

Epidemiology of Traumatic Spinal Injuries in Western Nepal: A Hospital-Based Study

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Abstract

Introduction: Traumatic spinal injury (TSI) is one of the most devastating forms of trauma, leading to profound physical disability and socioeconomic burden. Global incidence rates of TSI vary widely. Nepal's mountainous terrain, narrow roads, and lack of protective infrastructure increase the risk for fall-related spinal trauma, yet regional data are limited. This study aimed to describe the epidemiology, clinical profile, and management of TSI patients presenting to a tertiary hospital in Western Nepal.

Methods: A prospective descriptive study was conducted over 12 months (April 2024–March 2025) at Western Regional Hospital, Pokhara. All patients presenting with acute TSI were included. Data on demographics, injury mechanism, anatomical level, neurological status, management, complications, and outcomes were analyzed using SPSS v20.

Results: Of 100 patients, the mean age was 48.8 ± 15.2 years. Most were middle-aged males. Falls were the leading cause, followed by blunt trauma and road traffic accidents. The lumbar spine was most commonly affected. Around 90% were ASIA E grade on presentation. Fifty two percent were managed non-operatively; 48% had surgical stabilization. Mean hospital stay was six days. In-hospital complications were minimal.

Conclusion: TSI in Western Nepal predominantly affects middle-aged men, with falls as the leading cause. Thoracolumbar injuries and complete neurological deficits are common. Fall prevention, improved road safety, and better prehospital care systems are needed.

Keywords: epidemiology; falls; Nepal; road traffic accidents; spine trauma; traumatic spinal injury

Introduction

Traumatic spinal injury (TSI) leads to long-term motor, sensory, and autonomic deficits, posing a significant global public health issue. Incidence varies worldwide, ranging from 3.4 per 100,000 in parts of Europe to 13.7 per 100,000 in Southeast Asia and over 50 per million in the U.S.^{1,2,3} Major causes include road traffic accidents (RTAs) and falls.^{4,5} In South Asia, falls from trees, rooftops, and cliffs are prevalent mechanisms of injury.⁶

Nepal's terrain and infrastructure contribute to a high risk of fall-related trauma. Narrow mountain roads, unprotected rooftops, unsafe staircases, and climbing during agricultural work increase vulnerability.^{7,8,9} During the monsoon, landslides and slippery paths exacerbate risks.¹⁰ Although several hospital-based studies exist from central and eastern Nepal, the western

region remains underrepresented.^{11,12,13}

Western Regional Hospital (WRH) in Pokhara, a major tertiary center, serves hilly districts in Gandaki Province. This study aimed to characterize the epidemiology, neurological status, and management of TSI cases treated at WRH.

Methods

A prospective, observational study was conducted at WRH from April 2024 to March 2025.

Ethical clearance was obtained from Institutional review committee (IRC) of Pokhara Academy of Health Sciences (IRC: 29/081). Informed written consent was taken from all patients. All patients presenting with traumatic spinal injury to the emergency or orthopedic outpatient department were included.

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Exclusion criteria: pathological fractures (e.g. malignancy, metastasis), isolated minor injuries (AO type A0), and patients who died before hospital arrival or declined consent.

Demographic details, mechanism and level of injury, ASIA grade, management strategy (conservative vs. operative), and outcomes were recorded using a structured proforma. Data analysis was done in SPSS v20 using descriptive statistics.

Results

Among the 100 patients analyzed, the mean age was 48.8 ± 15.2 years with a median age of 44 years (IQR: 20). The youngest patient was 14 years old, while the oldest was 86 years. The male-to-female ratio was approximately 3:1, and most individuals were engaged in manual labor or agricultural work.

Falls were the most common cause (~50%), especially from rooftops, trees, ladders, and hillsides. This was followed by road traffic accidents (~25%) and direct blunt trauma (~20%), highlighting environmental and occupational hazards in the region.

The lumbar spine was most frequently involved (42%), followed by thoracic injuries (26%) and injuries at the thoracolumbar junction. Cervical spine injuries were less common.

Table 1: Descriptive characteristics of patients with traumatic spinal injury (n = 100)

Variable	Category	Number (n)	Percentage (%)
Age (years)	Mean $\pm$ SD	48.8 ± 15.2	
	Median (IQR)	44 (20)	
	Range	14–86	
Sex	Male	75	75.0
	Female	25	25.0
Neurological status (ASIA grade)	ASIA A	3	3.4
	ASIA D	2	1.7
	ASIA E	95	94.8
Mode of transport	Taxi	40	40.0
	Ambulance	32	31.7
	Jeep	8	8.3
	Scooter	5	5.0
	Motorcycle	5	5.0
	Others (bus, minibus, car, police van)	10	10.0
Management	Conservative	52	52.0
	Surgical	48	48.0

As shown in the table below, a large majority of patients (94.8%) were classified as ASIA E, indicating normal motor and sensory function. Only 3.4% had complete spinal cord injury (ASIA A), while 1.7% were ASIA D, indicating some motor preservation. These findings suggest most patients did not suffer from severe neurological deficits, although a minority experienced functionally limiting injuries.

Limb fractures and minor head trauma were observed in approximately 4% of the cohort.

The mean duration from injury to hospital arrival was

approximately 32.4 hours, with extremes ranging from 1 hour to 15 days. This indicates substantial delays, particularly in remote areas. The most common mode of transport was taxi (40.0%), followed by ambulance (31.7%), as depicted in the pie chart below. Other methods included jeep (8.3%), scooter (5.0%), and bike (5.0%), with smaller fractions arriving by bus, mini bus, car, or police van.

