

## A STUDY ON PATTERN OF PELVIC FRACTURES, ASSOCIATED INJURIES AND EARLY COMPLICATION

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Received : 07/03/2026  
Received in revised form : 23/04/2026  
Accepted : 12/05/2026

**Keywords:**

Pelvic fracture, Fracture pattern, Acetabular fractures, Emergency medicine.

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DOI: 10.47009/jamp.2026.8.3.63

Source of Support: Nil,

Conflict of Interest: None declared

*Int J Acad Med Pharm*  
2026; 8 (3); 352-356



### ABSTRACT

**Background:** Pelvic fractures are serious musculoskeletal injuries usually resulting from high-energy trauma like road traffic accidents, falls from height, and crush injuries. There are significant morbidity and mortality due to associated injuries of the abdomen, thorax, spine, head, and extremities. The present study aims to evaluate the pattern of pelvic fractures, identify commonly associated injuries, and to assess early complications among affected patients. **Materials and Methods:** An observational study was conducted among 130 patients with pelvic fracture reporting at the Emergency department of a tertiary care hospital between April 2023 to March 2024. Data was collected from electronic medical records of the hospital which included patient demographics (age, sex, occupation), mechanism of injury (road traffic accidents, falls, assaults), fracture classification (Tile classification) and associated injuries (head injury, chest trauma, thoracic trauma and urogenital injuries). **Result:** The mean age of patients was  $43.7 \pm 8.4$  years with 53.1% being males. The most common causes of pelvic fractures were road traffic accident (57.57%) followed by fall from height (29.2%). Based on tile classification type C (53.08%) was most common followed by type B (36.92%) and type A (10%). Blunt trauma caused 90% of injury with penetrating injuries making up only 10%. Thoracic injury (58.5%) was more common than genitourinary injury (36.9%) and abdominal injury (32.3%). The study found 66.9% survived with pelvic fracture. **Conclusion:** Pelvic fractures predominantly affected young and middle-aged males following road traffic accidents, with unstable Type B and C fractures, associated thoracoabdominal and genitourinary injuries, and complications like hemorrhagic shock and infections, emphasizing the importance of early stabilization and multidisciplinary management.

## INTRODUCTION

Pelvic fractures are recognized as some of the most severe injuries in trauma care due to the intricate anatomy of the pelvis and the critical structure site compasses.<sup>[1]</sup> The pelvis functions as a foundational support for the human body, facilitating the transfer of weight from the axial skeleton to the lower limbs while safe guarding essential neurovascular and visceral organs. These injuries are predominantly caused by high-energy trauma, including motor vehicle collisions, falls from considerable heights, and crush incidents, often resulting in substantial morbidity and mortality.<sup>[2]</sup> A comprehensive understanding of fracture patterns is vital for developing effective treatment protocols and optimizing patient outcomes.<sup>[3]</sup>

These fractures are frequently accompanied by injuries to nearby organs and structures.<sup>[4]</sup> Common complications include urogenital trauma, vascular damage, and neurological deficits, all of which significantly impact the patient's clinical presentation and therapeutic approach. Early complications following pelvic fractures significantly impact the clinical course with hemodynamic instability due to pelvic hemorrhage being a primary concern during the acute phase.<sup>[5]</sup> Additional complications such as soft tissue damage, infections, and thromboembolic events can emerge during their recovery period, prolonging rehabilitation and increasing the strain on healthcare resources. Prompt identification of these early complications and the initiation of appropriate interventions are crucial for minimizing associated morbidity and mortality.<sup>[6]</sup>

There is paucity of data on the epidemiological profile, fracture patterns, associated injuries, and early complications of pelvic fractures in our setting. Variations in demographic characteristics, road safety measures, healthcare accessibility, and trauma care facilities which necessitate the need for institution-specific studies. Hence, the present study aims to evaluate the pattern of pelvic fractures, identify commonly associated injuries, and to assess early complications among affected patients. Results from this study may help to improve early diagnosis of complication, optimizing management protocols, and reducing morbidity and mortality associated with pelvic trauma.

