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Original Research Article

Types and Management of Traumatic Hip Dislocation among Patients Attended at Muhimbili Orthopaedics Institute Dar es Salaam, Tanzania

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Abstract: ***Background***: Traumatic hip dislocation management is a time-sensitive medical emergency that occurs in high-energy trauma. The optimal result is obtained if the dislocation is reduced within 6 hours post-injury. Types of dislocation in patients with traumatic hip dislocations attended at MOI are not known. The study aimed to determine the types, time interval between dislocation and reduction and management provided to patients with traumatic hip dislocation attended at MOI. ***Aim of the study***: To determine the types and management of traumatic hip dislocation among patients attended at MOI from January 2016 to December 2018. ***Methods***: This was a hospital-based cross-sectional retrospective study that was conducted at MOI for 6 months from September 2019 until March 2020. One hundred patients who met the inclusion criteria were enrolled in the study. Data were collected using a data abstraction form. Types of dislocation and reduction maneuvers were obtained from patients' files. Types of management provided were recorded as non-operative or operative management. Associated injuries were recorded by frequency and percentage. Data were analyzed using SPSS version 25 and presented as frequency and proportion. ***Results***: A total of 100 patients with traumatic hip dislocation were recruited during the study period. The majority of study participants were males 85(85%). The mean age of patients was 36 ±12 years. Posterior dislocation of the hip was the most common injury 88(88%) while central dislocation of the hip was 7(7%) and anterior dislocation of the hip was 5(5%). Associated injuries were observed in 76(76%) of patients, acetabular fractures being the most frequent. The period between dislocation and reduction was less than 6 hours in 4(4%) of patients, between 6 and 12 hours in 21(21%), and over 12 hours in 75(75%). Over half of the patients 55(55%) were managed by a closed reduction for the traumatic dislocated hip and the rest were managed surgically. ***Conclusion***: Three types of traumatic hip dislocation were found which included: posterior dislocation, central dislocation, and anterior dislocations. The period between dislocation and relocation of the traumatic dislocated hip was not ideal in most patients. Reduction by Allis maneuver was done. Nearly half of all patients underwent surgical management for traumatic hip dislocation whereby the indication of surgery was associated injuries.

Keywords: Traumatic hip dislocation, time lag between dislocation and reduction, reduction maneuvers.

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INTRODUCTION

Traumatic hip dislocation affects mostly the young age group which is an important productive age group. High force is required to dislocate the hip joint, this is associated with other life-threatening injuries and fractures (Clegg *et al*., 2010; Dawson-Amoah *et al*., 2018). Motor traffic crashes (MTC) account for two-thirds of traumatic hip dislocation, but falls from height are also a significant cause, whereas sports injuries are less common causes (Beebe *et al*., 2016; Sanders *et al*., 2010). Traumatic hip dislocations can be divided into simple and complex, with the latter having associated fractures. The relationship of the femoral head to the acetabulum is used to classify the dislocation. There are

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three main types of hip dislocation; posterior, anterior, and central (Beebe *et al*., 2016; Sanders *et al*., 2010).

The purpose of this research was to determine the effect of type, associated injuries, time lag between dislocation, and reduction on management provided to patients with traumatic hip dislocation attended at MOI from 2016 to 2018. Several studies have been conducted on traumatic hip dislocation but there was no publication looking into the type of traumatic hip dislocation, associated injuries, time lag between dislocation and reduction, and how they affect management provided.

A thorough trauma assessment should be undertaken in simple dislocations and followed by an immediate attempt in reduction before considering operative measures (Beebe *et al*., 2016; Sanders *et al*., 2010). An optimal outcome is achieved when reduction is performed within 6 hours, which has been shown to minimize the incidence of ensuing avascular necrosis (Clegg *et al*., 2010; Dawson-Amoah *et al*., 2018). Open reduction is necessary when concentric reduction is not achieved by closed manipulation due to the interposition of soft tissue, cartilage, or bone. Surgical fixation of the acetabulum and femoral head, in complex cases, is necessary to maintain joint congruity and reduce the risk of late post-traumatic arthritis (Clegg *et al*., 2010).

