

# A Retrospective Analysis of the Patterns and Outcomes of Tile B and Tile C Pelvic Fractures in Cameroon

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## Abstract

**Background:** Pelvic fractures constitute about 2% - 8% of all fractures. This incidence may rise up to 25% in poly-traumatised patients. These fractures have a high mortality rate due to the fact that they occur usually as a result of high energy trauma, and most of the injured are poly-traumatised with concomitant haemodynamic instability. The aim of this study is to describe the patterns of injury and complications of unstable pelvic fractures treated in a level III hospital in Cameroon. **Methodology:** This was a hospital based retrospective analysis of files of patients admitted and treated for unstable pelvic fractures at the Regional Hospital Limbe within a period of 10 years (from 1<sup>st</sup> of January 2009 to 31<sup>st</sup> of December 2018). **Results:** A total of 139 cases of pelvic fractures were identified, amongst which 77 were unstable; 68 were finally analyzed. The ages ranged from 18 to 80 years with a mean of  $39 \pm 5$  years. The age group from 20 - 40 years was most represented (58.88%, n = 40). There were 45 males and 23 females giving a sex-ratio of 2:1. Road traffic injuries accounted for most of the cases (73.53%, n = 50). Forty-five (66.2%) were classified Tile B and 23 (33.82%) were Tile C, and 15 cases were open fractures (22.06%). Associated lesions were recorded in 30 cases, fractures of the lower extremity being the most common (33.33%, n = 10). Most of the cases were definitively treated surgically (80.89%, n = 55). The most common complications were surgical site infections (23.64%, n = 13). **Conclusion:** Unstable pelvic fractures are relatively common. Young males in the age group 20 - 40 years are the most affected, and the most common cause of injury was road traffic accident. Surgical site infections, pressure ulcers, severe

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anaemia and thrombo-embolism are common complications.

## Keywords

Unstable, Pelvic Fracture, Patterns, Complications, Cameroon

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## 1. Introduction

Pelvic fractures are defined as a break in the bony structures that constitute the pelvic ring. These bones consist of the ilium, the sacrum, the ischium, the pubis, and the coccyx [1]. Pelvic fractures constitute about 2% - 8% of all fractures, though this incidence may rise up to 25% in poly-traumatised patients [2] [3] [4].

Pelvic fractures can be classified as either stable or unstable using several classification systems, the Tile's classification being one of the most commonly used systems [5]. Based on the Tile's classification, Tile A fractures are considered as stable while Tile B and Tile C are considered as unstable fractures [5] [6] [7].

Unstable pelvic fractures have a mortality rate of up to 19% - 31% [8]. This high mortality is due to the fact that unstable pelvic fractures occur usually as a result of high energy trauma, and most of these patients present with associated injuries to the head, chest, abdomen, and extremities [9]. Concomitant haemodynamic instability associated with the pelvic fractures increases the mortality rate to 20% - 50% [10].

Patients with unstable pelvic fractures are best acutely managed by a multidisciplinary trauma team comprising a trauma surgeon, orthopaedic surgeon, radiologist with interventional radiology capabilities, urologist and a neurosurgeon [11]. This multidisciplinary team is lacking in most hospital settings in low and low-middle-income countries [3] [12] [13]. Few studies have focussed on the patterns and outcomes of unstable pelvic fractures treated in poor resource settings [3] [12] [13] [14] [15] [16]. The aim of this study is therefore to describe the patterns of injury, and outcome of unstable pelvic ring fractures treated in a level III hospital in a limited resource country in Africa.

## 2. Patients and Methods

### 2.1. Study Design

This was a hospital-based retrospective analysis of files of patients admitted and managed for unstable pelvic fractures at the Regional Hospital Limbe within a period of 10 years (from 1<sup>st</sup> of January 2009 to 31<sup>st</sup> of December 2018). The Regional Hospital Limbe is a level III health institution located in the South West region of Cameroon. It has a capacity of 200 beds, an emergency department functioning 24 hours/day and a surgical ward with 26 beds capacity. This ward has 5 surgical specialists including one orthopaedic surgeon, one general surgeon, one urologist, and two ENT surgeons. The definitive diagnosis of an unstable

pelvic fracture was jointly made by the Orthopaedic Surgeon (main author) and the Radiologists.

## 2.2. Study Population and Sampling

The study involved all patients who were admitted and treated at the Regional Hospital Limbe for unstable pelvic fracture within the 10 years' period. The sampling was done in a consecutive manner.

## 2.3. Selection Criteria

Inclusion criteria: All patients with unstable pelvic fractures that were admitted and treated in the Regional Hospital Limbe, within the study period were included in the study.

