RESEARCH ARTICLE

Epidemiology and functional dependence of spinal cord injury survivors in Pakistan: A prospective study

Neelam Bibi, Naeem Aslam

Abstract

Objective: To assess the epidemiology of traumatic spinal cord injury survivors in Pakistan, and to investigate the level of functional dependence of patients on their caregivers.

Method: The cross-sectional study was conducted from January 2021 to June 2023 after approval from the institutional ethics review board of the National Institute of Psychology, Quaid-i-Azam University, Islamabad, Pakistan, and comprised patients with spinal cord injury. Data was collected from spinal units of various public and private hospitals across the country. Demographic data, nature of injury, neurological level, aetiological factors of the injury, and functional dependence of patients were noted. Modified Barthel Index was used to measure the level of functional independence of the patients. Data was analysed using SPSS 26.

Results: Of the 205 patients, 121(59%) were males and 84(41%) were females. The overall mean age was 37.82±21.17 years, with 84(41%) being young adults, 50(26.3%) middle adults and 30(14.6%) adolescents. The most common cause was fall 74(36.1%), followed by road traffic accidents 64(30.2%), firearm injuries 40(19.5%) and sports injuries 11(5.4%). Majority of the patients had quadriplegic nature of injury 115(56.1%), involved cervical region 114(55.6%) and had American Spinal Injury Association neurological level A 152(74.1%). Total functional dependence was noted in 154(75.9%) cases.

Conclusion: In view of the specific epidemiology of spinal cord injury in Pakistani patients, it is crucial to develop a national registry for such patients.

Keywords: Epidemiology, Functional dependence, Rehabilitation, Spinal cord injuries. (JPMA 75: 1743; 2025)

DOI: https://doi.org/10.47391/JPMA.10997

Introduction

Spinal cord injury (SCI), one of the most distressing neurological conditions involving loss of motor and sensory functions of the injured, can affect anyone regardless of age, gender and other factors, and can have serious effects on many aspects of a person's life, including their ability to care for themselves and others.[1] Although it is unknown how many people globally are affected by SCIs, statistics from across the globe indicate that between 250,000 and 500,000 individuals globally suffer an SCI each year, with the majority being severe cases, and the absence of road or occupational security initiatives being the primary contributors to these accidents.[2]

The majority of common presentations comprises incomplete tetraplegia (41%), incomplete paraplegia (19%), complete paraplegia (18%) and complete quadriplegia (12%).[3] SCI is predominantly disturbing at the community level because it affects young or healthy persons aged 15-25 years. Traumatic SCI is the main cause of disability, healthcare expense and missed productivity.[4,5] SCI patients have difficulty performing the simplest of routine activities, like dressing, feeding and bathing. The quality of life in such individuals is highly compromised in view of the dependence factor. SCI affects not only the patient, but also family members and close social groups. The low quality of life in SCI patient is also found to be linked with onset of diseases at younger age, stumpy functional ability, low communal support, low mobility, marital status, spasticity and pain.[6]

In the past 20 years, SCI surveys have shown that men are more vulnerable than females, with the male: female proportions being as high as 10:1 in countries like Pakistan.[3] The most frequent aetiological cause for SCI in Pakistan has been reported to be a history of injuries, like falls and road accidents.[7] The risk of SCIs increases among adolescents because of hazardous behaviours, like reckless driving, climbing on trees, and trying to board moving vehicles.[8-10]

A study in Peshawar to investigate the epidemiology of SCIs among children aged up to 16 years[11] found that firearm injury was the most common cause, followed by fall from height, and road traffic accidents (RTAs). The majority of such patients have been reported to have SCI in the thoracic region, whereas the cervical is the least frequently reported area.[3,8]

Compared to the data in developed nations, gunshot

National Institute of Psychology, Quaid-i-Azam University, Islamabad, Pakistan.
Correspondence: Neelam Bibi. e-mail: neelam.yaseen@ymail.com
ORCID ID: 0009-0002-1115-0736

Submission completed: 09-10-2023 **1st Revision received:** 26-07-2024
Acceptance: 23-08-2025 **Last Revision received:** 19-08-2025

wounds to the spinal cord happen to be a cause unique to Pakistan.[12]

The current study was planned to examine the epidemiological characteristics and functional dependence of SCI patients in Pakistan.