Posterior hip dislocation accounts for approximately 80-90% of hip dislocation caused by MTC (Brock, 2015; Dwyer *et al*., 2006). In posterior hip dislocation, the femoral head is situated posterior to the acetabulum. During MTC the force is transmitted through the flexed hip in one of two ways: during rapid deceleration, the knees strike the dashboard and transmit the force through the femur to the hip. If the leg is extended and the knee is locked, the force can be transmitted from the floorboard through the entire tibia and femur to the hip joint (Deakin & Porter, 2009; Monma & Sugita, 2001).

Management of Traumatic Hip Dislocation

Traumatic hip dislocation management can be grouped as closed reduction and open reduction.

The aim of management is the prompt reduction of the femoral head into the acetabulum. Delayed reduction causes reduced blood flow to the femoral head (Clegg *et al*., 2010; Dawson-Amoah *et al*., 2018). The three most known closed reduction maneuvers of hip dislocation are Allis, Stimson, and Bigelow maneuvers.

In the Allis maneuver: an assistant holds the pelvic stable; hip flexed to 90^0, and traction is applied in direct line with the shaft of the femur followed by an internal and external rotation. It is recommended that the patient is placed on the floor while performing the reduction.

In the Stimson maneuver: the patient is placed in the prone position with the injured leg hanging off the side of the bed. The hip and knee are each brought to 90^0 of flexion. The surgeon applies an anteriorly directed force to the posterior calf (Brock, 2015; Dwyer *et al*., 2006).

Bigelow maneuver: the patient is placed in a supine position; an assistant holds the pelvic stable. The surgeon then applies steady longitudinal traction in the line of the deformity, using leverage from his or her arms and back. The adducted and internally rotated thigh is then flexed to at least 90^0. The femoral head is levered into the acetabulum by abduction, external rotation, and extension of the hip (Brock, 2015; Dwyer *et al*., 2006).

Operative Management

The absolute indications for open reduction include irreducible dislocations and non-concentric reductions with intra-articular fragments of bone or cartilage. Posterior dislocations are addressed via a Kocher-Langenbach approach. (Beebe *et al*., 2016; Clegg *et al*., 2010; Dawson-Amoah *et al*., 2018; Deakin & Porter, 2009).

Irreducible anterior dislocations are addressed via an anterior (Smith-Petersen) or an anterolateral (Watson-Jones) approach. The direct anterior approach will allow better visualization of injuries to the anterior aspect of the hip joint and femoral head fractures. The anterolateral approach permits access to the posterior hip through the same skin incision if needed (Beebe *et al*., 2016; Clegg *et al*., 2010; Dawson-Amoah *et al*., 2018; Deakin & Porter, 2009).

Study design: This was a hospital-based cross-sectional retrospective study. This study included patients with a diagnosis of traumatic hip dislocation who attended at MOI from January 2016 to December 2018.

Study area: The study was conducted at Muhimbili Orthopaedic Institute (MOI), Dar Es Salaam, Tanzania. MOI is offering primary, secondary, and tertiary care of preventive and curative health services in the field of Orthopaedics, Traumatology, and Neurosurgery. MOI is the largest Orthopaedics and trauma referral center in Tanzania with a capacity of 450 beds (30 privates and 420 general).

Study period: The study was conducted for a total of 6 months from September 2019 to March 2020.

Study population: All patients with traumatic hip joint dislocation who were treated at MOI from January 2016 to December 2018.

Sample size: This was a cross-sectional analytical retrospective study that used a convenient sampling technique to obtain the study sample. Briefly, data were obtained from files of all patients who sustained hip dislocations from 2016 to 2018 and were included in this

study. Out of 150 patients with traumatic hip dislocation, only 100 patient files were retrieved from records.

Minimum Sample size: by using Kish and Leslie formula.

$$n = \frac{Z^2 p(1-p)}{e^2}$$

p=5%, ***e***= 5%
95% confidence interval (***Z***) = 1.96
= 1.96^2 x5(100-5)/5^2 =73. ***n***=73

Where: ***n***= is the required minimum sample size
p= estimated prevalence of hip dislocation. From previous study p= 5% (Obakponovwe *et al* 2011, McNamara *et al* 2010, Yang *et al* 2011).
e= margin of error is 5%.

