 1. Yes…2. No….
i. Iliac bone fracture-avulsions and duverney 1. Yes…2. No….
j. Radiographically normal pelvic1. Yes…2. No….