Patients and Methods

The cross-sectional study was conducted from January 2021 to June 2023 after approval from the institutional ethics review board of the National Institute of Psychology, Quaid-i-Azam University, Islamabad, Pakistan, and comprised SCI patients whose data was collected from spinal units of various public and private hospitals across the country using convenience sampling technique. Patients having history of non-traumatic SCI, like multiple sclerosis, spondylosis and pyogenic meningitis, and those having any psychiatric or neurological disease were excluded. Written informed consent was taken from all the participants or their parents/guardians. The World Health Organisation (WHO) calculator was used for sample size estimation with confidence level 95%, margin of error 0.05 and expected response rate 0.08.[13]

The American Spinal Injury Association (ASIA) classification of SCI, which is a generally acknowledged standard determining the degree and nature of injury according to a comprehensive motor and sensory evaluation of the brain function, was used to establish the severity and neurological level of the injury.[14]

The Modified Barthel Index (MBI) was used to assess behaviour related to activities of daily living (ADLs), ranging from 0=complete reliance to 100=independence. A score of 0-20 indicates total dependency, 21-60 severe dependency, 61-90 moderate dependency, and 91-99 slight dependency.[14] The assessment is made by anyone who knows the patient well. With an internal consistency of 0.88 with ASIA scores in an SCI population, MBI is a highly dependable tool.

Data was analysed using SPSS 26. Data was expressed as mean±standard deviation, or as frequencies and percentages, as appropriate.

Results

Of the 250 SCI survivors approached, 205(82%) participated; 121(59%) males and 84(41%) females. The overall mean age was 37.82±21.17 years (range: 0-84 years). In terms of developmental stage, there were 7(3.4%) children, 30(14.6%) adolescents, 84(41%) young adults, 54(26.3%) middle adults, and 30(14.6%) late adults (Figure 1). The mean years of education was 8.69±5.43 years.

Regarding injury type, 115(56.1%) had quadriplegia and

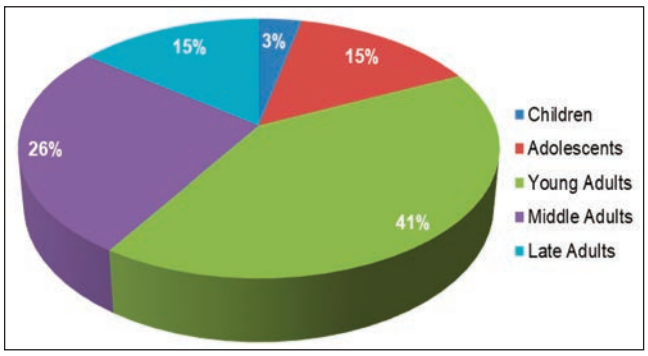

Figure-1: Age distribution on the basis of developmental level.

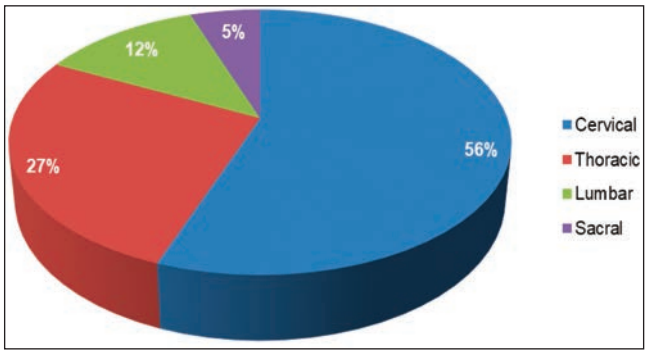

Figure-2: Type of spinal cord injuries.

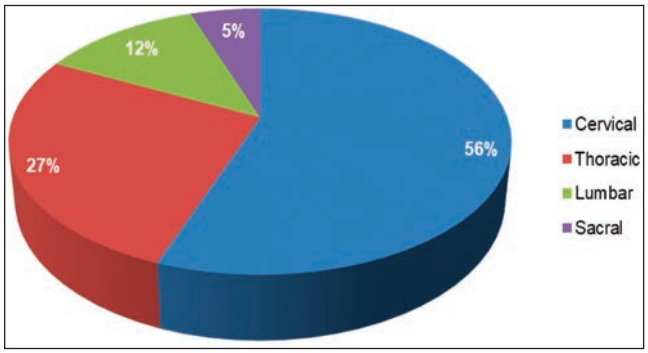

Figure-3: Causes of spinal cord injuries.

90(43.9%) had paraplegia. In terms of spinal region, 114(55.6%) patients had cervical injuries, 55(26.8%) thoracic, 25(12.2%) lumbar and 11(5.4%) had sacral injuries (Figure 2). Also, 152(74.1%) patients had ASIA-A injuries, and 49(24.4%) had ASIA-B injuries.

The most common cause of SCI was falls74 (36.1%), followed by 62(30.2%) RTAs, and 40(19.5%) gunshot or firearm (Figure 3). There were 154(75.9%) patients who were completely dependent on caregivers for ADLs (Table).

