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Pattern, Surgical Management, and Short-Term Neurological Outcomes of Traumatic Spinal Cord Injury Treated via the Posterior Approach: A Prospective Study at a Tertiary Centre in Sokoto, Northwestern Nigeria

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ABSTRACT

Background: Traumatic spinal cord injury (TSCI) is a major cause of neurological disability, particularly among young adults. Surgical management aims to achieve neural decompression, restore spinal alignment, and provide mechanical stability. However, data on neurological outcomes following posterior surgical management of TSCI in Northwestern Nigeria remain limited.

Objective: To determine the pattern, surgical management, and short-term neurological outcomes of patients with traumatic spinal cord injury treated through a posterior surgical approach at a tertiary neurosurgical centre in Sokoto, Northwestern Nigeria.

Methods: This prospective hospital-based descriptive study was conducted at the Regional Centre for Neurosurgery, Usmanu Danfodiyo University Teaching Hospital, Sokoto, from 1 November 2023 to 31 October 2024. Seventy-two adult patients with TSCI who underwent posterior surgical intervention were consecutively recruited. Sociodemographic characteristics, mechanisms and levels of injury, surgical procedures, and neurological outcomes were assessed. Neurological status was evaluated using the American Spinal Injury Association (ASIA) Impairment Scale preoperatively and at six months postoperatively. Data were analysed using descriptive statistics.

Results: A total of 72 patients were included, comprising 65 males (90.2%) and seven females (9.8%), with a mean age of 36.0 ± 16.2 years. The most affected age group was 21–30 years (25.0%). Road traffic accidents were the leading cause of injury (60.0%), followed by falls from height (25.0%) and gunshot injuries (15.0%). The thoracic spine was the most frequently affected region (47.2%), followed by the thoracolumbar and lumbar regions (26.4% each). Sixty-one patients (84.7%) underwent posterior spinal decompression and fixation, while 11 (15.3%) underwent decompression alone. Preoperatively, 49 patients (68.1%) had ASIA grade A injuries, nine (12.5%) had grade B injuries, and 14 (19.4%) had grade C injuries. At six months postoperatively, all 49 patients with ASIA grade A injuries remained neurologically unchanged. Among patients with grade B injuries, two (22.2%) improved to grade C, while eight of the 14 patients (57.1%) with grade C injuries improved to grade D. The remaining six patients (42.9%) with grade C injuries showed no neurological improvement.

Conclusion: Traumatic spinal cord injury requiring posterior surgical management predominantly affected young adult males, with road traffic accidents being the leading mechanism of injury. Thoracic injuries were the most common, and most patients presented with complete neurological deficits. At six months postoperatively, neurological improvement was observed more frequently among patients with incomplete spinal cord injuries, whereas no improvement was recorded among those with complete injuries. These findings emphasize the importance of injury prevention, timely access to specialist spinal care, and comprehensive postoperative rehabilitation.

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KEYWORDS:
Traumatic spinal cord injury, posterior surgical approach, spinal decompression, spinal fixation, ASIA impairment scale, neurological outcomes, Nigeria.

INTRODUCTION

Surgical management of traumatic spinal cord injury (TSCI) aims to achieve spinal cord decompression, restore spinal alignment, and provide stabilization to facilitate neurological recovery and rehabilitation [1]. In resource-constrained settings, the timing of surgery and selection of surgical approach are influenced by injury characteristics, neurological status, associated injuries, and available healthcare resources [2].

Traumatic spinal cord injury is associated with substantial morbidity, functional dependence, and socioeconomic burden for patients, families, and communities. Reports from Nigeria and other developing settings illustrate the challenges of clinical management and rehabilitation [3,4].

Surgical management is considered in selected patients with spinal instability, persistent neural compression, neurological deterioration, or deformity. The objectives include neural decompression, restoration of alignment, stabilization, and facilitation of rehabilitation. The Surgical Timing in Acute Spinal Cord Injury Study (STASCIS) reported an association between early decompression and improved neurological outcomes in selected patients with cervical TSCI [5]. However, decisions about surgical timing and approach depend on clinical stability, injury characteristics, and available resources.

The epidemiology of TSCI varies across geographical regions. Cripps et al. described substantial global variation in injury incidence and mechanisms, including road traffic collisions and falls [6]. The World Health Organization has also emphasized the considerable burden of SCI and disparities in access to comprehensive care [7].