In the year 2018, a total of 34 patients with traumatic hip dislocation were attended at MOI. This study is for three years starting from 2016 to 2018. 34x3 ~ 100.

Inclusion criteria
i) Age equal to or higher than 18 years old.
ii) Patients with complete information.

Exclusion criteria: Patients with incomplete information.

Data Collection Procedure

Patient registry books at EMD were used for data collection whereby all patients with the diagnosis of traumatic hip dislocation were enlisted. From the registry, the patient registration number was enlisted, and patients' files were obtained from the record department. One hundred patients' files were retrieved and data from these files were extracted and analyzed. Age, sex, etiology of dislocation, type of dislocation, previous treatment, types of treatment, presence of neurological deficit before and after treatment, and presence of associated injuries were extracted. Type of dislocation data was collected by the researcher whereby x-rays were retrieved from the system and in the circumstance of missing x-rays, x-ray findings were obtained from the patient's files. The dislocation was classified using Thompson and Epstein classification for posterior dislocation, and Epstein classification for anterior dislocation. Accessible post-reduction x-rays were assessed by the researcher.

Investigation tools and validity and reliability issues

A pilot test for the data extraction form was conducted by the researcher to check if it provides the required information. Necessary adjustments were made to obtain the required information. Lima *et al*, (2014). (Appendix I).

Data management and analysis

Data obtained were managed by Statistical software (Statistical Package for the Social Sciences {SPSS} version 25). Categorical variables such as types were presented as numbers and percentages. Data were presented as numbers and percentages. Continuous variables such as time intervals were obtained by recording the duration of symptoms of traumatic dislocated hip and presented as numbers and percentages. Categorical variables such as surgical management, non-surgical management, and associated injuries were summarized as numbers and percentages.

Ethical issues

Ethical clearance was obtained from the ethical clearance committee of Muhimbili University of Health and Allied Sciences. Permission to conduct this study was sought from the Muhimbili Orthopaedics Institute. Data were kept anonymous by the use of abbreviations or initials to ensure confidentiality instead of the patient's name. The patient's information was carefully handled with the utmost confidentiality. The obtained information was used for research purposes only.

RESULTS

A total of 100 patients with traumatic hip dislocation were recruited during the study period. The majority of study participants were males 85(85%). Their mean age was 36±12years. Most patients 67(67%) were between 18 and 39 years of age with only 3 patients (3%) above 60 years. (Table 1).

A total of 88patients had traumatic posterior hip out of which 59 patients were below 40 years of age. Seven patients had traumatic central hip dislocation out of which 5 patients were below 40years of age. Five patients had traumatic anterior hip dislocation out of which 3patients were below 40years old. (Figure 1).

Table 1: Social demographic characteristics of patients with traumatic hip dislocation (N=100)

Variables		Frequency	Percentage	*P*- value
Sex	Female	15	15	
	Male	85	85	0.001
Age	18-39 years	67	67	
	40-59 years	30	30	0.001
	60-79 years	3	3	
Type of Hip Dislocation				
Anterior		5	5	0.001
Posterior		88	88	

Central	7	7	
Duration of symptom (hrs)			
Less than 6	4	4	
6 - 12	21	21	0.001
More than 12	75	75	
Type of Management			
Surgery	45	45	0.1583
Closed reduction	55	55	

Inference: The difference between variables was statistically significant with a p-value of less than 0.05, except for the type of management provided where the difference between surgery and closed reduction was not statistically significant p-value of 0.1583.