Exclusion criteria: Files of patients with incomplete relevant information, and files of those who received initial surgical care from other health facilities were excluded.

## 2.4. Study Procedure

### Ethical and administrative issues

Ethical approval was obtained from the Institutional Review Board (IRB) of Faculty of Health Sciences, University of Buea, and administrative clearances were obtained from the Regional Hospital Limbe and the South west regional delegation of health.

### Data Collection and analysis

Files of patients with unstable pelvic fractures that were treated within the study period were retrieved from the records office. Registers of the emergency department, the surgical ward and the operating theatre were exploited to complement data on patients' clinical states on arrival and progress during hospitalisation. Variables that were considered for analysis include: age, sex, mechanism of injury, diagnosis, classification, associated injuries, complications, the number of days of hospitalisation, and outcome (discharged, referred, or dead). Data was entered in well-structured pre-tested data entry form and analysed using IBM SPSS Statistics 26 and Microsoft excel.

## 3. Results

A total of 139 cases of pelvic fractures were identified, amongst which 77 cases were unstable representing 55.40% of all pelvic fractures. Of these 77 cases of unstable pelvic fractures, 9 were excluded due to incomplete relevant information. Hence, 68 files were considered for analysis in this study.

### 3.1. Epidemiological Characteristics, Injury Patterns and Clinical Presentations

As shown in **Table 1**, the ages of the patients ranged from 18 to 80 years with a mean age of  $39 \pm 5$  years. The age group of 20 - 40 years was the most represented

**Table 1.** Epidemiological characteristics and injury patterns.

ITEMS	VARIABLE	FREQUENCY	PERCENTAGE
<b>Type of unstable pelvic fracture</b>	Tile B	45	66.18
	Tile C	23	33.82
	Open pelvic fractures	15	22.06
	Closed pelvic fracture	53	77.94
<b>Age groups (years)</b>	Less than 20	5	7.35
	20 - 40	40	58.88
	41 - 60	15	22.06
	61 - 80	8	11.76
<b>Gender</b>	Male	45	66.18
	Female	23	33.82
<b>Level of education</b>	None	12	17.64
	Primary	19	27.94
	Secondary	16	23.52
	Tertiary	21	30.88
<b>Occupation</b>	Commercial motorcycle rider	16	23.53
	Peasant farmer	6	8.82
	Street vendor	6	8.82
	Student	14	20.59
	Civil servant	14	20.59
<b>Mechanism of injury</b>	Retired	4	05.88
	Others	8	11.76
	Road traffic crash	50	73.53
<b>Mechanism of injury</b>	Falls	8	11.76
	Crush (other than road traffic crash)	5	7.35
	Assault	2	2.94
	Direct impact from falling objects (walls, trees, rocks)	3	4.41
<b>Mode of transport to health facility</b>	Ambulance	7	10.29
	Commercial vehicles	26	38.24
	Motorcycles	28	41.18
<b>Time of arrival at the health facility</b>	Private vehicles	7	10.29
	Within 1 hour	42	61.77
	1 to 6 hours	20	29.41
<b>Time of arrival at the health facility</b>	Beyond 6 hours	6	8.82

(58.88%, n = 40). There were 45 males and 23 females giving a male to female ratio of 2:1. Most of the patients had attained both primary and secondary

school education (51.47%, n = 35). However, a good number of them had tertiary education (30.88%, n = 21). The majority of the patients (79.41%, n = 54) had informal occupation (farmer, business, bike-rider, builder, carpenter, hairdresser, driver, maid, and others).

Road traffic injuries accounted for most of the cases (73.53%, n = 50), followed by falls (11.76%, n = 8), crush (7.35%, n = 5) and direct impact from falling objects (4.41%, n = 3). Among the 68 cases of unstable pelvic ring fractures, 45 (66.2%) were classified Tile B and 23 (33.82%) were Tile C. A total of 15 cases were open fractures (22.06%) and the rest were closed fractures (77.94%, n = 53). Most of the victims arrived the hospital within 1 hour following injury (61.77%, n = 42). Only a few were transported by ambulances (10.29%, n = 7).

As shown in **Table 2**, over a third of the cases had hypovolemic shock on arrival at the hospital (33.82%, n = 23), a few had a Glasgow coma score of less than 14 (2.94%, n = 2) while majority had Injury Severity Scores between 9 and 16 (70.59%, n = 48). Associated injuries were recorded in more than a third of the cases (44.12%, n = 30), fractures of the lower extremity being the most common (33.33%, n = 10).