Mechanisms of TSCI vary with age, setting, and socioeconomic circumstances; road traffic injuries, falls, and violence contribute in differing proportions across regions [6,7].

The proportion of complete and incomplete SCI and the prospects for neurological recovery depend on injury severity and case mix; comparisons across populations should therefore be interpreted cautiously [7].

The Global Burden of Disease (GBD) 2016 analysis estimated approximately 0.93 million new cases and 27.04 million prevalent cases of spinal cord injury globally in 2016, with falls and road injuries accounting for a substantial proportion of new cases [8].More recent GBD estimates further demonstrate the persistent global burden of spinal cord injury and considerable regional variation in incidence, prevalence, and disability [9].In Africa, the epidemiological profile of TSCI is influenced by demographic, socioeconomic, and healthcare factors, with road traffic injuries, falls, and interpersonal violence representing important mechanisms. Recent synthesis of African literature highlights substantial heterogeneity in the reported incidence, causes, mortality, and demographic characteristics of TSCI across the continent [10].

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JUSTIFICATION

Traumatic spinal cord injury (TSCI) remains a significant public health concern in Nigeria, particularly among economically productive young adults, because of its associated neurological disability, functional dependence, and substantial socioeconomic burden. Although several studies have documented the epidemiology, clinical characteristics, and management of TSCI in Nigeria, much of the available literature has focused on conservative management, general injury patterns, or heterogeneous populations comprising both surgically and non-surgically managed patients [3,11,12]. Consequently, there remains a paucity of prospective data specifically addressing the surgical management and subsequent neurological outcomes of patients with TSCI treated through a posterior approach.

Previous Nigerian studies, including those by Nwankwo and Uche [11] and Toluse and Adeyemi [12], have provided valuable information on the epidemiological characteristics, treatment patterns, and clinical outcomes of spinal cord injuries. However, these studies did not specifically evaluate six-month neurological outcomes in a defined cohort of patients undergoing posterior surgical intervention. Furthermore, the substantial impact of SCI on patients' health-related quality of life, as documented by Nasidi et al. [13], underscores the importance of understanding neurological outcomes following treatment.

More recently, Koko et al. [14] investigated the clinical pattern of spinal cord injury at a regional neurosurgical centre in Northwestern Nigeria, identifying young adult males as the predominantly affected population, road traffic accidents as the leading mechanism of injury, and cervical injuries as the most frequently involved anatomical region. Although this study provided important local epidemiological evidence, it did not specifically examine posterior surgical management or neurological outcomes following surgical intervention. Similarly, Kawu et al. [15] reported experience with spinal stabilization using pedicle screws and rods in Nigeria, but their study did not specifically address neurological recovery at six months among patients with TSCI managed through a posterior approach.

In Northwestern Nigeria, where access to specialized spinal care, advanced imaging, surgical facilities, and comprehensive rehabilitation services may be constrained, locally generated evidence on surgical management and neurological outcomes is particularly important.

Understanding the pattern and severity of injury, the surgical procedures performed, and changes in neurological status following treatment may provide valuable information for clinical decision-making, prognostic counselling, rehabilitation planning, and the organization of spinal trauma services.

Therefore, the present prospective descriptive study was undertaken to characterize the pattern of traumatic spinal cord injury, describe posterior surgical management, and assess neurological outcomes at six months postoperatively among patients treated at the Regional Centre for Neurosurgery, Usmanu Danfodiyo University Teaching Hospital, Sokoto. By focusing on a defined cohort of surgically managed patients, the study seeks to address an important gap in the existing regional literature and provide baseline evidence to guide clinical practice, improve patient counselling, inform healthcare planning, and support future comparative studies evaluating the effectiveness of surgical interventions for TSCI in resource-limited settings.

AIM

To determine Pattern, Surgical Management and Short-Term Neurological Outcome of Traumatic Spinal Cord Injury Treated by Posterior Approach.

STUDY AREA

The study was carried out in the Department of Neurosurgery, Usmanu Danfodiyo University Teaching Hospital Sokoto. The Hospital is one of the leading tertiary health institutions in the Northwestern region, located in Wamakko local government, Sokoto. It has 500 beds and includes the regional centre for Neurosurgery, which is a 60-bedded centre divided into three 20 bedded wards namely; Male Neurotrauma, Female/Paediatric and Male Neurosurgical wards. The Neurosurgery centre provides specialist services for Sokoto state, the northern region as well as neighboring countries.

