



Original Article

Epidemiology of pelvic fractures in adults: Our experience at a tertiary hospital

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ABSTRACT

Purpose: Pelvic fractures are severe injuries and are often associated with multiple system injuries, exacerbating the overall outcome. In India, the incidence of pelvic fractures is on a rise due to suboptimal roads and traffics but related literature regarding the overall epidemiology of these injuries is scarce and scanty. Our aim was to study the epidemiology of patients admitted with pelvic fractures at a level 1 trauma centre in India.

Methods: A 16-month (between September 2015 and December 2016) prospective observational study was carried out on trauma patients with pelvic fractures at a level 1 trauma centre of a tertiary care hospital. Demography of patients, mechanism of injuries and complications were recorded prospectively.

Results: We observed 75 patients who presented with pelvic fractures, where 56 were males and 19 were females. Mean age of the study population was 37.57 years. Road traffic accidents were the most common mode of injuries. Lateral compression injuries were the most common pattern. Associated injuries frequently encountered were lower extremities and acetabulum fractures, blunt abdominal trauma, urogenital injuries and head injuries. Out of the 75 patients, 52 were treated surgically and 23 were managed by conservative methods. Associated injuries of the extremities, head, abdomen and urogenital system indicated a longer hospital stay.

Conclusion: Pelvic fractures, although belong to a relatively rare trauma subset, cause a high morbidity and mortality with considerable burden on the economy. Proper road safety training and driving etiquettes along with its strict implementation in true sense and spirit are the need of the hour.

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Introduction

Pelvic fractures are perhaps the most severe & life threatening orthopedic injuries, constituting about 1.5%–3% of all skeletal injuries.¹ Although pelvic fractures represent only a small percentage they are associated with significant morbidity and mortality.² Majority of pelvic fractures result from high energy trauma, with road traffic accidents (RTAs) being the most common cause. Other causes are falls from height, and fall of heavy objects, etc.³ Patients with pelvic injuries often have associated multiple systemic injuries, adding to the overall morbidity & mortality.

Pelvic injuries have a male predilection and occur in younger age groups, resulting in an impending socio-economic impact as well.^{4–7} The literature is scarce as far as the overall epidemiology of

these injuries in Indian population. The present study aimed to study the epidemiology of pelvic fractures.

Methods

This was a prospective observational study conducted at a level 1 trauma centre of a tertiary care hospital, between September 2015 and December 2016.

Inclusion and exclusion criteria were set and accordingly the eligible patients were included and different patterns of pelvic fractures and their associated injuries were studied. All the demographic parameters were recorded as well.

Patients included were skeletally mature and had pelvic fractures, either isolated or associated with other bony injuries. Isolated acetabulum fractures, cases treated outside and skeletally immature patients were excluded. Records were noted via a questionnaire and radiological evaluation i.e. X-ray examination and computed tomography (CT) scans.

Pelvic fractures were classified according to Young and Burgess classification⁸ which includes 4 types of injuries:

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lateral compression (LC), antero-posterior compression (APC), vertical shear (VS) and combined (CM). LC injuries are further divided into LC1, LC2, and LC3; APC injuries into APC1, APC2 and APC3. Among these, LC1 and APC1 are considered stable injury patterns and the rest unstable. Management of pelvic fractures was decided by the injury patterns and presence of severe associated injuries precluding surgical intervention. Patients, for whom conservative management was contemplated, either due to stable fracture patterns or due to presence of severe associated injuries preventing surgical intervention, were advised the treatment of rest for 6 weeks, with pelvic binder or skeletal traction according to the fracture pattern and morphology.

Statistical analysis was carried out using Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, version 17.0 for Windows). All quantitative variables were estimated using measures of central location (mean, median) and measures of dispersion (standard deviation and standard error). Normality of data was checked by measures of skewness and Kolmogorov-Smirnov tests. For normally distributed data, means were compared by using student's *t*-test for two groups. For more than two groups ANOVA was applied. For skewed data, Mann-Whitney test was applied. For more than two groups, Kruskal Wallis test was applied.

