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Clinical Patterns and Management of Traumatic Spinal Injuries at a Tertiary Referral Hospital in Western Kenya: A Prospective Study

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ABSTRACT

Traumatic spinal injuries (TSI) are a significant cause of morbidity, disability, and socioeconomic burden, particularly in low- and middle-income countries where access to specialized care and rehabilitation remains limited. This study evaluated the clinical presentation, injury patterns, and management of TSI at Moi Teaching and Referral Hospital (MTRH), Eldoret, Kenya. A prospective descriptive study was conducted among 28 patients with TSI recruited through consecutive sampling. Data collected included demographics, injury mechanisms, anatomical levels, neurological severity, associated injuries, treatment modalities, complications, and functional outcomes. Neurological assessments was performed using the ASIA Impairment Scale. The mean age was 37.9 years (SD 12.4), with males comprising 85.7% of participants. Farmers (25%) and casual labourers (17.9%) were the most represented occupational groups. Falls were the leading mechanism of injury, while the lumbar spine was the most frequently affected region. Most patients (89.3%) had incomplete or no neurological impairment (ASIA D/E). Surgical intervention was performed in 67.9% of patients, with a mean time to surgery of 3.8 days (SD 3.22). The mean hospital stay was 12.8 days (SD 10.9). TSI predominantly affected economically active males, with falls being the leading cause. Strengthening occupational injury prevention, prehospital spinal care, timely referral, and comprehensive rehabilitation services may improve patient management in resource-limited settings.

Keywords: Traumatic spinal injuries; Spinal trauma; Neurological impairment; Surgical management; Kenya.

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INTRODUCTION

Traumatic spinal injuries (TSIs) represent a significant global public health challenge, contributing to substantial morbidity, long-term disability, mortality, and socioeconomic burden. These injuries commonly result from road traffic accidents, falls, violence, and sports-related activities [1, 2]. Traumatic mechanisms account for a substantial proportion of spinal cord injuries worldwide, making prevention and effective management important public health priorities [3]. The World Health Organization estimates that approximately 250,000–500,000 individuals sustain spinal cord injuries annually, although the actual burden may be underestimated, particularly in low- and middle-income countries (LMICs), where surveillance systems and healthcare infrastructure remain inadequate [4]. The epidemiology of these injuries varies geographically, reflecting differences in socioeconomic conditions, occupational exposures, transportation systems, and injury prevention strategies [5, 6].

TSIs disproportionately affect young, economically productive individuals, particularly those aged 20–40 years, resulting in considerable personal, familial, and societal consequences. Beyond neurological impairment and physical disability, affected individuals frequently experience secondary complications, including pressure ulcers, urinary tract infections, chronic pain, and psychological disorders such as anxiety and depression. These complications contribute to prolonged hospitalization, increased healthcare expenditure, reduced productivity, and diminished quality of life [7]. Effective management requires timely diagnosis, appropriate spinal stabilization, neurological assessment, surgical or non-surgical intervention, and comprehensive rehabilitation. However, access to these services remains limited in many resource-constrained settings [1].

Advancements in trauma systems, spinal surgery, critical care, and multidisciplinary rehabilitation have improved clinical and functional outcomes in high-income countries. Conversely, healthcare systems in LMICs continue to face challenges related to delayed presentation, inadequate prehospital care, limited diagnostic resources, shortages of specialized personnel, and insufficient rehabilitation facilities. These limitations may contribute to preventable complications, prolonged disability, and inconsistent treatment outcomes. In Kenya, traumatic spinal injuries constitute an important component of the trauma burden, with road traffic accidents, falls, and interpersonal violence representing major mechanisms of injury. Previous studies have highlighted challenges in spinal trauma management, including variations in treatment approaches, inadequate standardized protocols, and limited access to physiotherapy and occupational therapy services essential for restoring functional independence [8]. Despite improvements in surgical techniques and

trauma care, spinal injuries remain associated with considerable morbidity, long-term disability, and healthcare costs in Kenya [8, 9, 10].

Although previous research at Moi Teaching and Referral Hospital (MTRH) has examined aspects of spinal trauma, particularly thoracolumbar injuries, comprehensive prospective data describing injury patterns, clinical presentation, neurological severity, and treatment modalities across spinal regions remain limited. Understanding these characteristics is essential for improving clinical decision-making, resource allocation, and service delivery. Therefore, this study aimed to describe the clinical presentation and injury patterns of patients with traumatic spinal injuries and analyze the treatment modalities employed at MTRH, Eldoret, Kenya.