STUDY DESIGN

Prospective Hospital-based descriptive study, carried out over a period of 1year (1st November 2023 to 31st October 2024)

STUDY POPULATION

All consented patients who underwent post-traumatic posterior spine surgery at the department of Neurosurgery of Usmanu Danfodiyo University Teaching Hospital who fulfill inclusion criteria

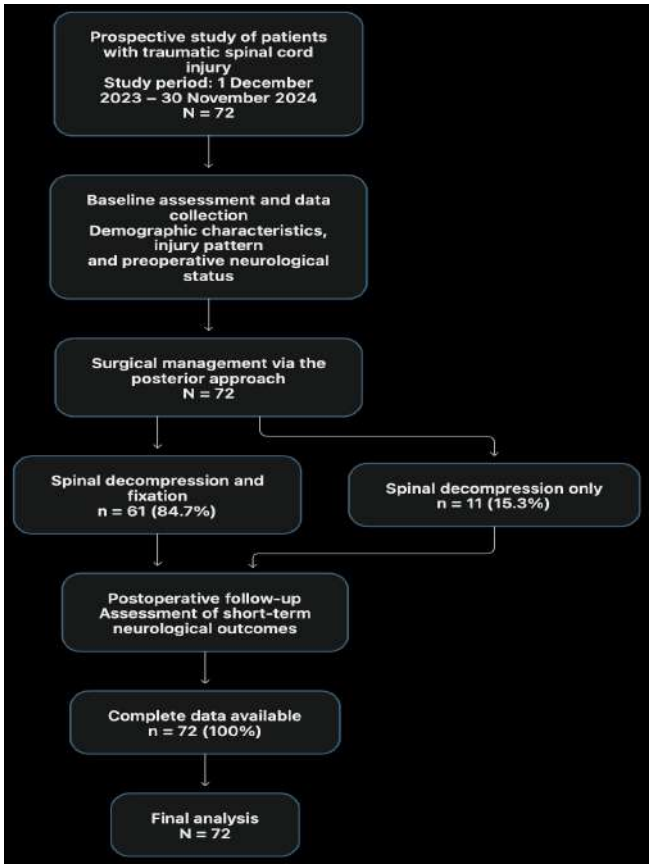
INCLUSION CRITERIA

Consented patients aged 18 years and above, who undergoes post traumatic posterior spine surgery.

EXCLUSION CRITERIA

Tandem (Non-contiguous multi-level) Traumatic Spinal cord Injury Polytraumatized patients-

FLOW DIAGRAM



CONSENT

Patient were adequately counselled, and an informed consent was obtained.

SAMPLING TECHNIQUE

Patients that fulfilled the inclusion criteria and consented were enrolled consecutively over the duration of the study.

DATA COLLECTION TOOL

A proforma was opened for each patient at the presentation where the age, sex,past medical history, comorbid conditions, current medications, current surgical diagnosis, operation to be performed, preoperative ASIA Grade, ASIA Grade at discharge, Six weeks, Six month and one year were entered into proforma.

OUTCOME ASSESSEMENT AND TIMING

The ASIA impairment grade was assessed by the principal i nvestigator in all patients immediate
preoperatively and at six months postoperatively.

DATA ANALYSIS

Data collected were analysed using the statistical package for social sciences (IBM-SPSS version 25.0). For qualitative variables, results were presented in tables, frequency and charts, while quantitative variables were presented using summary indices of measure, Mean and Standard deviation for variables that were normally distributed.

ETHICAL APPROVAL

Ethical approval was obtained from the ethical and research committee of the Usmanu Dan
fodiyo University Teaching Hospital. Informed consent were obtained from the patients .
UDUTH HREC Registration Number: NHREC/UDUTH-HREC/30/03/2023
Date:25/10/2023

DECLARATIONS

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Competing Interests

The authors declare that they have no competing financial or non-financial interests that could have influenced the conduct, analysis, or reporting of this study.

Data Availability

The datasets generated and analysed during the current study are not publicly available to protect patient confidentiality but may be obtained from the corresponding author upon request.