Results

A total of 3680 trauma cases presented during the study period, out of which 104 had sustained pelvic injuries, comprising 2.82% of total cases. Five patients with skeletal immaturity, and 3 patients managed outside were excluded from this study. Two patients were lost to follow-up as they took discharge against medical advice. Out of the remaining 94 patients, 11 died and 8 did not come for further follow-up and henceforth excluded as well. So, in total, 75 patients formed the study population in this prospective observational cohort study.

The male to female ratio was 56/19, with males forming the majority in the study population (74.67%). The youngest patient in the study was 17 years old while the eldest was 85 years old. Mean age was 37.57 years with patients below 50 years comprising 82% of the study population.

Most common mode of injury was vehicle accidents comprising 77.3% of the cases, falls from heights 21.3%, and fall of heavy objects 1.3% (a single case).

Most of the fractures were LC types (37.3%), followed by APC types (33.3%). Detailed distribution of the fractures based on Young and Burgess classification⁸ is shown in Fig. 1. Seventy patients (93.3%) had closed fractures and only 5 patients sustained open fractures.

Associated orthopedic injuries in the upper limb were seen in 9 cases (12%), in which 3 had open fractures. Humeral shaft fracture was the most common associated injury at upper limb. In lower limbs, 22 patients (29.3%) sustained fractures, with femoral shaft being the most commonly involved fracture site (14 cases), followed by both bone leg fractures (6 patients). 8 cases had open fractures. Other injuries included acetabulum fractures in 14 cases (18.7%), sacrum fractures in 7 cases (9.3%), spine fractures in 3 cases (4.0%) and others in 2 patients (2.7%). Facio-maxillary fractures were seen in 2 patients.

The non-orthopedic injuries included head injuries (17 cases, 22.7%), blunt trauma to abdomen (21 cases, 28%), blunt trauma to chest (8 cases, 10.7%), and urogenital injuries (17 cases, 22.7%).

Fifty-two patients (69.3%) were managed surgically while 23 (30.7%) were given conservative treatment. In the LC group, 9 patients had severe injuries or co-morbidities, disallowing surgery; while 11 had stable fracture configuration. Two patients had unsuitable skin condition due to Morel-Lavallée lesion and 1 patient had grade 3 bed sore.⁹

The interval between presentation and surgery was documented to be 9.67 days on average; minimum 1 day and maximum 37 days. Among 52 patients treated surgically, 10 (19.2%) were operated on within 48 h of presentation, 27 patients (51.9%) within a week and the rest 15 (28.8%) in more than a week due to presence of severe associated injuries, which lengthened the period for patients to settle down and became anesthesiologically fit to undergo surgery. The maximum hospital stay recorded was 45 days and the mean hospital stay was 14.4 days (Fig. 2).

Discussion

In trauma victims, pelvic fractures represent the tip of an iceberg, with relatively rare occurrence, but they carry a high risk of mortality and morbidity.^{4,5,10–12} Associated injuries involving other

