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Epidemiology of Acetabular Fractures in Bangladesh

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Abstract

Background: *Acetabular fractures are severe injuries primarily resulting from high-energy trauma, with significant morbidity and complex management challenges. Despite increasing incidence globally, comprehensive epidemiological data in Bangladesh remain limited.*

Objective: *This study aimed to delineate the epidemiological profile, injury mechanisms, fracture patterns, associated injuries, treatment modalities, and clinical outcomes of acetabular fractures in a tertiary care center in Bangladesh.*

Methods: *A prospective observational study was conducted involving 200 consecutive patients with radiologically confirmed acetabular fractures. Data on demographics, mechanism of injury, fracture classification according to Letournel and Judet, associated injuries, treatment methods, complications, and time intervals to hospital presentation were systematically collected and analyzed descriptively.*

Result: *The cohort had a mean age of 38.6 ± 12.4 years, predominantly male (79%), with the majority residing in urban areas (60.5%). Road traffic accidents constituted the predominant injury mechanism (64%), followed by falls from height (23%). Posterior wall fractures were the most prevalent fracture pattern (36%), with associated fractures observed in 41% of patients. Surgical management was employed in 70% of cases, mainly open reduction and internal fixation (60%). The mean hospital stay was 8.5 ± 3.2 days. In-hospital complications occurred in 25% of patients, with surgical site infection (13.5%) being the most common. Mortality was low (1.5%). Notably, only 26.5% of patients presented within six hours of injury.*

Conclusion: *The present study highlights a predominance of acetabular fractures in young urban males, primarily caused by road traffic accidents. Posterior wall fractures are the most frequent pattern encountered. Surgical intervention remains the cornerstone of treatment, although delayed hospital presentation is a significant concern. These findings underscore the necessity for enhanced trauma prevention strategies and expedited care pathways in Bangladesh.*

Keywords: *Acetabular fracture, Epidemiology, Road traffic accident, Letournel classification, Bangladesh, Trauma management*

1. Introduction

Acetabular fractures are significant injuries often resulting from high-energy trauma, including road traffic accidents (RTAs), falls from heights, or blunt force trauma.

These fractures, involving the socket of the hip joint, are critical for bearing the body's weight and enabling movement [1]. Worldwide, the incidence of acetabular fractures is estimated to be approximately 2-5 cases per 100,000 population annually. The global trend indicates an increase in these injuries, primarily due to rising traffic accidents and the aging population [2]. In Bangladesh, the lack of comprehensive data on acetabular fractures makes it difficult to fully understand the scope of the issue. However, increasing rates of trauma-related injuries,

especially in urban areas such as Dhaka, suggest a growing concern related to traffic accidents and poor infrastructure [3]. The pelvis, including the acetabulum, plays a pivotal role in the skeletal structure, protecting vital organs and major blood vessels [4]. Acetabular fractures are complex, often leading to severe morbidity, including long-term disability, loss of mobility, chronic pain, and post-traumatic arthritis [5]. These fractures are commonly associated with additional injuries to other organs, particularly the abdomen, chest, and lower extremities, further complicating the management and increasing the risk of mortality. In high-energy trauma cases, such as RTAs, patients with acetabular fractures often experience polytrauma, adding complexity to both diagnosis and treatment [6]. Acetabular fractures are more common in males, particularly among younger adults, with a growing trend in older patients due to osteoporosis-related fractures [7]. While in Bangladesh trauma-related injuries tend to be more prevalent in males, there is a lack of detailed data on the specific prevalence, causes, and outcomes of acetabular fractures, highlighting the need for more targeted research in this area [8]. Acetabular fractures can result in life-threatening complications, including hemorrhagic shock due to extensive blood loss, particularly in the case of major pelvic fractures [9]. Effective management of these fractures often requires a multidisciplinary approach, including early diagnosis, imaging, and surgical intervention, such as open reduction and internal fixation (ORIF) [10]. ORIF has become the gold standard for managing these fractures in many parts of the world. However, in Bangladesh, limited resources and challenges in healthcare delivery complicate the optimal management of acetabular fractures [11]. The rising number of RTAs and inadequate infrastructure in Bangladesh, particularly in urban areas like Dhaka, has led to an increase in trauma-related injuries, including acetabular fractures [12].