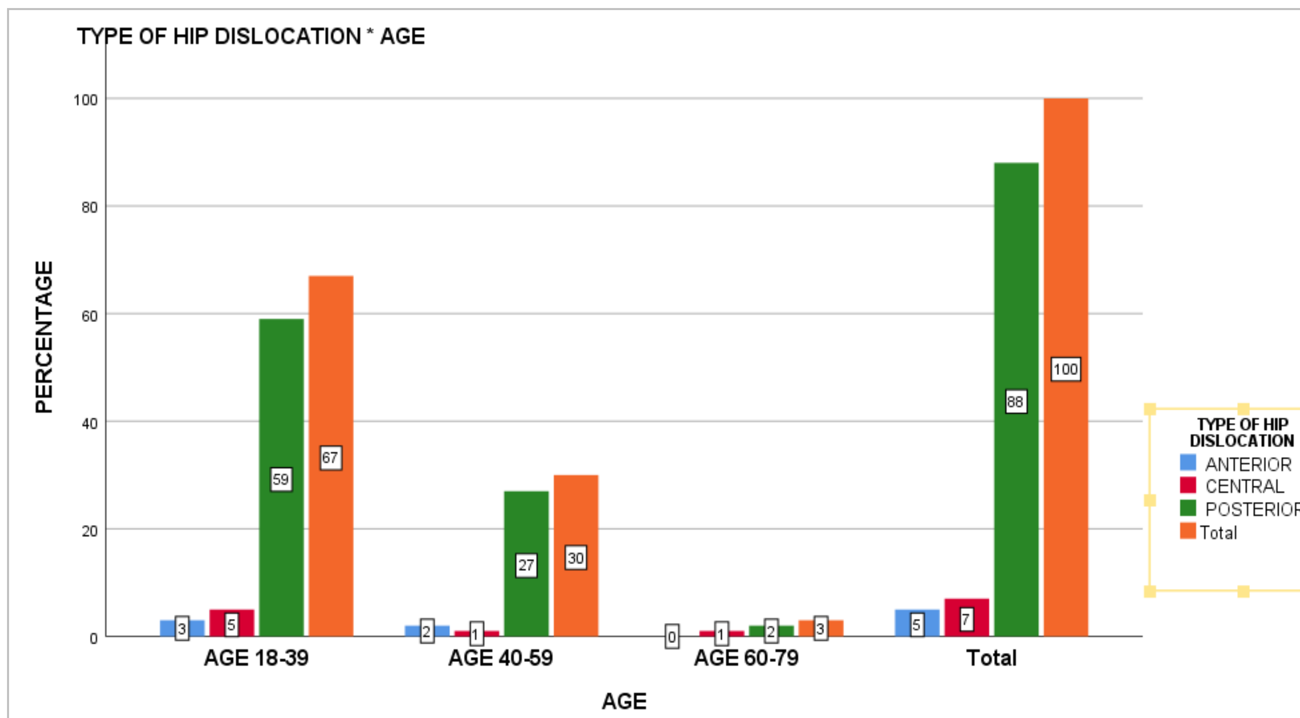

Figure 1: Types of hip dislocation versus Age of the patients

Inference: The majority of the patients 67(67%) were young aged below 40years and posterior hip dislocation was most common in young patients 59(59%).

Types of hip dislocation among patients with traumatic hip dislocation attended at MOI from 2016- 2018.

This retrospective cross-sectional study of 100 patients with a diagnosis of traumatic hip dislocation attended at MOI from January 2016- December 2018. Three types were found which include: posterior, central, and anterior dislocation as summarized in Table 2.

Table 2: Types of hip dislocation vs. management used

		MANAGEMENT USED		Total
		Surgery	Closed Reduction	
TYPES OF HIP DISLOCATION	anterior	2	3	5
		40.0%	60.0%	100.0%
	posterior	41	47	88
		46.6%	53.4%	100.0%
	central	2	5	7
		28.6%	71.4%	100.0%
Total		45	55	100
		45.0%	55.0%	100.0%

***p*-value 0.636**

Inference: There was no association between types of hip dislocation and management provided to the patients with traumatic hip dislocation (*p*-value 0.636).

In this study of 100 patients with traumatic hip dislocation 88% (88 patients) had posterior hip dislocation and were classified according to Thompson and Epstein classification as summarized in Figure 2.