MATERIALS AND METHOD

A hospital-based prospective descriptive study was conducted at Moi Teaching and Referral Hospital (MTRH), a tertiary teaching and referral hospital located in Eldoret, Kenya. The hospital provides specialized trauma, orthopaedic, and neurosurgical services to patients from Western Kenya, the Rift Valley region, and neighbouring areas. The study included 28 adult patients aged 18 years and above with radiologically confirmed traumatic spinal injuries, including fractures, dislocations, and ligamentous injuries diagnosed using plain radiographs, computed tomography (CT), or magnetic resonance imaging (MRI). Patients with non-traumatic spinal conditions, pathological fractures, spinal tumours, congenital spinal deformities, severe cognitive impairment, or those who declined consent were excluded. Consecutive sampling was employed, whereby eligible patients presenting during the study period were recruited until the required sample size was achieved.

Data were collected prospectively using structured questionnaires, direct patient interviews, and standardized medical record abstraction forms. Information obtained included sociodemographic characteristics, mechanisms of injury, anatomical level of spinal injury, neurological status, clinical presentation and treatment modalities. Neurological impairment was assessed using the American Spinal Injury Association (ASIA) Impairment Scale. Treatment modalities were categorized as surgical interventions, including spinal decompression and stabilization, or non-surgical management, including immobilization and physiotherapy.

Data were analyzed using descriptive and inferential statistical methods. Categorical variables were summarized using frequencies and percentages, while continuous variables were presented as means and standard deviations or medians, as appropriate.

Ethical approval was obtained from the Institutional Research and Ethics Committee (IREC), reference IREC/1128/2025, approval number 0005111. Institutional authorization was

granted by MTRH (reference ELD/MTRH/R&P/10/2/V.2/2010), and a research license was obtained from the National Commission for Science, Technology and Innovation (NACOSTI), license number NACOSTI/P/25/4176662. Written informed consent was obtained from all participants before enrolment.

RESULTS

A total of 28 patients with traumatic spinal injuries (TSIs) were included in the study. The mean age was 37.9 years (SD 12.4), with a median of 36.5 years and an age range of 17–62 years. Most participants were male (85.7%, n=24), while females accounted for 14.3% (n=4). Farmers constituted the largest occupational group (25.0%), followed by casual labourers (17.9%), civil servants (14.3%), and motorcycle taxi riders (10.7%). Regarding educational attainment, 35.7% had completed tertiary education, 35.7% secondary education, and 25.0% primary education. Most participants were married (67.9%), and 89.3% reported receiving social support. The majority resided in semi-urban (39.3%) or rural (35.7%) areas, while 25.0% lived in urban settings.

Table 1: Patient characteristics

	n (%) (n=28)
Age	
Mean (SD)	37.9 (12.4)
Median [Min, Max]	36.5 [18.0, 62.0]
Gender	
Female	4 (14.3%)
Male	24 (85.7%)
Occupation	
Bodaboda rider	3 (10.7%)
casual labourer	5 (17.9%)
civil servant	4 (14.3%)
construction worker	2 (7.1%)
Farmer	7 (25.0%)
Mechanic	2 (7.1%)
small scale trader	1 (3.6%)
Student	3 (10.7%)
Teacher	1 (3.6%)
Education Level	
None	1 (3.6%)
Primary	7 (25.0%)
Secondary	10 (35.7%)
Tertiary	10 (35.7%)
Marital Status	
Married	19 (67.9%)
Single	8 (28.6%)
Widowed	1 (3.6%)
Social Support	
No	3 (10.7%)
Yes	25 (89.3%)
Living Environment	

Rural	10 (35.7%)
semi urban	11 (39.3%)
Urban	7 (25.0%)
Substance Use	
Alcohol	10 (35.7%)
Tobacco	2 (7.1%)
None	16 (57.1%)
Physical Activity	
No	4 (14.3%)
Yes	24 (85.7%)
BMI	
Mean (SD)	22.5 (1.68)
Median [Min, Max]	22.8 [19.4, 26.0]

Falls were the leading mechanism of injury, accounting for 53.6% (n=15) of cases, followed by road traffic accidents (28.6%, n=8) and blunt trauma (17.9%, n=5). The lumbar spine was the most frequently affected anatomical region (57.1%, n=16), followed by the sacrococcygeal region (14.3%, n=4) and upper cervical spine (10.7%, n=3). Neurological assessment using the American Spinal Injury Association (ASIA) Impairment Scale revealed that 50.0% (n=14) of patients had normal neurological function (ASIA E), while 39.3% (n=11) had ASIA D injuries. Complete neurological impairment (ASIA A) was observed in 7.1% (n=2), while 3.6% (n=1) had ASIA C injuries.