Despite this, there remains a significant gap in the availability of comprehensive epidemiological data on the incidence, risk factors, treatment patterns, and outcomes of acetabular fractures in Bangladesh. Understanding these aspects is critical for the development of effective trauma care strategies, improving patient outcomes, and shaping public health policies [13]. The aim of this study is to investigate the epidemiology of acetabular fractures in Bangladesh, focusing on patient demographics, injury mechanisms, treatment patterns, and outcomes at two tertiary care hospitals in Dhaka, to inform targeted trauma care strategies and public health policies.

2. Methodology & Materials

This was a descriptive cross-sectional study conducted at the Department of Orthopedics, Dhaka National Medical College, Dhaka, Bangladesh. The study was carried out over a 12-month period, from January 2024 to December 2024. A total of 200 consecutive patients meeting the eligibility criteria were included in the analysis. The study protocol was approved by the Institutional Review Board (IRB) of [Institution Name]. Written informed consent was obtained from all participants prior to enrollment

2.1. Inclusion Criteria

- Patients aged 18 years or older.
- Radiologically confirmed acetabular fractures (based on plain radiographs and/or CT scans).
- Patients admitted and managed (conservatively or surgically) during the study period.
- Patients (or legal guardians) who provided informed written consent.

2.2. Exclusion Criteria

- Patients with pathological acetabular fractures (e.g., due to metastatic disease or metabolic bone disorders).
- Periprosthetic acetabular fractures.
- Patients with polytrauma in whom acetabular fracture was not the primary concern.
- Incomplete clinical or radiological records.

2.3. Data Collection Procedure

Data were prospectively collected using a structured case report form, which was designed to capture demographic, clinical, and radiological data. Information was extracted from patient interviews, clinical examinations, and hospital records. The variables included sociodemographic details (age, sex, occupation, residential area), mechanism of injury, time to hospital presentation, fracture classification, associated injuries, treatment modality, duration of hospital stay, and in-hospital complications.

2.4. Fracture Classification

Acetabular fractures were classified using the Letournel and Judet classification system [14], which is widely used in the clinical assessment of acetabular fractures. This classification divides acetabular fractures into elementary and

associated types. Elementary fractures include posterior wall, anterior column, and others, while associated fractures involve combinations, such as both column fractures or T-type fractures. Radiographic and CT imaging findings were used to categorize the fractures appropriately.

2.5. Statistical Analysis

All collected data were entered into a secure database and analyzed using IBM SPSS Statistics for Windows, Version 26.0 (IBM Corp., Armonk, NY). Descriptive statistics were employed to summarize the variables. Categorical data were presented as frequencies and percentages, while continuous variables were expressed as means with standard deviations (SD).

3. Result

Table 1 presented the demographic characteristics of the study population (n=200). The mean age of the patients was 38.6±12.4 years. The majority of patients belonged to the 20–39 years age group (45.00%), followed by those aged 40–59 years (20.00%), while patients aged less than 20 years accounted for 16.00%. Those aged ≥60 years constituted 19.00% of the cohort. Males predominated the study population with 79.00%, whereas females represented only 21.00%. Regarding residence, 60.50% of the patients came from urban areas, and the remaining 39.50% resided in rural settings. In terms of occupation, manual laborers comprised the largest group (26.50%), followed by drivers (20.00%), farmers (16.50%), students (13.50%), and others including unemployed or miscellaneous workers (23.50%). Table 2 outlined that road traffic accidents were the most common cause, accounting for 64.00% of all cases. Falls from height were responsible for 23.00% of injuries, followed by industrial or occupational injuries at 8.00%. Falls at ground level were the least frequent mechanism, reported in 5.00% of cases. Elementary fractures were more common, with posterior wall fractures being the most prevalent (36.00%), followed by transverse fractures (18.00%), anterior wall (3.00%), anterior column (2.50%), and posterior column fractures (1.50%). Among associated fracture patterns, both column fractures were most frequent (22.00%), followed by transverse with posterior wall (9.00%), T-type fractures (5.00%), and anterior column with posterior hemitransverse (3.00%) (Table 3). 41.00% of patients had associated injuries along with acetabular fractures. The most common associated injury was pelvic ring fracture (18.00%), followed by lower limb fractures (14.00%), and soft tissue trauma (9.00%).