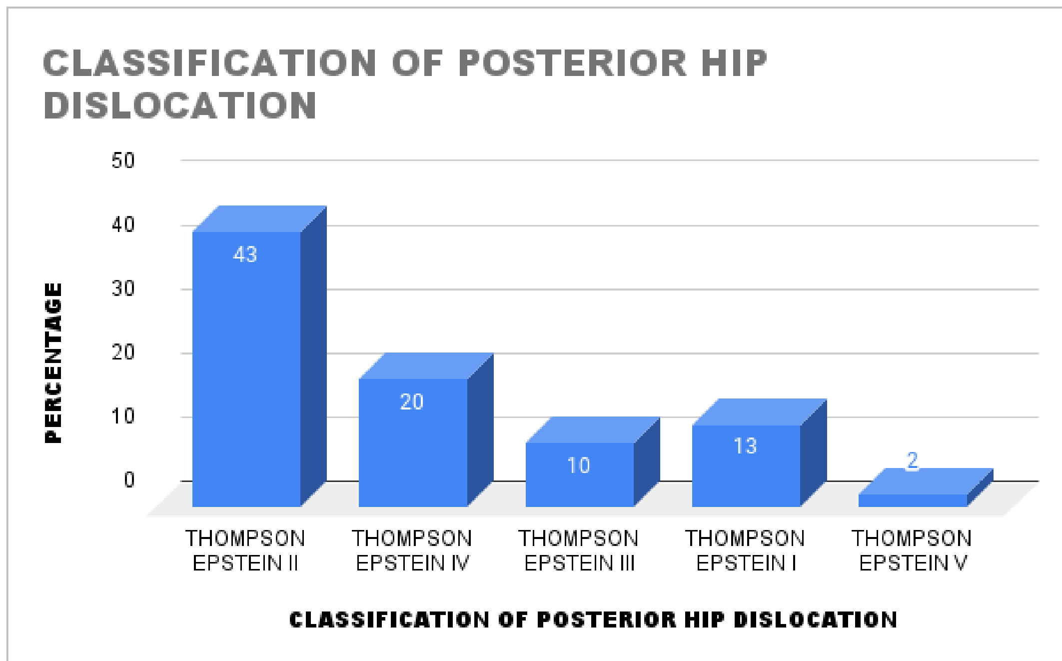

Figure 2: Classification of posterior hip dislocation.

Inference: The majority of patients 88(88%) had posterior hip dislocation and were classified by Thompson Epstein whereby the majority had Thompson Epstein type II 43(43%).

The time lag between the dislocation and reduction of dislocation among patients with traumatic hip dislocation attended at MOI from 2016 to 2018.

Out of 100 patients with traumatic hip dislocation, few patients reported to MOI EMD within six hours from the time of the dislocation, and the majority reported after 12 hours from the time of dislocation. Results for the time lag between dislocation and reduction against management used are summarized in table 3.

Table 3: The duration of symptoms between dislocation and reduction vs. management used.

		MANAGEMENT USED		**Total**
		Surgery	**Closed Reduction**	
DURATION OF SYMPTOM OF DISLOCATED HIP.	less than 6 hours	2	2	4
		50%	50%	100%
	6 - 12 hours	4	17	21
		19%	81%	100%
	more than 12 hours	39	36	75
		52%	48%	100%
Total		45	55	100
		45%	55%	100.0%

***p*-value = 0.027**

Inference: There was an association between time elapse between dislocation and reduction vs. management used, whereby among patients who reported between 6-12 hours, 81% were managed by closed reduction while patients who reported more than 12 hours were likely to be managed surgically 52% (surgical reduction) vs., 48% (closed reduction), p-value 0.027.

Associated injuries among patients with traumatic hip dislocation attended at MOI from 2016 to 2018.

Associated injuries were divided into two groups: the first includes those injuries which occurred away from the dislocated hip. Second, are those injuries which occurred at the same dislocated hip. Out of 100 patients, 42 patients (42%) had associated injury away from the dislocated hip. Twelve patients (12%) had

traumatic hip dislocation associated with pelvic fracture. Nine patients (9%) had traumatic hip dislocation associated with head trauma. Six patients (6%) had traumatic hip dislocation associated with a tibia fracture. Six patients (6%) had traumatic hip dislocation associated with a forearm fracture. Humeral fractures were found in three patients (3%). The results of associated injuries away from the hip are summarized in figure 3.

