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Epidemiology and clinical patterns of acetabular fractures in yaoundé: A 3-year prospective survey

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Abstract
Acetabular fractures are uncommon but very serious injuries. Literature on the epidemiology of acetabular fractures is scanty, most especially in our context, as no studies have been found on the exact burden of these injuries. The aim of our study was to describe the epidemiology of acetabular fractures over a 3-year period, in the capital city of Cameroon. This preliminary epidemiological study in Yaounde would provide a platform to advance high-level clinical research.
We obtained data for 76 patients who presented to our centres from 2018 to 2020 with a diagnosis of acetabular fracture. Age, sex, the cause of injury, fracture classification, mode of treatment, associated injuries, and other complications were analysed. We had an annual incidence of 1 case per hundred thousand inhabitants and the number of new cases increased steadily over the years. The average age of the population was 37.2 years with a sex ratio of 2.8. Indirect mechanisms, precisely dashboard injuries during high energy road traffic accidents constituted the most common mechanism for acetabular fractures (80%). The fracture patterns according to the Judet and Letournel's classification system were simple in 54% and complex in 46%, and mainly associated with hip dislocation, other lower limb fractures and pelvic fractures. Eighty-six percent (86%) of patients were managed by open reduction and internal fixation with the Kocher-Langenbeck approach being the most used surgical approach (87%).
Acetabular fractures are therefore rare in Yaounde but present a rising trend, affecting mainly young active adults involved in high energy road traffic accidents.

Keywords: acetabular fractures, epidemiology, kocher-langenbeck approach

Introduction
Acetabular fractures are uncommon injuries with a worldwide incidence of 2 cases per hundred thousand per year and usually a result of high energy injuries [1], with road traffic accidents (RTA) constituting the main cause [2]. They however are a challenging and complex injury, constituting an important healthcare problem because they are associated with high morbidity dictating prolonged periods of absence from work and a heavy burden on its victims [3]. In addition, for many decades, their management have remained an intellectual challenge with massive technical demand for orthopaedic surgeons globally [3,4]. In the past 60 years, following pioneering work by Judet and Letournel, there has been limited clarity regarding the management of these fractures [5, 6]. Since their early works [6–8], surgical treatment of acetabular fractures has become the gold standard for unstable and displaced fractures [9].
In Cameroon, like many developing countries, the tendency is for economic development and industrialisation to bring about a steady rise in acetabular injuries [4], owing to the growing nature of the population with rising incidences of road traffic injuries [12] and work-place accidents. However, data as to the exact burden of acetabular injuries in terms of its prevalence, population affected, injury mechanisms, fracture patterns and management options, are rare or even inexistent. We therefore in this preliminary write-up, describe the epidemiology of these fractures in Yaounde, the capital city of Cameroon.

Methodology
We carried out a 3-year multi-centric prospective review of patients presenting acetabular fractures from January 2018 to December 2020. This was done in five referral hospitals in Yaounde with known capacity to carry-out major orthopaedic and trauma surgical interventions. Included in the study were all patients presenting with acetabular fractures following a hip or pelvic injuries, who freely consented to take part in the study. Patients with fractures of the pubic ramus and pelvic fractures not involving the acetabulum were excluded. We used a simple consecutive exhaustive approach to recruit our participants and data were entered into a pre-established tested and approved data entry form. Our procedure started with the obtainment of an ethical clearance from the Institutional Review Board of the Faculty of Medicine and Biomedical Sciences of the University of Yaounde I. Then administrative approvals from managing directors of our recruitment centres were also requested and obtained. All patients admitted into the emergency rooms with hip or pelvic trauma were rapidly assessed. Primary and secondary surveys carried out. Those diagnosed of acetabular fractures were stabilised and placed on temporary treatment modalities (reduction of luxations and traction) and preliminary information was retrieved. Informed consent was then obtained from the patients or their parents for patients less than 21 years. The data collected included: Socio-demographic and pre-injury characteristics, mechanism of injury, clinical and radiological presentations and therapeutic options. The fracture patterns were evaluated using plain AP radiography of the pelvis, augmented by oblique Judet views and pelvic CT for those who could afford. Fractures were classified according to the Judet and Letournel classification system, associated injuries and management options were recorded and analysed using SPSS version 26.