Discussion

Global literature has highlighted that SCI more drastically affects males compared to females,[3,11,15-17] and the current findings were similar.

In the current study, a large number of young adults had

Table-2: Patient characteristics (n=205).

Demographics	n (%)
Gender	
Male	121 (59.0)
Female	84 (41.0)
Age (in years)	
Childhood (0-10)	7 (3.4)
Adolescence (11-19)	30 (14.6)
Young Adults (20-40)	84 (41.0)
Middle Adults (41-60)	54 (26.3)
Late Adults (60+)	30 (14.6)
Marital Status	
Single	101 (49.3)
Married	104 (50.7)
Nature of Injury	
Paraplegic	90 (43.9)
Quadriplegic	115 (56.1)
Type of Injury	
Cervical	114 (55.6)
Thoracic	55 (26.8)
Lumbar	25 (12.2)
Sacral	11 (5.4)
Level of Injury	
ASIA A	152 (74.1)
ASIA B	49 (24.4)
Missing	4 (2.0)
Reason of Injury	
Road Traffic Accidents	62 (30.2)
History of Fall	74 (36.1)
Gunshot Injury	40 (19.5)
Sports Injury	11 (5.4)
Fall from electric poles	10 (4.9)
Other Accidents	8 (3.9)
Functional Dependence	
Total Dependency	154 (75.9)
Partial Dependency	49 (24.1)

ASIA: American Spinal Injury Association.

SCIs because they are more likely to participate in risky behaviours, including careless driving, climbing trees, and trying to board moving automobiles, like public transport busses. The findings were in line with previous research in Pakistan.[3,9,11]

Middle adults were the second most vulnerable group in the current study, which indicates that mostly people become victim of this life-changing injury in the most productive years of their life. There were 39 SCI patients aged 4-19 years. Paediatric SCIs are less common in Western countries, but in Pakistan such cases are common due to the poor infrastructure management, fall from height during kite-flying, fall from trees, bomb blasts and rash motorcycle driving.[11] In the West, history of fall is the commonest SCI cause.[4] A history of fall has also been identified as the primary cause of SCI in developing countries, such as Bangladesh, Turkiye, India, Nigeria and Nepal.[18] RTAs have been reported to be the second largest category of injuries in Pakistan, and it has also been reported as a major cause of traumatic SCI in Western countries.[16,19] According to national and global studies, falls from heights and RTAs are the two primary causes of SCIs.[11-20] Compression and burst fractures are typically caused by falls, whereas fracture dislocations are typically caused by RTAs.[21]

The current study reported higher frequency of cervical injury compared to thoracic, lumbar and sacral regions, and the finding was inconsistent with the majority of national literature[9,11,17] except one recent study in Pakistan[19] and were consistent with the findings of European countries .[22]

The current findings indicated that majority of patients had ASIA-A level of quadriplegic injuries. These findings were not consistent with earlier Pakistani studies in which the majority of SCI patients were paraplegic and had thoracic or lumbar injurie.[17] Studies conducted on disaster-hit populations, like earthquakes and bomb blasts, reported that the majority of patients had ASIA-A injuries.[9,12]

In the current study, the majority of SCI patients were totally dependent upon their caregivers for ADLs. Functional independence of traumatic SCI patients is correlated with their level of injury and the spinal region involved. Patients with lower SCI, such as lumbar and thoracic, are functionally more independent compared to those with cervical injuries.[5,19,23]

The current findings highlight the need of a national spinal cord database and the development of appropriate guidelines for the recovery of individuals with SCI. However, the current study has limitations, as it comprised only patients who reported to various spinal units, leaving out those who could not survive due to poor evacuation and rehabilitation mechanisms. Also, the study is based on one-time data from SCI patients on their functional dependence which might change after rehabilitation services. Nationwide empirical studies with due follow-up data are needed to validate the current findings.

Conclusion

Adolescents, particularly males in their prime years of efficiency, were found to be more susceptible to traumatic SCI. Most patients had history of fall, followed by RTAs, gunshot injury, and sports injury. ASIA-A level of injury having cervical region involved was the most common SCI, and majority of the patients were completely dependent on their attendants for ADLs.

Disclaimer: None.

Conflict of Interest: None.

Source of Funding: None.

