



## Spine Injury Patterns in Adults: A Retrospective Study in a Tertiary Care Institute of North India

Authors

**Dr Yawar Haider<sup>1</sup>, Dr Tanveer Ahmed Bhat<sup>2\*</sup>, Dr Imtiyaz Ahmad Beigh<sup>3</sup>**

<sup>1</sup>Senior resident, Hamdard Institute of Medical Sciences and Research, New Delhi

<sup>2,3</sup>Postgraduate, Department of Orthopedics, GMC Jammu

\*Corresponding Author

**Dr Tanveer Ahmed Bhat**

### Abstract

**Background:** *To study epidemiological behaviour of spine fracture patterns in adult patients attending to a tertiary care hospital and their analysis with respect to age, gender, mode of trauma, neurological deficit if any and associated injuries.*

**Materials and Methods:** *All patients with acute spinal injury admitted to our hospital from May 2016 to December*

*2018 were included in this study. Each case was analysed with respect to given variables (age, gender, mode of injury, neurological deficit and associated injuries)*

**Results:** *There were 430 patients of acute spine trauma (260 males, 170 females in the age group 18 and above with mean age of 38.3 years) admitted in our orthopaedics department over 32 months period. 6.5 percent mortality was seen in patients admitted to the department. Lumbar spine injuries were more common followed by dorsal spine and cervical spine with thoracolumbar region accounting for most of the injuries.*

**Conclusions:** *Our study demonstrates relevance between spine fracture patterns and their mode of injuries.*

*Most patients were in the middle age group (31-40 years) with falls accounting for about 53.4% of injuries*

**Keywords:** *Spine trauma, Mode of trauma, Neurological deficit, thoracolumbar.*

### Introduction

Spine trauma represents minority among trauma patients but its socioeconomic and psychological burden is more than any other trauma.<sup>1</sup> The estimated annual incidence of spinal cord injury in US is approximately 525 to 1124 persons per million population.<sup>2,3</sup> Significant spinal column injuries are about twice as common as those causing spinal cord injury. Approximately 2% to 6% of trauma patients sustain a cervical spine

fracture. The highest risk occurs in patients who manifest a focal neurologic deficit (20%).<sup>4</sup> The annual rate of trauma-related thoracic and lumbar fractures is approximately 15,000.<sup>5</sup> 60% of thoracic and lumbar fractures occur between T11 and L2 vertebral levels.<sup>6</sup> Thoracic and lumbar fractures account for 30% to 50% of all spinal injuries in trauma victims. A spinal cord injury can be disabling or life-threatening with devastating long-term physical and psychological

consequences. An estimated 240,000 to 337,000 people in the United States are living with the sequelae of spinal cord injuries. It drains patients as well their families both economically as well as psychologically. The estimated life-time cost of treating a 25-year-old patient in US with a spinal injury can reach \$2.8 million. In the present study, we analysed our study population for correlations of spinal injuries to age, gender, fracture distribution, as well as other associated injuries.

**Materials and Methods**

All cases of spine trauma presenting to Govt medical college Jammu emergency orthopaedics department were analysed over a 32-month period. All cases of spine trauma warranting inpatient treatment were included in the study. Cases of spontaneous osteoporotic spinal fracture and other pathological spine fractures were excluded from the study. Patients aged below 18 years were also excluded from the study. The medical records section department was consulted to ensure the inclusion of all relevant cases. Cases were reviewed independently by two researchers. Registry was maintained documenting all the patient characteristics which included description of the injury and its mechanism, age, gender, neurological deficit if any, radiographic findings, concurrent non-spinal injuries.

**Results**

During the 32-month period, a total of 430 cases of traumatic spinal injury were managed at the study hospital. The cohort comprised 260 males (60.4%) and 170 females (39.6%). The overall male to female ratio was 1.52:1. 6 patients were pregnant at the time of injury. The annual incidence of traumatic spinal injury presenting to the orthopaedic department was 16.1 per 100,000 persons per year. 12.5% of the cases were poly trauma (n = 54).

**Age Profile**

The most common age group at which spine injury occurred was at 28-37years of age. The

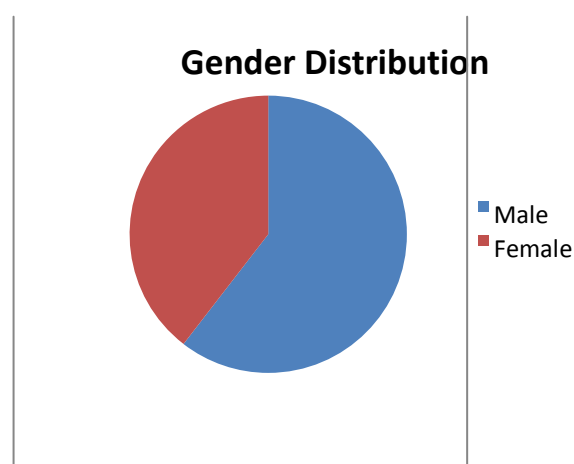
male to female ratio was approximately 1.5:1. For males, the peak incidence was at age 30. For females, the peak incidence was at age 32