RESULTS

Table 1: Socio-Demographic Characteristics Of Participants

Variable	Frequuency
Age	
18-20	**14(19.4%)**
21-30	**18(25%)**
31-40	**15(20.8%)**
41-50	**9(12.5%)**
51-60	**8(11.1%)**
≥60	**8(11.1%)**
Mean± SD	**36.0 ± 16.2 years**
Sex	
Male	**65(90.2%)**
Female	**7(9.8%)**

The largest proportion of participants were aged 21–30 years (25%). Fourteen patients (19.4%) were aged 18–20 years, while eight (11.1%) were aged 60 years or older. The mean age of the participants was 36.0 ± 16.2 years.

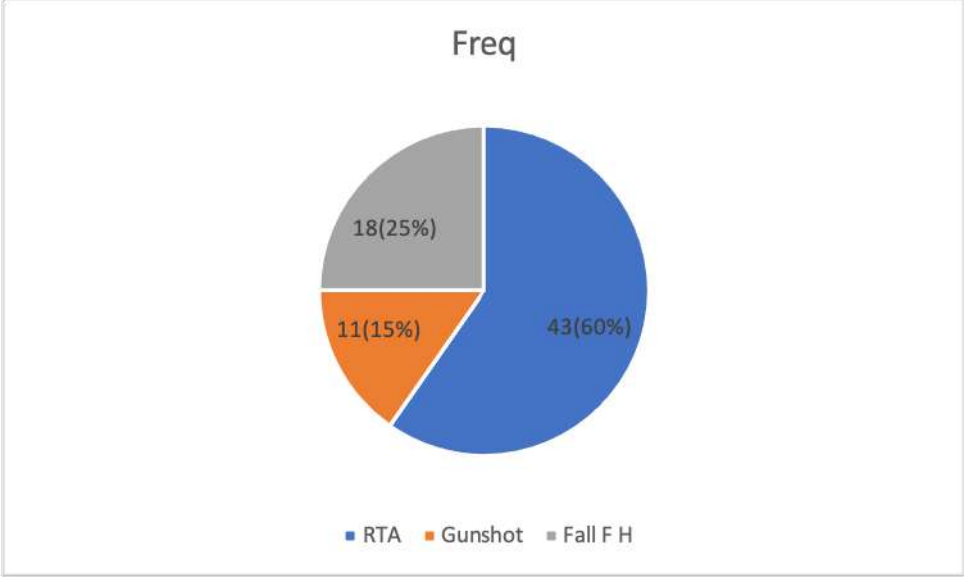


Figure 1: Mechanism of Injury Among Respodents

Road traffic accidents (RTAs) were the leading mechanism of injury, accounting for 43 patients (60%), followed by falls from height in 18 patients (25%) and gunshot injuries in 11 patients (15%).

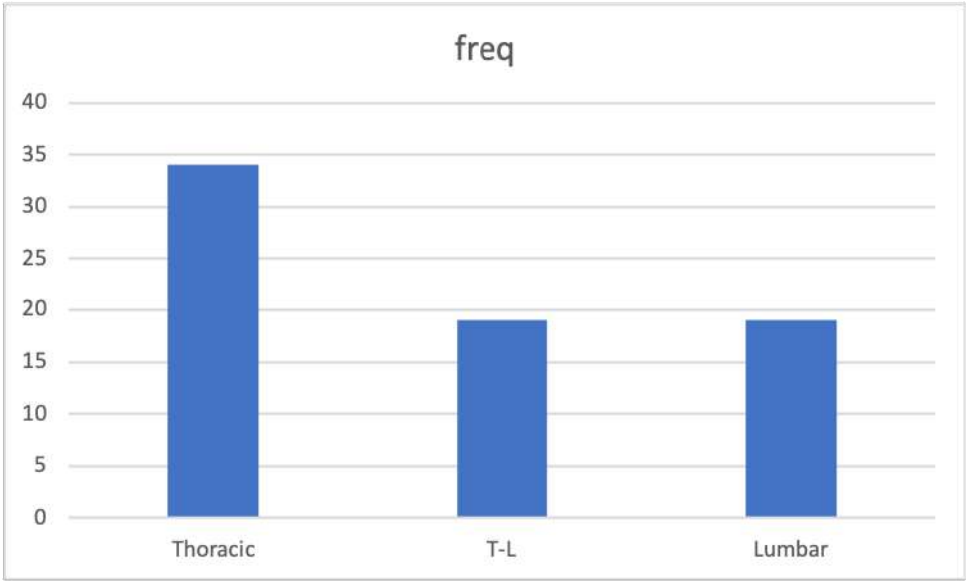


Figure 2: Level of injury among respondents

Thoracic spinal cord injuries were the most common, occurring in 34 patients (47.2%). Thoracolumbar and lumbar injuries were each observed in 19 patients (26.4%).