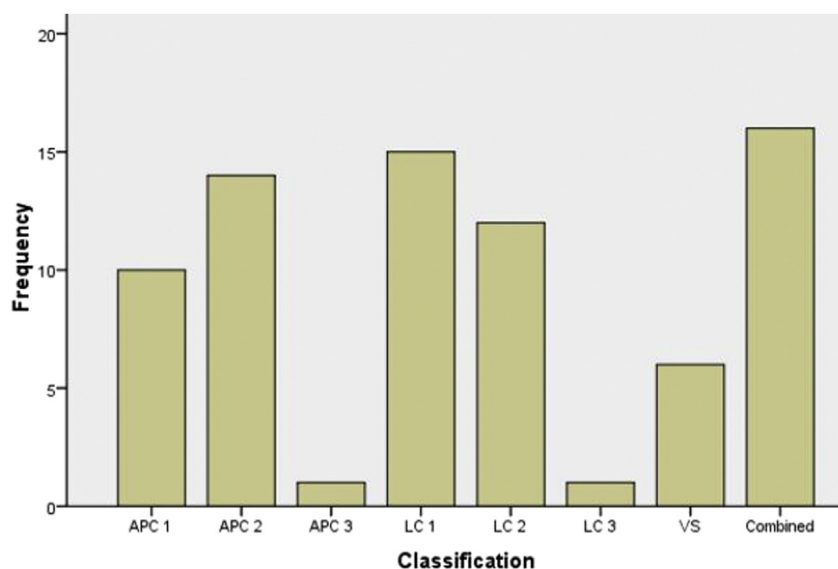


Fig. 1. Distribution of pelvic fractures according to Young and Burgess classification.

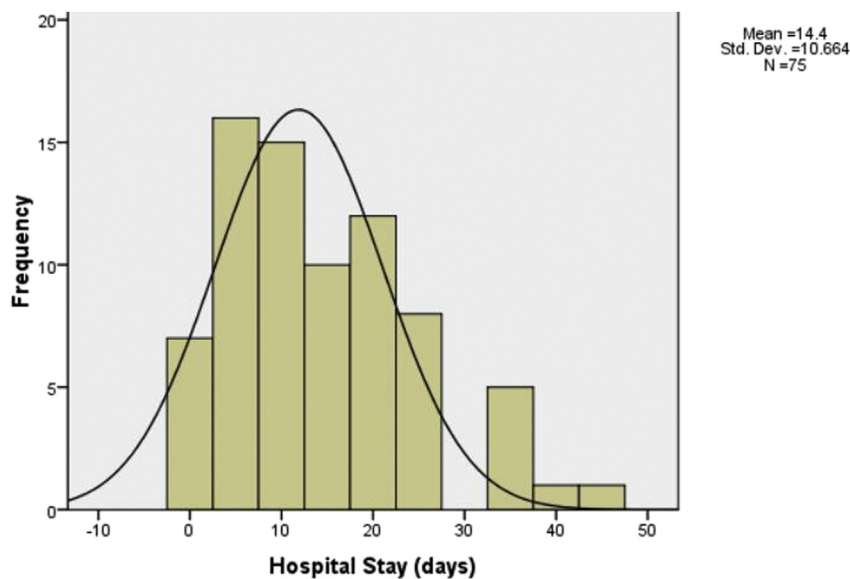


Fig. 2. Graph depicting variations in hospital stay.

systems further deteriorate the outcome. The incidence of pelvic injuries in the present study was 2.82% (104 in 3680 cases), similar to the study by Gansslen et al.¹¹ Though studies have reported a higher incidence of 8%–9%, the incidence is probably less in and around our tertiary care centre.

The most common mode of injury is RTAs^{4,5,7,11} and in the present study it is the culprit as well, responsible for 77.3% of pelvic injuries. The topography in our territory consists of hilly areas with suboptimal roads and poor traffic sense prevailing among the drivers. This could have caused a high incidence of vehicle accidents. Male predilection in the present study could be due to the fact that in our part of the world, conventionally males are the major workforce while females historically have been homemakers, hence the former have to travel more for livelihood and could get involved in more accidents. Drunk driving, as a social menace is more common in males than in female counterparts.¹³ In literature similar sex predilection has been documented too.^{4–7}

Pelvic fracture is a disease attacking younger population with most of patients under 50 years old.^{4–7} In the present study the mean age was 37.57 years. Hence young economically productive adult males are prone to these injuries. The reduced labor force together with the treatment cost is a vicious cycle that burdens the society.

Though most of the studies in literature use Tile's classification, we used the classification by Young and Burgess, which is based on the mechanism of injury and helps in making decision for the subsequent management.^{8,14}

Isolated pelvic fractures are even rarer due to the high energy required to cause such injuries. Moreover the high energy trauma transmits to other bones and systems and hence association of other injuries is very common. The most common associated fracture at the upper limb has been described to be humeral fracture¹⁵ and in our study this was noted too. The associated lower limb fractures commonly occur in the femoral shaft and both bone legs. Gansslen et al.¹¹ and Yang et al.¹⁵ reported similar lower limb injuries in association with pelvic trauma. Co-involvement of other systems is not seldom and injuries to the head, chest and abdomen are widely reported.^{4,5,10,11,15,16} In our study as well, injuries to these body parts have been found. A comparative study of our results and the literature is shown in Table 1.