**Table 1:** Age profile of traumatic spinal injury

Age groups	Number of males	Number of females	Percentage of total no. of patients
18-27	68	30	22.7%
28-37	96	66	37.6%
38-47	40	25	15.1%
48-57	24	28	12.1%
58-67	20	17	8.6%
68 & above	12	04	3.7%
TOTAL	260	170	100%

**Gender Distribution**

In our study among 430 patients admitted as cases of spine trauma 260 were males and 170 were females. Among female patients 6 were pregnant.



**Figure 1:** Gender distribution

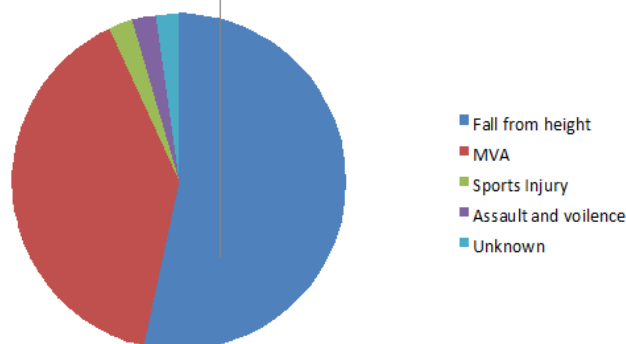
**Aetiology of Traumatic spinal Injury**

The causes of spine trauma seen in our cohort of study can be broadly divided into two groups: falls occurring in 230 cases (53.4%) and motor vehicle accidents (MVAs) 170cases (39.6%), sports related 10 cases (2.3%), assault and violence related 10 cases(2.3%). For both sexes the pattern of injury aetiology was almost identical.

**Table 2:** Aetiology of traumatic spinal injury

MODE OF TRAUMA	NUMBER OF CASES	PERCENTAGE OF TOTAL CASES
FALL FROM HEIGHT	230	53.4%
MOTOR VEHICLE ACCIDENTS	170	39.6%
SPORTS RELATED	10	2.3%
ASSAULT AND VIOLENCE RELATED	10	2.3%
UNKNOWN	10	2.3%
TOTAL	430	100%

Aetiology of traumatic spinal injury (%)



**Fall from height**

180 patients had history of fall from height of 1-5 metres (78.2%) ,30 patients greater than 5 metres (13%) and 20 patients less than 1 metre (8.7%). higher proportion of male falls occurred from a height more than 1 metre when compared to females, and conversely a higher proportion of female falls occurred at 1 metre or less.

**Table 3:** Fall from height

FALL FROM HEIGHT	NO. OF PATIENTS	PERCENTAGE OF TOTAL PATIENTS
<1 METRE	20	8.7%
1-5 METRES	180	78.2%
>5METRES	30	13%
TOTAL	230	100%

**Motor Vehicle Accidents**

170 cases occurred due to motor vehicle accidents (39.6%). most common due to two wheeler accidents followed by car and buses and pedestrian crossing the road.

**Traumatic Spinal Injury Patterns**

In 430 patients there were a total of 540 fractures in the vertebral column consisting of 380 vertebral body fractures, 280 compression fracture, 100 burst fractures, 50 subluxations, 10 fracture-subluxations, 20 unilateral lamina fractures, 30 bilateral lamina fractures, 30 transverse process fractures, 20 spinous process fractures. 260 (48%) of the 540 vertebral fractures were solitary while the remainder occurred in 170 patients as multilevel injury. Each patient with multilevel injuries sustained a mean of 1.6 fractures. The

overall mean number of fractures was 1.25 per Patient.

**Table 4:** Traumatic spinal injury patterns

Injury type	Number of injuries
Vertebral body fractures	380
Subluxations	50
Fracture –subluxations	10
Unilateral lamina fractures	20
Bilateral lamina fractures	30
Transverse process fractures	30
Spinous process fractures	20

**Relationship of Patient Age to Fracture**

On average, females sustain traumatic spinal injury at an older age than males. The mean age of male injury was 30 years (range 18 years and above) compared to 32 years (range 18 years and above) for females.

**Spine Trauma with Neurological Findings**

160 of the 430 patients had abnormal findings on neurological examination (37.2%). The male: female ratio for positive neurological findings was 3.3:1, suggesting that males are much more likely than females to sustain neurological injury as a result of sustaining spine trauma. 25 (5.8%) cases had bowel /bladder involvement.

**Anatomical Distribution Of Fractures In Spine**

Lumbar region accounted for 233(43%) of fractures, 178 (32.9%) fractures were of dorsal spine, 129 (23.8%) fractures were at cervical spine level.