Notably, 59.00% of patients did not have any associated injuries (Table 4). Table 5 showed that open reduction and internal fixation (ORIF) was the most commonly employed treatment, administered in 60.00% of cases, while conservative management was used in 30.00%, and percutaneous fixation in 10.00%. The mean duration of hospital stay was 8.5 ± 3.2 days. In-hospital complications occurred in 25.00% of patients, with infection being the most frequent (13.50%), followed by pulmonary complications (6.50%) and deep vein thrombosis (3.50%). The in-hospital mortality rate was 1.50%. Regarding time to hospital presentation, 28.00% of patients arrived after 24 hours, 26.50% within 6 hours, 23.50% between 7–12 hours, and 22.00% between 13–24 hours.

Table 1. *Demographic characteristics of the study population (n = 200)*

Variable	Frequency (n)	Percentage (%)
Age Group (years)		
<20	32	16.00
20–39	90	45.00
40–59	40	20.00
≥60	38	19.00
Mean±SD	38.6 ± 12.4	
Gender		
Male	158	79.00
Female	42	21.00
Residence		
Urban	121	60.50
Rural	79	39.50
Occupation		
Manual laborer	53	26.50
Driver	40	20.00
Farmer	33	16.50
Student	27	13.50
Others	47	23.50

Table 2. *Mechanism of injury among patients with acetabular fractures*

Mechanism of Injury	Frequency (n)	Percentage (%)
Road traffic accident (RTA)	128	64.00
Fall from height	46	23.00
Industrial/Occupational injury	16	8.00
Fall at ground level	10	5.00

Table 3. *Distribution of acetabular fracture patterns based on Letournel and Judet classification*

Fracture Pattern	Frequency (n)	Percentage (%)
Elementary Fractures		
Posterior wall	72	36.00
Transverse	36	18.00
Anterior wall	6	3.00
Anterior column	5	2.50
Posterior column	3	1.50
Associated Fractures		
Both column	44	22.00
Transverse + posterior wall	18	9.00
T-type	10	5.00
Anterior column + posterior hemitransverse	6	3.00

Table 4. *Associated injuries in patients presenting with acetabular fractures*

Associated Injury	Frequency (n)	Percentage (%)
Any associated injury	82	41.00
Pelvic ring fracture	36	18.00
Lower limb fracture	28	14.00
Other soft tissue trauma	18	9.00
No associated injuries	118	59.00

Table 5. *Treatment modalities, hospital outcomes, and time to hospital presentation*

Variable	Frequency (n)	Percentage (%)
Type of Treatment		
Conservative management	60	30.00
Open reduction and internal fixation	120	60.00
Percutaneous fixation	20	10.00
Duration of Hospital Stay (days), (Mean ± SD)	8.5 ± 3.2	
In-Hospital Complications		
Infection	27	13.50
Deep vein thrombosis	7	3.50
Pulmonary complications	13	6.50
None	150	75.00
Mortality (if any)	3	1.50
Time to Hospital Presentation		
≤6 hours	53	26.50
7–12 hours	47	23.50
13–24 hours	44	22.00
>24 hours	56	28.00

4. DISCUSSION

Acetabular fractures represent a complex orthopedic injury pattern typically associated with high-energy trauma and significant morbidity. In our study, the majority of patients were young males, with 79% being male and 45% aged between 20 and 39 years.