### 3.2. Methods of Surgical Pelvic Stabilisation

As shown in **Table 3**, all the cases were initially stabilised using either a pelvic

**Table 2.** Clinical characteristics of the patients on admission.

ITEMS	VARIABLES	FREQUENCY	PERCENTAGE
<b>Hemodynamic state on admission</b>	Hypovolemic shock	23	33.82
	Normal	45	66.18
<b>Glasgow coma score on admission</b>	Less than 9	1	1.47
	9 to 13	1	1.47
	14 and 15	66	97.06
<b>Injury severity score on admission</b>	Less than 9	18	26.47
	9 to 16	48	70.59
	Greater than 16	2	2.94
<b>Associated injuries (n = 30)</b>	Lower extremity fractures	10	33.33
	Upper extremity fractures	3	10.00
	Blunt chest injury	3	10.00
	Bladder injury	1	3.33
	Urethral injury	4	13.33
	Blunt abdominal injury with hemoperitoneum	4	13.33
	Head injury	2	6.67
	Ano-rectal injuries	2	6.67
	Vaginal injuries	1	3.33

**Table 3.** Treatment methods, complications and outcome.

ITEMS	VARIABLES	FREQUENCY	PERCENTAGE
Initial pelvic stabilization method	Pelvic binder	58	85.29
	External fixation	8	11.76
	Pelvic clamp	2	2.94
Definitive Surgical stabilization methods (n = 55)	Closed/open reduction and External fixation (EF) plus ilio-sacral screw	34	61.82
	Open reduction and internal fixation(IF) with plates and screws plus ilio-sacral screw	10	18.18
	Combined External and internal fixations plus ilio-sacral screw	11	20.00
Post-operative complications	Thromboembolic events	6	10.91
	Severe anaemia	10	18.18
	Surgical site infection	13	23.64
	Pressure ulcers	15	27.27
Length of hospital stay	Urinary tract infection	2	3.64
	Less than 30 days	30	44.11
	30 to 60 days	33	48.53
	60 to 90 days	3	4.41
Final status	More than 90 days	2	2.94
	Discharged	46	67.65
	Referred to pursue more specialized surgery	8	11.76
	Dead	14	20.59

binder (85.29%, n = 58), external fixators (11.76%, n = 8), or a pelvic clamp (2.94%, n = 2). No case underwent emergency embolization. Two cases had pelvic packing to control haemorrhage. Most of the cases were definitively treated surgically (80.89%, n = 55) while 13 were definitively treated non-operatively. Modalities of definitive surgical management included external fixation plus ilio-sacral screw (60.82%, n = 34), open reduction and internal fixation (IF) with plates and screws plus ilio-scaral screw (18.18%, n = 10), combined external and internal fixations plus ilio-sacral screws (20.00%, n = 11).

### 3.3. Length of Hospital Stay and Complications

Length of Hospital stay varied from 21 days to 120 days with a mean of  $36.54 \pm 17$  days. Majority stayed in the hospital for 30 to 60 days (48.53%, n = 33). Complications were recorded in over half of the cases (67.65%, n = 46), the most common being pressure ulcers (27.27%, n = 15) and surgical site infections (23.64%, n = 13) as shown in **Table 3**. Some cases were eventually referred to pursue more specialised surgeries (urological repairs, plastic reconstruction) in other hospitals (11.76%, n = 8), while majority fared well and were discharged from hospital (67.65%, n = 46). Cases of death were equally recorded during treatment (20.59%, n = 14) due to sepsis, thromboembolism and/or severe anaemia.

#### 4. Discussion

This study had as aim to describe the patterns of injury and complications of unstable pelvic ring fractures treated in a level III hospital in a limited resource country in Africa. A total of 139 cases of pelvic fractures were identified, amongst which 77 cases were unstable pelvic fractures representing 55.40% of all pelvic fractures. Of these 77 cases of unstable pelvic fractures, 9 files were excluded due to incomplete relevant information. Hence, 68 files were considered for analysis in this study.

A total of 77 cases of unstable pelvic fractures were identified from hospital records, within a 10-year period. After excluding 9 files due to incomplete data, 68 cases were considered for further analysis. Unstable pelvic fractures represented 55.40% of the cases of pelvic fractures which were admitted and treated. This value is higher than those reported in Japan [17], and India [18]. This can be explained by the fact that a majority of the cases in this study were due to very high energy trauma from road traffic crashes involving mainly commercial motor-vehicles and motorcycles which are the most widely used commercial means of transportation in urban and rural communities in the south west region of Cameroon. Most of these drivers and motorcyclists are known for their reckless driving and lack of implementation of road traffic safety measures, thereby exposing them to fatal accidents and injuries [19]. Moreover, the Limbe regional hospital is an urban referral hospital that may have received mostly patients with severe pelvic fractures from other hospitals [19] [20].