Results

We recruited a total of 76 patients with acetabular fractures during a 3-year period. This gave us an annual incidence of 1 case per hundred thousand inhabitants. The number of new cases increased steadily during the years (Figure 1). Our study population was male dominated with a sex ratio of 2.8. Their average age was 37.2 (±12.7) years with the youngest patient being 11 years and the oldest 69 years old, all previously autonomous (Table I). The median body mass index (BMI) for our study population was 23.8Kg/m2 and ranged from 17.9 to 37.4. Married persons made up 46% and singles were 48%, with a globally low educational background (Figure 2). The study population was constituted of Christians (93%) and to a lesser extent, some Muslims (7%). Over 78% of our study population (60/76) did not present any significant past medical or surgical history. Comorbidities such as diabetes mellitus (5.2 %), HIV infection (2.6%) were relatively rare amongst the population. Indirect mechanisms especially dashboard injuries during high energy road traffic accidents constituted the major MOI for acetabular fractures (Figure 3). About 54% of patients had simple fracture patterns while 46% had complex fracture patterns. 77 % of injuries affected the left side and only one patient had a bilateral involvement.

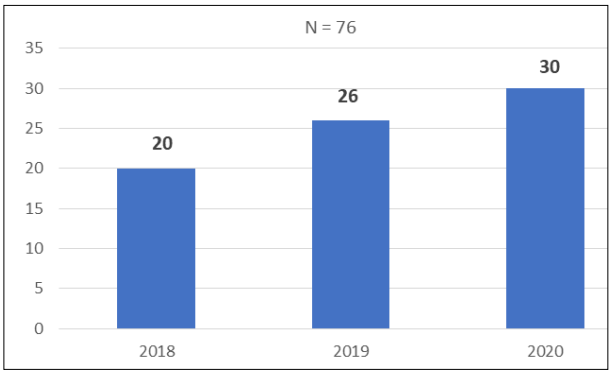

Fig 1: Number of Acetabular Fractures diagnosed over 3 years

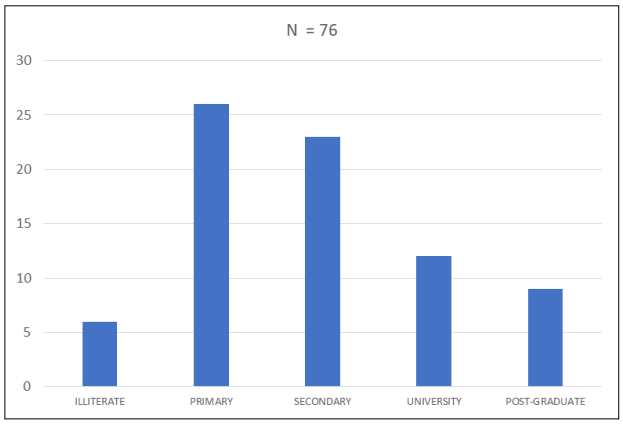

Fig 2: Educational Background of Study Population

Fracture diagnosis was with plain AP x-rays of the pelvis, augmented by the Judet oblique views (Table I). Posterior wall fractures (32.5 %) and transverse + posterior wall fractures (28.6 %) were the most common fracture patterns (Table III). Injuries associated to acetabular fractures included; hip dislocation (72.4 %), lower limb fractures (25 %), pelvic ring fractures (17.1 %), head and cervical spine injuries (10.5%) etc. There were no cases of associated major vascular injuries (Table II)

A total of 86 % of the patients with acetabular fractures were treated by open reduction and internal fixation (Figure 4).