## MATERIALS AND METHODS

**Study Design and Setting:** This study was an observational analysis conducted at MGM Medical College, Kamothe, Navi Mumbai a tertiary care center, over a period of 12 months, from April 2023 to March 2024. Ethical approval was obtained from the Institutional Ethics Committee prior to data collection.

### Study Population

#### Inclusion Criteria

1. Patients above 18 years of age of both the sex.
2. Patients who are willing to give written consent.
3. Patients who have pelvic fracture confirmed by radiological imaging.

#### Exclusion Criteria

1. Patients who are not willing to give consent.
2. Patients who are below 18 years of age.

#### Sample Size Calculation

The sample size for this study was calculated using the formula  $n = Z^2 \times p \times (1-p) / d^2$  Where n is the sample size, Z is the value for 95% confidence level (1.96), p is the expected proportion of the outcome of interest (based on previous studies or pilot data) and d = margin of error (precision of the estimate).

For present study, p was assumed to be 0.5 (50%) as this value provides the maximum sample size with a conservative approach and d was set at 0.075 (7.5%) to achieve an acceptable precision. The sample size was calculated to be 130.

**Data Collection:** Data were collected from the electronic medical records of the hospital which included patient demographics (age, sex, occupation), mechanism of injury (road traffic accidents, falls, assaults), fracture classification (Tile classification) and associated injuries (head injury, chest trauma, thoracic trauma and urogenital injuries)

#### Classification of Pelvic Fractures

Pelvic fractures were classified using the Tile classification system, which categorizes fractures into:

**Type A:** Stable fractures without rotational or vertical instability

**Type B:** Rotationally unstable but vertically stable fractures

**Type C:** Rotationally and vertically unstable fractures

**Management Protocol:** Patients were managed according to standardized institutional protocols. Conservative management comprised of bed rest, pelvic binder, analgesics, and physiotherapy while surgical management included external fixation, open reduction and internal fixation (ORIF), or percutaneous screw fixation, depending on fracture type and severity.

## RESULTS

The mean age of patients with pelvic fracture in the present study was  $43.7 \pm 8.4$  years with 53.1% being male and 46.9% females. Shopkeepers were the most commonly affected occupation (14.6%), followed by housewives (10.8%) and students (10.8%). The most common causes of pelvic fractures were road traffic accident (57.5%) followed by fall from height (29.2%). [Table 1]

**Table 1: Distribution as per mechanism of action (N=130)**

Mechanism of injury	Frequency	Percentage
Road traffic injury	75	57.7
Fall from height	38	29.2
Assault	30	10.0
Others	4	3.1

The most common fracture types observed were type C (53.08%), followed by type B (36.92%) and type A (10%). These fracture patterns indicate a significant

proportion of complex or unstable fractures which require careful management. The sub-classification of the fracture is given in [Table 2].

**Table 2: Distribution as per pelvic fracture pattern (tiles) subtypes**

Pelvic fracture (Tiles)	Frequency	Percentage
A2	13	10.0
B1	10	7.7
B2-1	18	13.8
B2-2	20	15.4
B3	14	10.8
C1-1	17	13.1
C2-2	21	16.2
C3	17	13.1

Blunt trauma was the leading cause of injury (90%), with penetrating injuries making up only 10%. This is consistent with the fact that most pelvic fracture result from blunt force mechanisms such as falls and vehicle collisions. Radiologically diagnosed pelvic fractures were predominant, accounting for 90% of cases, while only 10% were clinically diagnosed. This emphasizes the importance of imaging in accurately identifying pelvic fractures.

Acetabular fracture was seen among 44.6% of cases. The distribution of various injuries following the pelvic fracture is given below in Table 3. Severe Glassglow coma scale (GCS) scores were observed in 36.2% of patients, moderate among 32.3% and mild among 31.5%. We found 87 patients out of 130 i.e. 66.9% survived while 43 died (33.1%).