These findings are consistent with previous studies on acetabular fractures, which have similarly reported a predominance of young adult males, with mean ages ranging from 35 to 38 years and male representation between 70% and 88% [15-16]. In our study, 60.5% of acetabular fracture cases were urban residents, with manual laborers (26.5%) and drivers (20%) comprising the most affected occupational groups, indicating heightened risk in physically intensive and transport-related jobs. Similarly, Cavalcante et al. reported 81% involvement of economically

active, predominantly urban workers in Brazil [17]. The mechanism of injury in our cohort was predominantly road traffic accidents (64%), followed by falls from height (23%). This study's findings align with existing evidence demonstrating road traffic accidents (RTAs) as the principal etiology of acetabular fractures [16-17]. A retrospective analysis from Nepal reported RTAs as the cause in 70.8% of pelvic and acetabular fractures, with falls from height accounting for 25%, predominantly in working-age males [18]. Similarly, RTAs accounted for 85.5% of pelvic fractures in a local study, while falls from height contributed a smaller but significant proportion [19]. Studies from Singapore and Jordan further confirm these patterns, reporting RTAs as the cause in 54% and 57% of cases, and falls from height—often linked to occupational hazards—constituting 28.4% and 42.6%, respectively [20-21].Fracture pattern analysis using the Letournel and Judet classification demonstrated a predominance of elementary fractures, notably posterior wall fractures (36%) and transverse fractures (18%). Among associated fractures, both-column types were most frequent (22%). These findings align with Trikha et al., who reported posterior wall (21.4%), transverse (12.7%), and both-column fractures (6.38%) as common patterns [15]. Similarly, AlRousan et al. documented posterior wall fractures in 37.6%, transverse fractures in 18%, and both-column fractures in 22% of cases [21]. Associated injuries were present in 41% of cases in the current study, with pelvic ring fractures (18%) and lower limb fractures (14%) being most common. A retrospective observational study conducted at a level-one trauma center reported a higher incidence of associated injuries (62%) in acetabular fracture cases, predominantly involving pelvic and abdominal regions [15]. Additionally, previous literature indicates that combined acetabular and pelvic ring fractures occur in up to 15.7% of cases, emphasizing the complexity of these injuries and the necessity for comprehensive clinical evaluation [22]. Surgical intervention was the primary treatment modality in our study, with 60% undergoing open reduction and internal fixation (ORIF) and 10% receiving percutaneous fixation. This is consistent with the 66% surgical treatment rate reported in Jordan [21]. Conversely, studies from Sweden and South Korea report lower surgical intervention rates, possibly due to differences in patient age and fracture complexity [23]. In-hospital complications occurred in 25% of patients, with infection (13.5%) and pulmonary complications (6.5%) being most prevalent. Although these rates are within global ranges, they underscore the need for robust perioperative care protocols. Deep vein thrombosis (3.5%) was also noted, emphasizing the importance of early mobilization and thromboprophylaxis. Mortality was low (1.5%), consistent with other studies reporting 1–3% mortality in isolated acetabular fractures [24]. However, higher mortality rates have been observed in elderly polytrauma patients [25]. In the present study, timely hospital presentation following injury was notably limited, with only 26.5% of patients arriving within the first 6 hours post-injury. Early presentation to a healthcare facility is critical, as delays in initial evaluation and intervention may compromise definitive management, elevate the risk of complications, and adversely influence overall clinical outcomes [26]. The average hospital stay in our study was 8.5 ± 3.2 days, which is slightly shorter than reports from European centers, where stays average 10–12 days [27].

5. Limitations of the Study

The present study has certain limitations that should be acknowledged. Firstly, the retrospective nature of data collection may introduce recall bias and limit the accuracy of patient-reported variables such as mechanism of injury. Secondly, variations in radiographic interpretation and fracture classification may lead to observer bias. Additionally, certain confounding factors, including comorbidities or socioeconomic status, were not evaluated, which might influence injury patterns and treatment outcomes. Lastly, the heterogeneity in treatment protocols could affect the generalizability of findings regarding management strategies and associated complications across different clinical settings.

6. Conclusion And Recommendations

In the present study, acetabular fractures in Bangladesh were predominantly observed among young adult males, with road traffic accidents being the leading cause. Posterior wall fractures were the most common pattern, and nearly half of the patients had associated injuries, notably pelvic ring and lower limb fractures. Surgical intervention, primarily open reduction and internal fixation, was the preferred treatment. While most patients experienced favorable in-hospital outcomes, a small proportion developed complications or delayed hospital presentation. These findings underscore the critical need for early diagnosis and timely intervention. Public

health strategies should prioritize road safety enforcement and trauma care system strengthening.

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CONFLICT OF INTEREST

None declared

ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee.

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