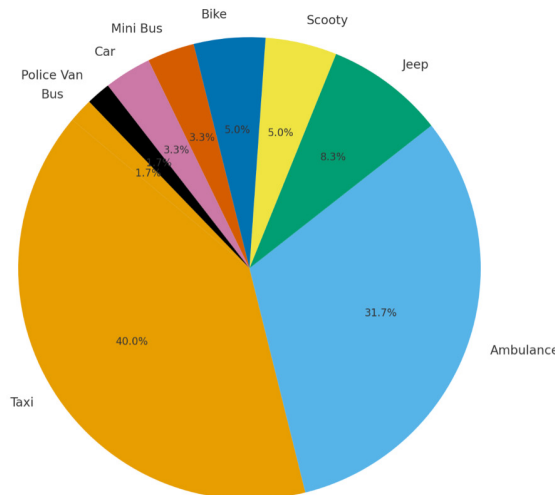


Fig 1: Mode of transportation to hospital

Management Approach: 52% of patients were managed conservatively (bed rest, bracing, physiotherapy), while 48% underwent surgical intervention using pedicle screw fixation, primarily for unstable thoracolumbar fractures as shown in Fig 2.

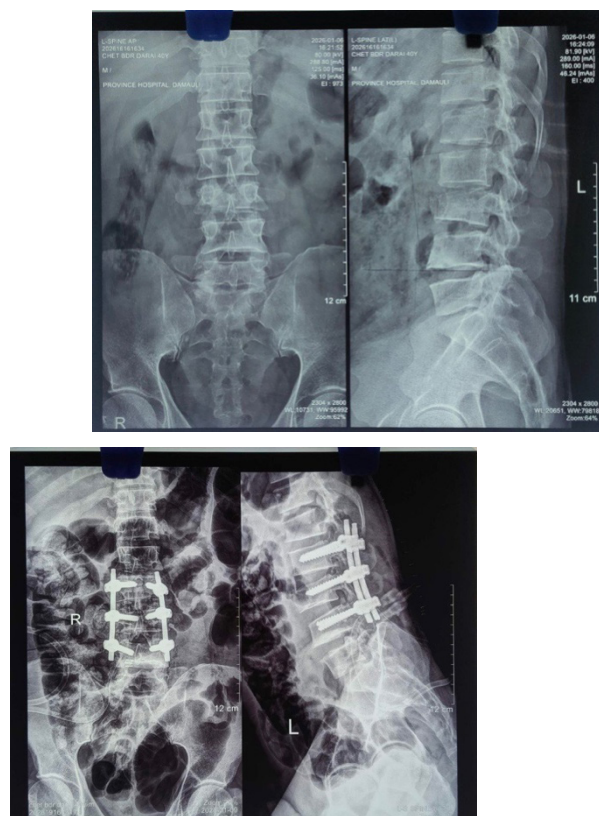


Fig 2: Posterior instrumentation L3 fracture

Hospital Stay and Complications: The mean hospital stay was

6 days, with a median of 4 days (IQR: 3). Only 2% of patients developed complications such as pressure sores or pneumonia. All patients survived until discharge.

Discussion

This study confirms that TSI in Western Nepal predominantly affects middle-aged males, with falls as the leading mechanism. Similar trends are reported in Eastern Nepal and other South Asian regions.^{5,12,13} In our setting, falls from trees and rooftops reflect occupational hazards in rural, hilly terrain.^{6,9,10}

Thoracolumbar junctions were most affected, consistent with injury biomechanics during vertical falls.¹⁵ A proportion presented with ASIA A injuries, mode of transportation in gaps in early transport, immobilization, and spine-specific care.^{16,17}

Compared to earlier studies from Eastern Nepal where surgery was rarely performed, our 48% operative rate reflects increasing capacity for spine surgery at WRH. Still, challenges persist with post-discharge rehabilitation and long-term follow-up.^{11,13,19}

As in our study regarding delay, similar delays and transport patterns have been reported in other low- and middle-income settings. In a Nepalese series of traumatic thoracolumbar spine injuries, the median injury-to-hospital time was 8 hours (IQR 4–48), with a substantial proportion arriving after several days, especially from remote regions.²⁰ Studies from Addis Ababa and Patan have likewise shown that taxis are the predominant mode of transport for injured patients (32–54%), while ambulances account for only 10–23% of arrivals, reflecting limited EMS coverage and high out-of-pocket costs.²¹ A systematic review of prehospital trauma care in low- and middle-income countries highlights similar barriers worldwide, including poor infrastructure, lack of trained prehospital providers and reliance on informal transport such as private cars, motorcycles and police vehicles.

As this was a single center study and convenient non sampling technique was used, the findings cannot be generalized and risks of selection bias exists.

Based on the findings of this study, further large-scale and multicenter research is recommended to validate the results and improve generalizability. Future studies should include a broader population and longer follow-up to better assess clinical outcomes and long-term implications. Incorporating additional relevant variables and more robust statistical analysis would strengthen the evidence base. These steps will help translate the findings into practical clinical application and guide evidence-based decision-making.

Conclusions

Traumatic spinal injuries in Western Nepal largely affect men in their working years. Falls from rooftops, trees, and hillsides are the leading causes, often resulting in thoracolumbar injuries and complete neurological deficits. Strengthening prevention, emergency response, and rehabilitation systems is essential to reduce morbidity and support recovery.

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