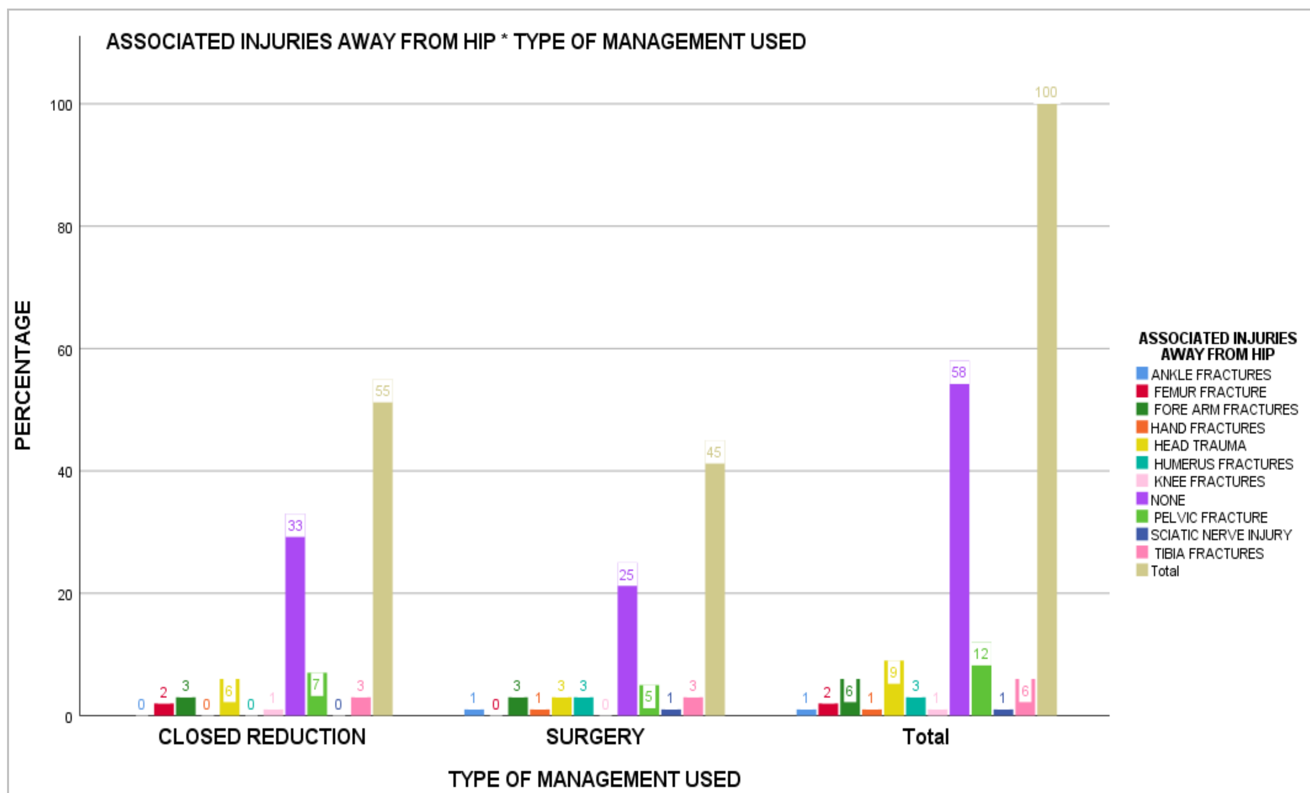

Figure 3: Associated injuries away from hip versus management used.

Inference: Forty-two patients had associated injuries away from the dislocated hip whereby twenty underwent surgical management, the most common being pelvic fracture and head trauma.

Associated injuries close to the hip, among patients with traumatic hip dislocation.

Associated injuries were observed in 76% of patients, posterior wall acetabular fractures being the most frequent. The results for associated injuries are summarized in table 4.