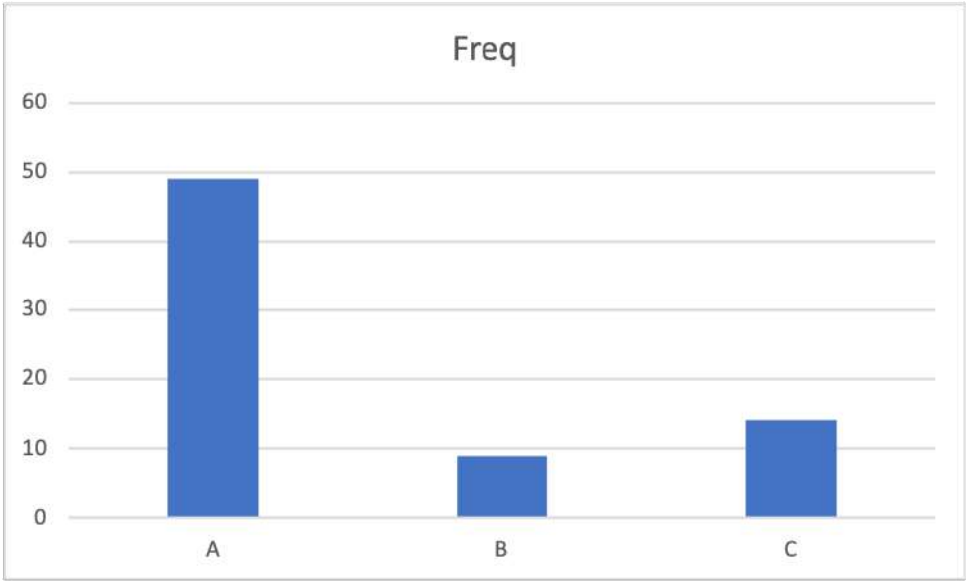


Figure 3:ASIA level of respondents

Most patients, 49 (68.0%), presented with an ASIA grade A injury, while 14 (19.4%) had ASIA grade C injuries and 9 (12.5%) had ASIA grade B injuries.

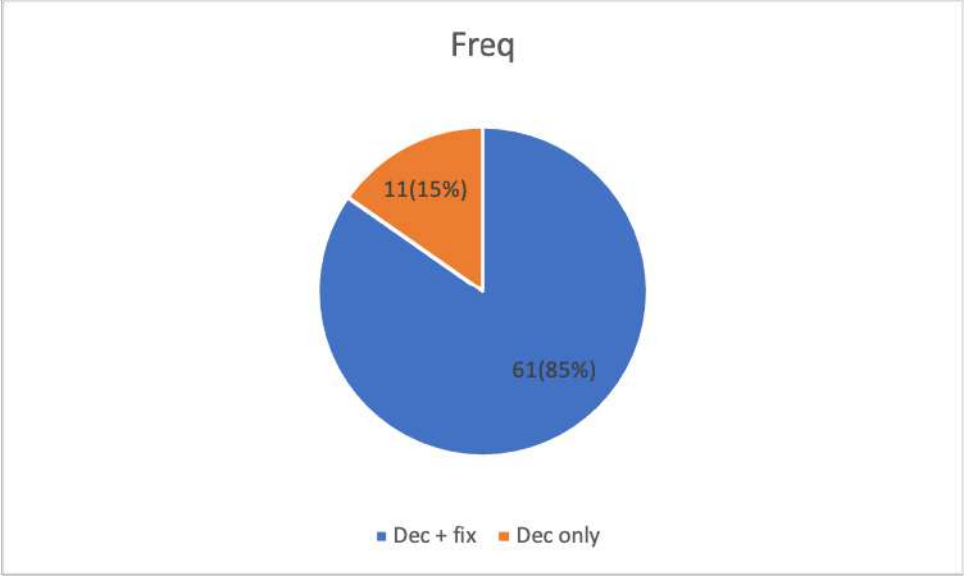


Figure 4: Surgical intervention among respondents.

Most patients (61; 85%) underwent spinal decompression and fixation, while the remaining 11 (15%) underwent decompression alone.