Table 2: Clinical Presentations

	n (%) (n=28)
Mechanism of Injury	
Blunt trauma	5 (17.9%)
Fall	15 (53.6%)
RTA	8 (28.6%)
Region of spine injury	
Lower Thoracic	2 (7.1%)
Lumbar	16 (57.1%)
Sacrococcygeal	4 (14.3%)
Subaxial C spine	1 (3.6%)
Thoracic	2 (7.1%)
Upper cervical	3 (10.7%)
ASIA Impairment Scale	
A	2 (7.1%)
C	1 (3.6%)
D	11 (39.3%)
E	14 (50.0%)
Loss Bowel Control	
No	23 (82.1%)
Yes	5 (17.9%)
Loss Bladder Control	
No	23 (82.1%)
Yes	5 (17.9%)
Associated Injuries Details	

Head injury	1 (3.6%)
N/A	19 (67.9%)
Pelvic fracture	3 (10.7%)
Pneumothorax	2 (7.1%)
Pneumothorax, head injury	1 (3.6%)
Rib fractures	1 (3.6%)
Tarsal fractures	1 (3.6%)
Time to Presentation	
Mean (SD)	2.11 (2.17)
Median [Min, Max]	1.00 [0, 9.00]

Pain was predominantly localized to the lumbar region (67.9%), followed by the cervical (14.3%), sacral (10.7%), and thoracic (7.1%) regions. Numbness was reported in 32.1% of patients, while lower limb weakness occurred in 39.3%. Loss of bowel and bladder control was reported in 17.9% of patients for each symptom. Associated injuries were documented in 32.1% (n=9) of patients, including pelvic fractures (10.7%), pneumothorax (7.1%), and other injuries involving the head, ribs, and extremities. The mean time from injury to hospital presentation was 2.11 days (SD 2.17), with a median of 1 day and a range of 0–9 days. Most patients (60.7%) had not received previous treatment before presentation.

All patients received immediate care upon presentation, including combinations of spinal immobilization, cervical collar application, medications, and intravenous fluid administration. The most frequently administered initial treatment combination was spinal immobilization, medications, and intravenous fluids (42.9%), followed by spinal immobilization and medications (21.4%).

Surgical management was performed in 67.9% (n=19) of patients, while 32.1% (n=9) received non-operative treatment. Surgical procedures done were decompression, posterior instrumentation, and fusion. Non-operative management included physiotherapy, medications, rehabilitation programmes, and cervical immobilization. The mean time to surgery was 3.79 days (SD 3.22), with a median of 3 days and a range of 1–12 days.

Table 3: Treatment modalities

	n (%) (n=28)
Immediate Care	
Yes	28 (100%)
Initial Treatments	
Cervical collar, Spine immobilization, Medications, Intravenous fluids	5 (17.8%)
Spine immobilization	1 (3.6%)
Spine Immobilization + Medications	6 (21.4%)
Spine immobilization + Medications + Intravenous fluids	12 (42.9%)
Medications only	4 (14.2%)
Surgical Treatment	19 (67.9%)
Non-Surgical Treatments	9 (32.1%)

Physical therapy, Medications, Rehabilitation programs	4 (14.3%)
Medications	1 (3.6%)
Medications and Rehabilitation programs	3 (10.7%)
Cervicalcollar	1 (3.6%)
Time_to_Surgery	
Mean (SD)	3.79 (3.22)
Median [Min, Max]	3.00 [1.00, 12.0]
Hospital_Stay_Days	
Mean (SD)	12.8 (10.9)
Median [Min, Max]	9.00 [2.00, 35.0]
Followup_Care	
Yes	28 (100%)
Followup_Type	
Outpatient physical therapy	1 (3.6%)
Outpatient physical therapy and neurological assessments	1 (3.6%)
Outpatient physical therapy, neurological assessments and Post-Operative surgical follow up	10 (35.7%)
Physical therapy and medications	5 (17.9%)
Medications	11 (39.3%)

The mean duration of hospitalization was 12.8 days (SD 10.9), with a median of 9 days and a range of 2–35 days. All patients received follow-up care, which included combinations of outpatient physiotherapy, neurological assessments, medications, occupational therapy, and postoperative surgical reviews. The most frequently documented follow-up categories were medications alone (39.3%) and combined outpatient physiotherapy, neurological assessment, and postoperative surgical follow-up (35.7%).

DISCUSSION

This study evaluated the clinical presentation, injury patterns, and treatment modalities of patients with traumatic spinal injuries (TSIs) at Moi Teaching and Referral Hospital (MTRH), Kenya. The findings demonstrated a predominance of young, economically active males, with falls being the leading mechanism of injury and the lumbar spine the most frequently affected anatomical region. Most patients presented with preserved or relatively mild neurological impairment, while surgical intervention constituted the predominant treatment modality. These findings provide insight into the epidemiology and management of spinal trauma in a resource-limited tertiary healthcare setting.