**Table 3: Distribution of type of injury**

Type of injury	Frequency	Percentage
Acetabular fracture	58	44.6
Thoracic injury	76	58.5
Haemothorax (n=76)	21	27.6
Lung contusion (n=76)	20	26.3
Pneumothorax (n=76)	23	30.3
Rib fracture (n=76)	13	15.8
Abdominal injury	42	32.3
Blunt (n=42)	35	83.3
Penetrating (n=42)	7	16.7
Bowel perforation (n=42)	10	23.8
Haemoperitoneum (n=42)	17	40.5
Upper GI bleed (n=42)	8	19.0
Others (n=42)	7	16.6
Genitourinary injury	48	36.9
Bladder contusion (n=48)	8	16.6
Perineal injury (n=48)	19	39.5
Lower limb fracture (n=48)	15	31.3
Others (n=48)	6	12.5

## DISCUSSION

In the present study the mean age of patients were 43.07 years. This age distribution is consistent with findings from Abdelrahman et al,<sup>[1]</sup> who reported a mean age of 41 years in their multicenter study across Qatar and Germany, highlighting that pelvic fractures are most common among young to middle-aged adults, primarily due to high-energy mechanisms such as road traffic accidents and falls. Similarly, Wachira et al,<sup>[7]</sup> found that most of their patients with pelvic fractures were between 30 and 40 years old, reflecting the active age group most prone to high-risk activities. The relatively young age distribution in our study reflects the active lifestyle and increased risk-taking behavior of this age group, making them more susceptible to high-energy trauma, which is a common cause of pelvic fractures.

Our study revealed a slight male predominance in pelvic fractures, with males accounting for 53.1% and females 46.9%. Ferede et al,<sup>[8]</sup> observed a male-to-female ratio of 7:1 in Ethiopia, reflecting a significant gender disparity due to cultural and occupational factors. Bakhshayesh et al,<sup>[9]</sup> also reported a higher proportion of males (62%) among patients with high-energy pelvic fractures, further supporting the notion that males are more frequently exposed to trauma due to their engagement in physically demanding activities.

Our study found that the most affected occupations among patients with pelvic fractures were shopkeepers (14.6%), housewives (10.8%), and students (10.8%). These findings are consistent with

Wachira et al,<sup>[7]</sup> who reported that young adults, including students and individuals in active occupations, were at higher risk of pelvic fractures due to their engagement in daily travel and other high-risk activities. Ferede et al,<sup>[8]</sup> highlighted that most of their patients with pelvic fractures were engaged in physically demanding jobs or occupations with a higher risk of trauma, such as laborers and farmers.

Our study revealed that Type C fractures were the most common (53.08%), followed by Type B (36.92%) and Type A (10%). Ferede et al,<sup>[8]</sup> also reported a similar pattern, where high-energy trauma, such as road traffic accidents and falls, was predominantly associated with Type C fractures due to their severe instability. Zingg et al,<sup>[11]</sup> highlighted the moderate interobserver reliability of the Tile classification system (kappa = 0.44), suggesting that classification accuracy can vary between radiologists and surgeons, which may impact clinical decision-making. Type C fractures often requiring surgical stabilization due to their inherent instability.<sup>[10]</sup> Our findings confirm that Type C fractures, characterized by both rotational and vertical instability, are the most common and clinically challenging type in high-energy trauma cases.

Our study demonstrated that radiological diagnosis was the predominant method for identifying pelvic fractures (90%), while clinical diagnosis accounted for only 10%. This is consistent with the findings of Zingg et al,<sup>[11]</sup> who emphasized the critical role of radiological imaging, particularly CT scans, in accurately classifying and diagnosing pelvic

fractures. They also highlighted that interobserver reliability among radiologists was higher than among surgeons, underscoring the importance of specialized imaging expertise.

Our study revealed that blunt trauma accounted for 90% of pelvic fractures, while penetrating trauma was responsible for only 10%. This finding aligns with the results of Abdelrahman et al,<sup>[1]</sup> who reported that the vast majority of pelvic fractures in their multicenter study were caused by blunt trauma, primarily from road traffic accidents and falls. Velazquez et al,<sup>[12]</sup> highlighted that while blunt trauma is the primary cause of pelvic fractures, it is also associated with a higher risk of associated injuries, including genitourinary and gastrointestinal injuries.