OUTCOME OF SURGICAL INTERVENTION AMONG RESPONDERS

Of the 49 patients who presented with preoperative ASIA gr ade A injuries, none (0%) demonstrated neurological improv ement to grade B, while all 49 patients (100%) remained at g rade A at six months postoperatively.

Of the nine patients with preoperative ASIA grade B injuries, 2 (22.2%) improved to grade C at the six-month postoperative assessment. Eight (8) out of 14 patients (57.1%) who presented with preoperative ASIA grade C injuries achieved grade D by six months postoperatively, while the remaining six patients (42.9%) showed no improvement and remained at ASIA grade C.

DISCUSSION

In this prospective cohort, 65 of 72 patients (90.2%) were male, and the largest age group was 21–30 years (25.0%). This predominance of young men is broadly consistent with Nigerian reports by Iwegbu [16], Emejulu and Ekweogwu [17], Obalum et al. [18], and Igun et al. [19]. Koko et al. likewise described a predominance of young adult men among patients with SCI at a regional neurosurgical centre in Northwestern Nigeria [14]. Differences in the proportions reported across studies may reflect variations in referral patterns, study periods, and inclusion criteria.

Road traffic accidents were the leading mechanism of injury in our study (43/72; 59.7%), followed by falls from height (18/72; 25.0%) and gunshot injuries (11/72; 15.3%). The predominance of road traffic injuries is consistent with the earlier Nigerian report by Iwegbu [16] and with the clinical pattern described by Koko et al. [14]. Studies from other settings, including that of Zeinali et al., have also documented variation in demographic characteristics and causes of SCI [20]. Although insecurity and firearm-related violence may be relevant contextual factors in Northwestern Nigeria, our descriptive data cannot establish the specific circumstances responsible for the gunshot injuries.

Most patients presented with complete neurological injuries (ASIA grade A: 49/72; 68.1%). Thoracic injuries were the most common anatomical category in our cohort (34/72; 47.2%), in contrast to the anatomical patterns reported in some other spinal injury series [18]. The distribution of injury levels should be interpreted in light of differences in study populations and inclusion criteria. Complications and mortality remain important considerations in SCI care, as highlighted in a Nigerian study by Kawu et al. [21]; however, these outcomes were not evaluated in detail in the present analysis. A retrospective study by Swain et al. described the distribution and patterns of blunt cervical spine injury in another setting [22].

Among the 49 patients who presented with preoperative ASIA grade A injuries, none demonstrated neurological improvement at six months postoperatively, with all 49 patients (100%) remaining at grade A. Of the nine patients with preoperative ASIA grade B injuries, two (22.2%) improved to grade C at the six-month follow-up. Similarly, among the 14 patients who presented with preoperative ASIA grade C injuries, eight (57.1%) improved to grade D, while the remaining six (42.9%) remained at grade C.

These findings demonstrate that neurological improvement during the six-month postoperative follow-up was more frequently observed among patients with incomplete spinal cord injuries than among those with complete injuries.This observation is consistent with the findings of Emejulu et al. [17], who reported an absence of neurological recovery among patients with complete spinal cord injuries.

Although neurological improvement was observed following posterior surgical management,the descriptive nature of the

present study and the absence of a non-surgical control group preclude establishing a direct causal relationship between surgical intervention and neurological recovery.Nevertheless, the findings provide useful information on the short-term neurological outcomes of patients undergoing posterior surgical management for traumatic spinal cord injury in our setting.

LIMITATION

Single centre study
No non-surgical control group (precluding attribution of recovery to surgery)
Single unblinded outcome assessor
Exclusion of polytrauma and tandem injuries (selection bias)
Absence of surgical timing, complication
Six-month follow-up only
No functional outcome measures.

CONCLUSION

This study demonstrates that traumatic spinal cord injury (TSCI) treated through a posterior surgical approach at our centre predominantly affects young adult males, with road traffic accidents being the leading cause of injury. Thoracic injuries were the most common, and most patients presented with severe neurological deficits (ASIA grade A). At six months postoperatively, neurological improvement was observed particularly among patients with incomplete injuries (ASIA grades B and C), whereas recovery among patients with complete injuries was limited. These findings highlight the importance of effective injury prevention, timely surgical management, and appropriate postoperative rehabilitation to optimize outcomes in patients with TSCI in Northwestern Nigeria.

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