The predominance of males (85.7%) and the mean age of 37.9 years are consistent with previous studies demonstrating that TSIs disproportionately affect young, economically productive males, particularly in low- and middle-income countries [4, 5, 11, 12]. Similar demographic patterns have been reported in previous studies conducted at MTRH and Kenyatta National Hospital [8] [9] [10]. The high representation of farmers (25%), casual labourers (17.9%), and motorcycle taxi riders (10.7%) suggests substantial occupational exposure to injury-related hazards. These findings underscore the socioeconomic implications

of spinal trauma, particularly through lost productivity, prolonged disability, and increased dependency among economically active individuals. In contrast, studies from high-income countries have reported an increasing burden of spinal injuries among older populations, often associated with falls [13].

Falls accounted for 53.6% of injuries, followed by road traffic accidents (28.6%) and blunt trauma (17.9%). This distribution is consistent with findings from Rwanda, where falls accounted for 73.8% of cases, and northeastern Tanzania, where falls contributed to 66.6% of spinal injuries [1, 11]. Similarly, study conducted in Kenya reported falls as the leading mechanism of injury (45%) across three counties, followed by road traffic accidents (38%) [14]. However, another study at Kenyatta National Hospital identified road traffic accidents as the predominant mechanism, potentially reflecting differences in urbanization, traffic density, and occupational exposures [8]. These variations highlight the importance of context-specific injury prevention strategies, particularly occupational safety interventions and road traffic injury prevention.

The lumbar spine was the most frequently injured anatomical region (57.1%), followed by the sacrococcygeal region (14.3%) and upper cervical spine (10.7%). This pattern is consistent with previous Kenyan studies reporting a predominance of lumbar and thoracolumbar injuries [8, 10, 14]. Conversely, studies from Rwanda and other developing countries have reported a greater proportion of cervical spine injuries [1, 15]. Differences in anatomical injury distribution may reflect variations in injury mechanisms, trauma severity, and referral patterns. The predominance of lumbar injuries in the present study may be related to the high proportion of falls, although the relationship between injury mechanism and anatomical level was not specifically established.

Neurological assessment demonstrated that 50.0% of patients had normal neurological function (ASIA E), while 39.3% presented with ASIA D impairment. Complete neurological injury (ASIA A) was observed in 7.1% of patients. These findings are consistent with previous Kenyan studies reporting a predominance of neurologically intact or incomplete injuries [8, 10, 14]. Nevertheless, lower limb weakness was documented in 39.3% of patients, while bowel and bladder dysfunction each occurred in 17.9%, highlighting the importance of comprehensive neurological assessment. The relatively high proportion of patients with preserved neurological function may have influenced treatment selection and hospitalization duration.

Surgical intervention was performed in 67.9% of patients, while 32.1% received non-operative treatment. The surgical rate was substantially higher than the 27.5% reported at MTRH and the 33% reported at Kenyatta National Hospital [8, 10]. This difference may

reflect variations in injury severity, surgical indications, patient selection, and availability of specialist services and instrumentation. Surgical procedures included spinal stabilization with instrumentation, decompression, and fusion, consistent with established principles of managing unstable spinal injuries and neurological compromise [16]. Non-operative management involved immobilization, medications, physiotherapy, and rehabilitation, reflecting the continued role of conservative treatment in selected patients.

The mean time to surgery was 3.79 days (SD 3.22), which is comparable to findings from low- and middle-income countries [17]. A meta-analysis involving 3,819 patients, reported a significantly shorter mean time to surgery in high-income countries (1.92 days) compared with low- and middle-income countries (3.27 days; p=0.020) [17]. Although the present study demonstrated access to surgical intervention, the mean surgical delay exceeded the early intervention window frequently recommended for patients with acute traumatic spinal cord injury. Previous evidence has associated earlier decompression with improved neurological recovery in appropriately selected patients [16]. However, the present study did not establish an association between surgical timing and neurological recovery. Further evaluation of factors contributing to surgical delays, including referral pathways, theatre availability, and access to implants, may help identify opportunities for improving care.

The mean hospital stay was 12.8 days (SD 10.9), reflecting variation in injury severity and treatment requirements. This was shorter than the 25.6 days reported for high-income settings [17]. Differences in hospitalization duration may reflect variations in injury severity, rehabilitation pathways, healthcare resources, and discharge practices. All patients received documented follow-up care, including combinations of physiotherapy, neurological assessments, medications, and postoperative reviews. Rehabilitation remains essential for preventing secondary complications, restoring functional independence, and improving quality of life following spinal trauma [18, 19].

CONCLUSION

Traumatic spinal injuries at Moi Teaching and Referral Hospital predominantly affected young, economically active males, with falls being the leading mechanism of injury and the lumbar spine the most frequently affected region. Most patients presented with preserved or incomplete neurological function. Surgical management was the predominant treatment modality (67.9%), with a mean time to surgery of 3.79 days. Strengthening occupational injury prevention, prehospital care, timely referral, surgical services, and rehabilitation is essential to improving spinal trauma management in resource-limited settings.

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