Table 4: Associated injuries close to the hip among patients with traumatic hip dislocation.

ASSOCIATED INJURIES	SURGERY	CLOSED	TOTAL	p-value
Away from hip				
Head trauma	3	6	9	
Pelvic fracture	5	7	12	
Forearm fracture	3	3	6	
Tibia fracture	3	3	6	0.024
Humerus fracture	3	0	3	
Femur fracture	0	2	2	
Sciatic nerve injury	1	0	1	
Close to hip				
Posterior wall acetabular fracture	25	28	53	
Anterior wall acetabular fracture	2	1	3	
Femur head fracture	2	0	2	0.001
Both column	8	2	10	
Transverse	2	5	7	

Inference: There was an association between the presence of associated injuries and management provided whereby patients with associated injuries were more likely to be managed surgically p-Value 0.024, 0.001.

Type of management provided to patients with traumatic hip dislocation attended at MOI from 2016 to 2018.

All patients 100(100%) with traumatic hip dislocation were reduced by the Allis maneuver and none with other reduction maneuvers. Out of 100 patients with traumatic hip dislocation, 45(45%) underwent surgical management, and the rest underwent closed reduction.

DISCUSSION

The study observed majority of patients were males, the mean age was 36±12years. Most patients were between 18 and 40 years of age with few patients above 60 years (Table 1, figure 1). Dawson-Amoah. *et al*, (2018) and Clegg. *et al*, (2010) had similar findings whereby the majority of patients with traumatic hip dislocations belonged to the young age group. Young age group predominance can be explained by the fact that this group of young patients is largely involved in high-risk and demanding activities such as machine operating, motorcycle riding, car driving, and construction work, therefore putting them at risk of physical injuries.

The majority of the patients had a posterior hip dislocation and few had anterior dislocation (Table 1, figure 1). This is similar to a study conducted by Beebe *et al*, in the USA whereby it was observed that posterior hip dislocations were reported to be the most common type of hip dislocation and anterior hip dislocations were reported to be slightly higher compared to the result in this study (Beebe *et al* 2016). However similar findings were noted in a study conducted in New York by Sanders *et al* 2010 who reported that hip dislocations are infrequent and occur almost always after a traumatic injury; the majority of these are posterior dislocations. There was no association between types of hip dislocation and management provided to the patients with traumatic hip dislocation (Table 2).

Most of the patient's traumatic dislocated hips were managed late because the patient reported late to MOI. There was an association between time elapse between dislocation and reduction vs. management used, whereby patients who reported between 6-12 hours, the majority were managed by closed reduction while patients who reported more than 12 hours were likely to be managed surgically (Table 3). Contrary to a study conducted by Raffaele *et al*., in Italy whereby it was found that the majority reported within 6 hours post-injury (Raffaele *et al*., 2019). Also, the results reported by Sahin *et al*, in a study conducted in Turkey whereby found that the majority of the study participant reported within 12 hours, and few reported after 12 hours of post-traumatic hip dislocation (Sahin *et al*, 2003). This was probably due to the fact that patients who reported to MOI more than 12 hours post-traumatic hip dislocation had associated injuries that could not be managed in the peripheral hospitals. Kellam *et al*., in the USA, reported similar findings to this study whereby the majority of study participants reported late and the rate of developing AVN was high in those who reported late (Kellam *et al* 2016).

Deakin and Porter reported similar findings, whereby they stated that traumatic hip dislocation is an orthopedic emergency and once any life-threatening injuries have been addressed the dislocation should be reduced at the earliest opportunity (Deakin & Porter, 2009). The urgency of reduction is even more important when evidence of pre-reduction sciatic nerve dysfunction is present (Deakin & Porter, 2009).