In our study, 12 patients had urinary bladder injuries and 8 had urethral injuries, which were either isolated or associated with the bladder injuries. Two patients had vaginal rents caused by fragments from the fractured pubic rami. Similar vaginal lacerations were reported by Sunil et al.⁵

Death occurred in 11 of our patients (8 in the emergency department); 6 deaths had associated head injuries, blunt chest

Table 1
Epidemiological results of pelvic fractures by comparing the present study with literature.

Study	Incidence of pelvic fractures	Mean age (years)	Male gender	Caused by RTAs	Associated injuries and incidence					Mortality
					Head injury	BTA	BTC	Urogenital injuries	Lower limb fractures	
Gansslen et al. ¹¹	3	—	—	59.7	35	15	28	—	30	13.4
Giannoudis et al. ⁴	8	39	57.8	62.9	10	22	40	—	—	14.2
Demetriades et al. ¹⁰	9.3	—	—	—	—	—	—	16.6	—	13.5
Sunil et al. ⁵	—	29.99	82	80	—	—	—	21.8	—	8.97
Dzupa et al. ⁷	—	49.9	59.49	50	—	—	—	—	—	—
Mardanpour et al. ¹⁶	—	—	—	—	5.2	15.7	5.2	31.5	44.7	—
Yoshihara et al. ⁶	—	45	56	—	—	—	—	—	—	—
Yang et al. ¹⁵	—	—	—	—	17.59	11	7.2	—	21.5	—
Our study	2.82	37.57	74.7	77.3	22.7	28	10.7	22.7	29.3	11.7

All the data are expressed as percentage except for the mean age.

“—” means unstated.

RTA: road traffic accident; BTA: blunt trauma to abdomen; BTC: blunt trauma to chest.

trauma or blunt abdominal trauma and presented in a state of shock; the other 5 deaths were primarily because of the head injuries in 3 and abdominal injuries in 2. The high energy leads to multiple associated injuries, which are the most crucial factors leading to mortality. Hypovolemic shock associated with hemorrhage demands urgent resuscitation efforts; otherwise the patients may deteriorate in a very short time. Pelvic stabilization, maintenance of airway, breathing and body fluids, monitoring of input and output, along with vitals are crucial for survival, all of which require a coherent multidimensional approach by the entire trauma team.

Our treatment protocol was dependent and decided upon by two major factors: fracture stability and overall patient stability in view of associated injuries & co-morbidities. We managed 52 cases surgically as most of the fractures were unstable. The mean hospital stay was 14.4 days. Similar length of stays has been reported in literature.^{7,15–17}

The present study gives an idea about the demographic factors of pelvic fractures, their incidence and impact. We believe this is one of a kind study with adequate numbers in study population, a prospective design and elaborate findings. However there are some limitations. Due to the hospital being a tertiary centre, often several cases are not referred to it from the suburbs and rural areas, so absolute prevalence could not be commented upon, although incidence has been adequately discussed in the study.

In conclusion, pelvic fractures form a relatively rare trauma subset, however, with a documented high morbidity and mortality. In recent times due to increasing RTAs, the incidence is on a rise and the predilection of these injuries to young male adults has a potent economic impact especially, on developing nations. Proper road safety training and driving etiquettes and its strict implementation in true sense and spirit are the need of the hour. The treatment of most of these cases is surgery, wherever possible, and this aids in shorter hospital stays and could provide better outcomes.

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Ethical statement

This study has been approved by the local ethics committee and informed consent has been obtained from all the patients or their relatives.

Conflicts of interest

The authors declare no conflicts of interest.

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