Our study showed that acetabular fractures were present in 44.6% of cases, while 55.4% of patients had no acetabular involvement similar to a study by Bakhshayesh et al,<sup>[9]</sup> Zingg et al,<sup>[11]</sup> highlighted that accurate classification of acetabular fractures using imaging, particularly CT scans, is critical for determining the appropriate management strategy, given the complex anatomy of the acetabulum. Ferede et al,<sup>[8]</sup> further noted that acetabular involvement was more common among patients with high-energy trauma, reflecting the severe force required to disrupt the hip joint.

Thoracic injuries were present in 58.46% of patients with pelvic fractures, with pneumothorax (30.27%) and hemothorax (27.63%) being the most common types. Mostafa et al,<sup>[10]</sup> emphasized the importance of early identification and management of thoracic injuries in patients with pelvic fractures, as they are associated with higher morbidity and mortality.

Abdominal injuries were present in 32.3% of patients with pelvic fractures, with hemoperitoneum (40.48%) and bowel perforation (23.81%) being the most common types. Abdelrahman et al,<sup>[1]</sup> also reported that abdominal injuries were a common complication in patients with pelvic fractures, particularly those with unstable or displaced fracture patterns. Mostafa et al,<sup>[10]</sup> emphasized the importance of thorough abdominal evaluation in all patients with pelvic fractures, given the risk of concurrent internal injuries.

Genitourinary injuries were present in 39.58% of patients with pelvic fractures, with perineal injuries being the most frequent (39.58%), followed by lower limb fractures (31.25%). Velazquez et al,<sup>[12]</sup> also reported that genitourinary injuries were a common complication of blunt pelvic trauma, reflecting the anatomical proximity of the urinary tract to the pelvic bones. Zhao et al,<sup>[13]</sup> found that lower urinary tract injuries (LUTIs) were more common in patients with unstable pelvic fractures, particularly in males due to the anatomical position of the male urethra.

Our study revealed that hemorrhagic shock was the most common complication of pelvic fractures (26.92%), followed by infections (14.62%). Velazquez et al,<sup>[12]</sup> similarly reported that hemorrhagic shock was a frequent and life-

threatening complication of pelvic fractures, often associated with vascular injury. Li et al,<sup>[14]</sup> also emphasized that pelvic infections are a significant concern, particularly in open fractures or those requiring surgical intervention.

Our study demonstrated that 66.9% of patients with pelvic fractures survived, while 33.1% died within 14 days. Velazquez et al,<sup>[12]</sup> highlighted that early mortality in pelvic fracture patients is often due to hemorrhagic shock, traumatic brain injury, or multi-organ failure. Li et al,<sup>[14]</sup> similarly emphasized that early mortality is closely linked to the severity of the fracture, the presence of associated injuries, and the patient's hemodynamic status at presentation. Mostafa et al,<sup>[10]</sup> noted that the first two weeks are critical for patients with pelvic fractures, with most deaths occurring due to uncontrolled bleeding or associated injuries.

## CONCLUSION

Pelvic fractures were predominantly observed among young and middle-aged adults, with a slight male predominance, reflecting the higher risk of exposure among males due to occupational and lifestyle factors. Road traffic accidents emerged as the leading cause of pelvic fractures. Complex fracture patterns, particularly Type C and Type B, were the most common, indicating a high incidence of unstable and severe fractures. Blunt trauma was the most frequent mechanism of injury. Associated injuries were common, with thoracic, abdominal, and genitourinary injuries frequently complicating the clinical presentation. Hemorrhagic shock and infections were the most prevalent complications, reflecting the severity of these injuries and the risk of life-threatening conditions. The study highlights the critical need for early diagnosis, hemodynamic stabilization, and a multidisciplinary approach in managing pelvic fractures.

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