It was found that the majority of the patients had hip dislocation and associated injuries and few had pure hip dislocation without associated injuries. There was an association between the presence of associated injuries and management provided whereby patients with associated injuries were more likely to be managed surgically (Table 4, figure 3). This finding is similar to a study conducted in the USA whereby the majority of patients with traumatic hip dislocation had associated injuries (Clegg *et al*., 2010). This study found that posterior wall acetabular fractures were the most frequent pattern after posterior hip dislocation, this is similar to a study conducted in the USA by Alonso *et al* 2000. Several studies conducted in different settings have reported similar findings to the current study whereby the associated injuries were reported to be high (Obakponovwe *et al*., 2011, Madu *et al*., 2011, Lima, 2014). This similarity could be due to the fact that the majority of patients with traumatic hip dislocation were involved in MTC which is a high-energy trauma causing dislocation of the hip and associated injuries. The associated head injuries results in this study were lower compared to the result reported by Clegg *et al*., this lower percentage of head injuries is probably due to the increasing use of helmets among motorcyclists and passengers (Clegg *et al*., 2010).

It was found that the most used hip reduction technique at MOI is the Allis technique. Similarly, a study conducted by Waddell *et al*., in the USA reported that the Allis method was the most common hip reduction method in their most common recorded posterior hip dislocation (Waddell *et al*., 2016) Other studies conducted in USA and Canada by Beebe *et al*. and Brock *et al*., had similar findings whereby the Allis technique has been suggested to be effective in most reduction attempts (Beebe *et al* 2016, Brock *et al* 2015).

Despite the relatively common use of the Allis technique, there are several disadvantages to this technique (Gottlieb *et al*, 2018). The use of primarily lower back muscles may not allow as much force to be

used for the reduction attempt. Also, the awkward position may place the provider at risk of a lower back injury. (Gottlieb *et al*, 2018, Dawson-Amoah *et al* 2018).

Hendey and Avila at America College of Emergency reported that the Captain Morgan technique allows the provider to apply anterior force to the patient's hip in a controlled manner with the patient supine on the stretcher and the provider standing on the floor. This technique reduces the risk of lower back injury to the provider and no risk of falling off the bed as the provider is standing on the floor (Hendey & Avila, 2011).

The study observed that almost half of the study participants underwent surgical management and the indication of surgery was associated injuries. There was an association between the presence of associated injuries and management provided whereby patients with associated injuries were more likely to be managed surgically (Table 4). This is similar to a study conducted by Bo Liu *et al* in China whereby it was found that half of the patients underwent surgical management (Bo Liu *et al*., 2020). Raffaele *et al*., in Italy, it was reported that surgery is indicated when there are intra-articular bone fragments that need to be removed by joint wash out, fragment excision, ORIF, or total hip arthroplasty (Raffaele *et al*, 2019). It was found that for most patients who underwent surgical management, the indication for surgery was associated injuries. No patient in this study was operated on due to failure of closed reduction and no patient underwent total hip replacement (THR) as a result of traumatic hip dislocation. Such findings were also seen in three other studies which were done in different settings (Deakin *et al* 2009, Madu *et al* 2011, Sahin *et al*., 2003).

Study limitations

1. There were difficulties in the process of retrieving patient data from paperless systems.
2. Being a retrospective study it was not possible to prove that early reduction improve prognosis of the patients with traumatic hip dislocation.

CONCLUSION

The study revealed the followings findings

1. Three types of traumatic hip dislocation were found which include: posterior dislocation, central dislocation and anterior dislocation. The majority of patients in this study had posterior hip dislocation.
2. The majority of patients with traumatic hip dislocation were managed late because they reported late at MOI EMD.
3. Associated injuries were observed in most patients, acetabular fractures being the most frequent.
4. All patients with traumatic hip dislocation were reduced by the Allis maneuver. Almost half of the study participants underwent surgical management and the indication of surgery was associated injuries.

Recommendations

1. Patients with traumatic hip dislocation are highly recommended to be treated as emergency.
2. Half of the patients with traumatic hip dislocation underwent surgical management; there is a need to train more doctors on surgical management to reduce the workload to the few available surgeons.
3. A follow-up study is needed to evaluate the development of avascular necrosis and osteoarthritis because the majority reported late.

Declarations

Ethical clearance: it was obtained from the MUHAS research and publication committee and permission to collect data was obtained from MOI.

Conflict of Interest: The authors declare no conflicts of interest.

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