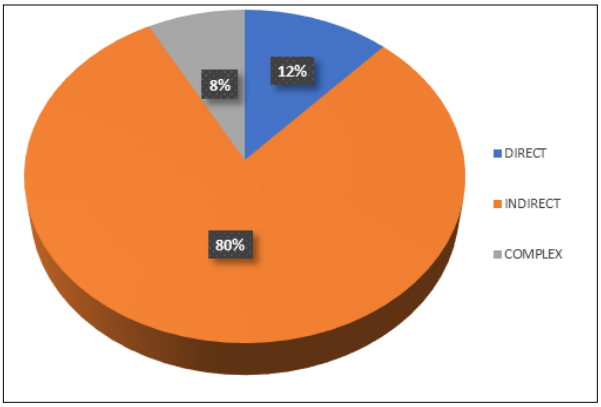

Fig 3: Mechanism of injury

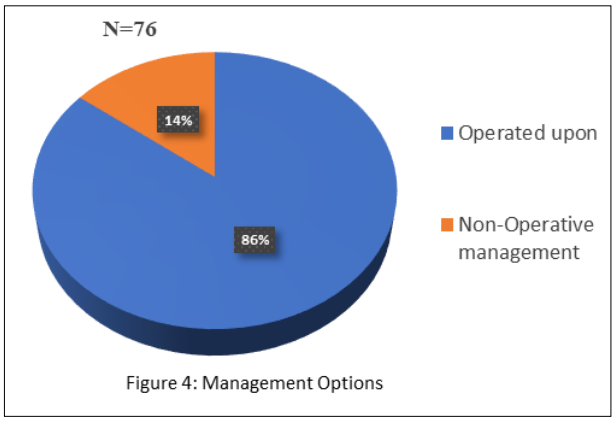

Fig 4: management options

The K-L surgical approach was the most used approach for the ORIF of acetabular fractures. It was used as the only approach in 87.7 % of cases, and used in combination with other classical approaches in 4.6 % of cases. The ilio-inguinal and ilio-femoral approaches were used in 4.6% and 3.1% respectively (Table IV).

Table 1: Injury Characteristic of Patients with Acetabular Fractures

Characteristic		Frequency	Percentage
Pre-injury status	Autonomous	76	100
	Semi-autonomous	0	0
	Non-autonomous	0	0
Injury circumstance	RTA	70	92.1
	Fall from height	1	1.3
	Fall from standing/sitting position	1	1.3
	Hit by heavy object	4	5.3
Diagnostic Radiology	AP Pelvis	76	100
	Judet Oblique Views	73	96.1
	CT	42	55.3
Associated injuries	Yes	75	98.7
	No	1	1.3

RTA = Road Traffic Accident
CT = Computer Tomography scan

Discussion

- **Incidence and evolution of the number of new cases of acetabular fractures**

During the period of our study, we recorded a total of 76 new patients with acetabular fractures in the 5 study centres, giving an estimated incidence of 1 case per 100 000 inhabitants per year. This incidence was less than the 2-3/100 000 per year estimated in most developed countries' literature [3, 13]. We associated our lower incidence to the fact that we do not have specialised trauma centres for this type of injuries and some patients with these fractures would have sorted medical attention in centres not included in our recruitment sites or might have sorted alternative fracture management. The number of new fracture cases steadily increased over the years from 20 new cases in 2018 to 30 new cases in 2020. This steady rise may be due to the growing number of active populations, a booming economy with a significant development of the construction industry, and a migration from the countryside to the cities.

- **Demographic characteristics of the population with acetabular fractures**

The injury affected mainly young autonomous adults with mean age of 37.2 (±12.7) years and median BMI of 23.8 Kg/m^2 (17.9 – 37.4). The youngest patient in our study population was 11 years old and the oldest was 69 years old. The population was predominantly a masculine group (74 %), with a sex ratio of 2.8. The proportion of men was within the average range of international literature, around 3 men to every woman [4]. Our findings were similar to the findings of Cavalcante et al. in Brazil in 2019, who had an average age of 39.8 (±13.1) years and male dominated victims [1].

A majority of the population were either single or married, with an overall low level of education and diverse professional status and of Christian (93 %) or Muslim (7 %) religious backgrounds.

Table 2: Injuries Associated to Acetabular Fractures in the Study Population (N = 76)

Associated injuries	Frequency (%)
Hip Dislocation	55 (72.4)
Head and cervical spine injury	8 (10.5)
Pelvic ring	13 (17.1)
Lower Extremity	19 (25)
Thoracic injury	7 (9.2)
Intraabdominal	7 (9.2)
Genitourinary	0 (0)
Spinal Cord injury	0 (0)
Upper extremity	4 (5.3)
Morel La Vallee	5 (6.6)
Major vascular	0 (0)
Femoral neck fracture	1 (1.3)
Sciatic nerve injury	1 (1.3)

- **Past History and Injury characteristics**

About 16 patients out of 76 presented comorbidities such as HIV infection (2.6 %), Diabetes mellitus (5.3 %) and past history of chronic alcohol and tobacco consumption. However, closed to 79 % of them did not present any significant past history.

The mechanism of injury (MOI) for acetabular fracture was mainly indirect injuries in 80.3 % of cases. These were mainly dashboard injuries sustained during road traffic accidents (RTAs) (92.1 %). Ahmed et al. in Qatar in 2018 also showed that motor vehicle crashes were the most common causes of acetabular fractures **[3].** Direct and complex mechanisms of injury occurred in 11.8 % and 7.9 % of cases respectively.