The mean age at which these injuries occurred was  $39 \pm 5$  years old, and the male gender in the age group of 20 - 40 years (30.9%) were the most affected. These findings are similar to those obtained by other authors [3] [14] [17]. This could be explained by the fact that young males are naturally more active and mostly engaged in risky activities including reckless driving and non-respect of the safety rules on roads. Some authors found higher mean ages of over 45 years in patients with pelvic ring fractures [21] [22]. This can be explained by the fact that these were epidemiological community based studies which didn't consider only unstable pelvic ring fractures.

Regarding the mechanism of injury, it was observed that road traffic accidents were the most frequent causes of injuries, accounting for 73.53% of the cases, and mostly involved transportation vehicles like cars, trucks and motorcycles. This is consistent with results from other studies in which these injuries were caused by motor vehicles accidents [14] [23]. Regarding the type of unstable pelvic ring injuries, Tile B was found in 45 cases (66.18%) and Tile C in 23 cases (33.82%). This is similar to other studies that found Tile B to be more common than Tile C [21] [22]. In this study, 15 cases (22.06%) of open unstable pelvic fractures were recorded. These cases were characterized by fractures with direct communication between the fracture haematoma and the external environment, including the rectum and the vagina. Although it is a rare occurrence (with an estimated rate of 2% to 4% of all traumatic pelvic ring lesions) they predomi-

nantly occur in young adults and motorcycle users, and are due to high-energy accidents like in this study. It should be noted that open pelvic injuries are associated with a high incidence of complications [24]. Open pelvic fractures usually occur in poly-traumatised victims presenting with associated visceral, thoracic, uro-genital, spine and lower extremity lesions [25] [26]. Regarding the initial states of the cases on admission, 23 (33.82%) had hemorrhagic shock and 48 (70.59%) had Injury Severity Scores between 9 and 16. This is because unstable pelvic fractures occur as a result of high energy trauma, and most of these patients present with concomitant haemodynamic instability which may increases mortality [10].

Associated injuries were present in 30 cases (44.12%). The most common associated injuries were lower extremity fractures, urogenital injuries, and blunt abdominal injuries with hemoperitoneum. These injuries together with brain and chest injuries constitute the most common injuries associated with pelvic ring fractures [27] [28]. Initial pelvic stabilization was mostly done using pelvic binders in 58 cases (85.29%), and external fixators in 8 cases (11.76%). These emergency bony stabilisation methods including concomitant surgeries like laparotomies, chest tube placements, evacuation of intracranial haemorrhages, external stabilization of long bone fractures, have been proven to reduce mortality in patients with pelvic ring fractures [29]. Pelvic embolization as an emergency procedure was not done in these cases because of lack of technical facility and inadequate human resources.

Definitive surgical stabilisation was done in 55 cases while 13 were treated non-operatively. The reasons for non-operative treatment include financial constraints, unstable clinical conditions, and advanced age. The most common post-operative complications encountered were pressure ulcers, surgical site infections severe anaemia and thromboembolic events. These complications were mostly recorded in patients who were admitted for more than 30 days. A total of 14 (20.59%) deaths were recorded, while 46 cases (67.65%) were successfully treated and discharged. The rate of in-hospital mortality in this study is comparable to the 20% reported by other authors [8] [9] [10]. However, this mortality rate might go up to 50% in case of open compound fractures and resource-limited setting where medical equipment and resuscitation materials are limited [10] [25] [26]. Although the functional outcomes following pelvic injuries have improved with modernised diagnostic and therapeutic modalities, it is not the case in poor resource settings where the lack of these modalities makes the management challenging [30].

## 5. Conclusion

The proportion of unstable pelvic fractures in this study was relatively high. A third of the cases presented on admission with hypovolemic shock. Associated injuries were frequent (lower extremity fractures, urogenital injuries, and blunt abdominal injuries with hemo-peritoneum). Complications occurred in over

half of the cases, and the in-hospital mortality rate was high. A multidisciplinary trauma team, and the use of adequate diagnostic and therapeutic facilities, are absolutely necessary to improve the quality of care for patients with unstable pelvic fractures in hospitals with limited resource settings.

## Limitation

This study was retrospective in its design, therefore, we could not report the prospective functional outcome of the cases. Up to and 9 cases were excluded in the analysis.

## Conflicts of Interest

All authors declared that they have no competing interest.

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