**Table 5:** Anatomical distribution of spine fractures

Region of Spine Involved	No. Of Fractures	Percentage
Cervical Spine	129	23.8%
Dorsal Spine	178	32.9%
Lumbar Spine	233	43%
Total	540	100%

**Associated Injuries**

75 (17.4%) patients had associated injuries. 21 (4.8%) had head injuries, 11(2.5%) had abdominal injuries, 22(5.1%) had blunt chest injuries,21(4.8%) had upper limb fractures , 63 (14.5%) had lower limb fractures, 35(8.0%) had pelvic ring fractures and acetabular fractures.

**Table 6:** Associated injuries

Associated Injuries	No. Of Patients	Percentage Of Total Patients
Head Injuries	21	4.8%
Abdominal Injuries	11	2.5%
Chest Trauma	22	5.1%
# Upper Limb	21	4.8%
# Lower Limb	63	14.5%
#Pelvic Ring+Acetabulum	35	8.0%

### Discussion

The purpose of this study was to present an overview of epidemiological features of spine fractures in adult trauma patients. In addition, both male and female patients of age group 18 years and above were included in order to prevent statistical bias.

The study revealed that approx. 60% of the patients with vertebral fracture were male. This result suggested that men were more likely to sustain high-energy trauma, either due to their professions or recreational activities. The cervicothoracic junction fractures were mostly due to motor vehicle accidents, whereas the thoracolumbar junction experienced injuries due to falls. This observation can be explained due to the difference in biomechanical environment. The transition between the cervical and the dorsal spine is vulnerable to acceleration/deceleration force due to its relatively weak muscular support. Therefore, fractures are more likely to occur as a result of high-speed traffic accidents. In contrast, the thoracolumbar junction with its well defined muscular apparatus is structurally more protected against distraction forces, but on the other hand more prone to compression fractures, due to the greater weight acting on each individual vertebral body. This relative weakness against compression forces might be responsible for the greater number of fall associated fractures in the lumbar spine. Our data, supported by previously reported studies, demonstrated that thoracolumbar region was the most common site of spine fractures.

Associated injuries were seen in 17.4% of the study population. These injuries were more common in patients with motor vehicle accidents. The mean age of patients with associated injuries

was lower than those with only spine fracture patients. Most common associated injuries were those to the head, thorax and extremities. This much of evidence openly supports the hypothesis that high-energy trauma is the predominant cause of concomitant injuries. As mentioned above, high-energy traumas were more likely to be accompanied by associated injuries, such as head trauma or extremity fractures.

In our study neurological deficits were found in 37.2% of patients. This is in contrast to what previous studies have reported. Fall from height is implicated as mode of trauma in about 53% of spine fracture patients. This can be explained by the fact that ours being a hilly area and the profession mostly taken by our people in these areas exposes them to the risk of falls more than those residing in plains. Overall this study has brought some interesting facts in front of our eyes that might help our institution and primary care physicians in dealing with these group of patients. However, the retrospective nature of our work goes along with limitations, the most obvious being the dependence upon the quality of the data recorded in the medical records.

### Conclusion

This study describes the spinal fracture pattern seen in a tertiary care centre of North India. We can report that a spine trauma register can provide useful insights into injury patterns at a regional level and recommend the establishment of a standardised spinal trauma registry at a national and possibly international level in the future. Our study was the first investigation that attempted to calculate the burden of spinal fractures in our region. The present study showed a considerable burden for spinal fractures which is due to lifelong disability in subjects with spinal trauma. The results of this study can be used to advise policy makers, prioritization of preventive measures, support the evaluation of interventions, and provide guidance on the degree of impairment and disability following specific types of spinal trauma.

**References**

1. Deepa K, Julio C F, Michael G F. Epidemiology and Clinical Outcomes of Acute Spine Trauma and Spinal Cord Injury: Experience From a Specialized Spine Trauma Center in Canada in Comparison With a Large National Registry. *J Trauma* 2009;67: 936–943.
2. Banta G, ed. *Emergency Care and Transportation of the Sick and Injured*. Menasha, WI: American Academy of Orthopaedic Surgeons; 1987.
3. Lasfargues JE, Custis D, Morrone F, et al. A model for estimating spinal cord injury prevalence in the United States. *Paraplegia*. 1995;33(2):62–68.
4. Blackmore CC, Emerson SS, Mann FA, et al. Cervical spine imaging in patients with trauma: determination of fracture risk to optimize use. *Radiology*. 1999;211(3): 759– 765.
5. Grazier H, Praemer A, eds. *Musculoskeletal Conditions in the United States*. Rosemont, IL: American Academy of Orthopaedic Surgeons; 1999.
6. Reier PJ. Cellular transplantation strategies for spinal cord injury and translational neurobiology. *Neuro Rx*. 2004;1(4):424–451.