Diagnosis and pre-operative planning were based on plain AP radiographs of the pelvis and the Judet oblique views in all the cases.

Only about 55% of the study population did a CT for diagnostic confirmation and management planning.

These fractures affected mostly the left side (77.6 %) and was bilateral in only 1.3 % of cases. Posterior hip dislocation was the most frequently encountered associated injury (72.4 %), similar to findings in Qatar **[3].** Other associated injuries included pelvic ring fractures (17.1 %), other lower extremity fractures (25 %), cervical spine and head injuries (10.1 %), thoraco-abdominal injuries (18.4 %), upper extremity fractures (5.3%), Morel la Vallee (6.6 %) and post-traumatic sciatic nerve palsy (1.6 %). There were no major vascular or genitourinary associated injuries.

The most common fracture patterns according to the Judet and Letournel classification system were:

- Elementary fractures which made up 54 %
- Complex fractures were 46 % of acetabular fractures.

According to the frequency of fracture types, we had the posterior wall (25/76), posterior wall + transverse (22/76), transverse (6/76), anterior column (6/76), Both columns (5/76), posterior wall + posterior column (4/76), posterior column (3/76), anterior wall (2/76), T-shaped (2/76) and anterior column + posterior hemi-transverse (2/76). Posterior wall fractures were also predominant in many other research works in literature [1, 3, 4, 13]. The posterior wall and transverse + posterior wall fractures were most predominant owing to the most common MOI, as they are the structures that receive the femoral head impact during dashboard injuries in RTAs. Khan and collaborators however had a predominance of both column fractures **[2]** in their research.

- **Management options**

Non-operative management for various indications was done in 14.5 % of the study population and 85.5 % (65/76) were treated by open reduction and internal fixation (ORIF), through one standard approach or another.

The indications for non-operative treatment (11/76) of acetabular fractures in our study included:

- Un-displaced stable fracture (2/11)
- Refusal of surgery/ Financial constraints (6/11)
- Medical or technical difficulties (2/11)
- Delayed diagnosis/missed lesion (1/11)

The close to 86 % of patients who underwent osteosynthesis in our study was smaller than the over 90 % treated by ORIF in the study by Cavalcante **[1]** before the 14th day following injury. This could be because of the influence of alternative practices for fracture management in our setting, leaving certain patients to completely reject surgery for their injuries

Table 3: Classification of acetabular fractures according to the Judet/Letournel and the side affected (N = 76).

Fracture type	Sub-type	Side involved			Total
		Right (%)	Left (%)	Bilateral (%)	
Elementary (n = 41)	Posterior wall	4 (16)	21 (84)	0 (0)	25 (100)
	Posterior column	0 (0)	3 (100)	0 (0)	3 (100)
	Anterior wall	1 (50)	1 (50)	0 (0)	2 (100)
	Anterior column	4 (66.7)	2 (33.3)	0 (0)	6 (100)
	Transverse	2 (33.3)	4 (66.7)	0 (0)	6 (100)
Complex (n = 35)	T-shaped	1 (50)	1 (50)	0 (0)	2 (100)
	Posterior wall + Posterior column	0 (0)	4 (100)	0 (0)	4 (100)
	Posterior wall + Transverse	2 (9.1)	20 (90.9)	0 (0)	22 (100)
	Anterior column + Posterior hemi-transverse	0 (0)	2 (100)	0 (0)	2 (100)
	Both columns	2 (40)	2 (40)	1 (20)	5 (100)
Total		16 (21.1)	59 (77.6)	1 (1.3)	77 (100)

Table 4: Distribution of surgically treated acetabular fractures according to the surgical approaches (N = 65)

Surgical Approach	Frequency	Percentage
Kocher-Langenbeck	57	87.7
Ilio-inguinal	3	4.6
Ilio-femoral	2	3.1
Stoppa	0	0
Percutaneous	0	0
Combined (KL and another)	3	4.6
Total	65	100

KL = Kocher-Langenbeck

Conclusion

Acetabular fractures are rare in Yaounde with an annual incidence of 1 case per hundred inhabitants. However, the trend is rising steadily, affecting mainly young adults involved in high energy road traffic accidents. The Kocher-Langenbeck (K-L) surgical approach is the most used approach in the surgical management of these fractures and its main indications are posterior wall and transverse + posterior wall fractures, which are the two most common acetabular fracture patterns.

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