References

1. Blanes L, Carmagnani MI, Ferreira LM. Health-related quality of life of primary caregivers of persons with paraplegia. Spinal Cord. 2007;45:399-403. doi:10.1038/sj.sc.3101966
2. Lenehan B, Boran S, Street J, Higgins T, McCormack D, Poynton AR. Demographics of acute admissions to a national spinal injuries unit. Eur Spine J. 2009;18:938-42. doi:10.1007/s00586-009-0919-9
3. Raja IA, Vohra AH, Ahmed M. Neurotrauma in Pakistan. World J Surg. 2001;25:1230-7. doi:10.1007/s00268-001-0071-0
4. American Spinal Injury Association. Facts on pediatric spinal cord injury. [Online] [Cited 2023 October 14]. Available from: URL: http://asiaspinalinjury.org/committees/pediatric/pediatric-committee-news-and-resources/pediatric-spinal-cord-injury-facts/
5. Barbetta DC, Cassemiro LC, Assis MR. The experience of using the scale of functional independence measure in individuals undergoing spinal cord injury rehabilitation in Brazil. Spinal Cord. 2014;52:276-81. doi:10.1038/sc.2014.3
6. Jain NB, Ayers GD, Peterson EN, Harris MB, Morse L, O'Connor KC, et al. Traumatic spinal cord injury in the United States, 1993-2012. JAMA. 2015;313:2236-43. doi:10.1001/jama.2015.6250
7. Butt RM, Shams S, Habib A, Raja IA, Sarwar A, Ahmed A. Epidemiology of spinal injuries. Pak J Neurol. 1997;3:20-5.
8. Rathore MF, Hanif S, Farooq F, Ahmad N, Mansoor SN. Traumatic spinal cord injuries at a tertiary care rehabilitation institute in Pakistan. J Pak Med Assoc. 2008;58:53-7.
9. Rathore MF, Rashid P, Butt AW, Malik AA, Gill ZA, Haig AJ. Epidemiology of spinal cord injuries in the 2005 Pakistan earthquake. Spinal Cord. 2007;45:658-63. doi:10.1038/sj.sc.3102074
10. Qureshi AA, Irfan A, Memon MA. Spinal injuries: a prospective study. Biomedica. 2001;17:27-9.
11. Darain H, Ilyas SM, Zeb A, Ullah I, Muhammad D. Epidemiology of spinal cord injury in Pakistan: a retrospective study. Phys Med Rehabil Kurortmed. 2017;27:106-9.
12. Arsh AH, Darain ZUH, Zeb A, Ali I, Ilyas SM. Epidemiology of spinal cord injuries due to bomb blast attacks, managed at paraplegic center Peshawar, Pakistan: a nine years retrospective study. [Online] [Cited 2023 December 22]. Available from: URL: https://www.kmuj.kmu.edu.pk/article/view/16814
13. Lwanga SK, Lemeshow S. Sample size determination in health studies: a practical manual. Geneva: World Health Organization, 1991.
14. Collin C, Wade DT, Davies S, Horne V. The Barthel ADL index: a reliability study. Int Disabil Stud. 1988;10:61-3. doi: 10.3109/09638288809164103.
15. Algahtany MA. Epidemiology, trend and in-hospital outcome of traumatic spinal injuries due to road traffic accidents. Pak J Med Sci 2022;38: 492-7. doi:10.12669/pjms.38.3.5288
16. Pickett GE, Campos-Benitez M, Keller JL, Duggal N. Epidemiology of traumatic spinal cord injury in Canada. Spine. 2006;31:799-805. doi:10.1097/01.brs.0000207258.80129.03
17. Qureshi MA, Khalique AB, Pasha IF, Asad A, Malik AS, Shah MQA, et al. Epidemiology of non-disaster spinal injuries at a spine unit. J Coll Physicians Surg Pak. 2010;20(10):667–70.
18. Masood Z, Wardug GM, Ashraf J. Spinal injuries: experience of a local neurosurgical centre. Pak J Med Sci. 2008; 24:368–71.
19. Sarfraz M, Shiren H, Shafee I, Firdous S, Liaquat AK. Assessment of functional independence in different levels of traumatic spinal cord injury patients of Pakistani population: a cross-sectional survey. Pak Biomed J. 2022;5:106-9. doi:10.54393/pbmj.v5i3.351
20. Chiu WT, Lin HC, Lam C, Chu SF, Chiang YH, Tsai SH. Epidemiology of traumatic spinal cord injury: comparisons between developed and developing countries. Asia Pac J Public Health. 2010;22:9-18. doi:10.1177/1010539509355470
21. Leucht P, Fischer K, Muhr G, Mueller EJ. Epidemiology of traumatic spine fractures. Injury. 2009;40:166-72. doi:10.1016/j.injury.2008.06.040.
22. Jain NB, Ayers GD, Peterson EN, Harris MB, Morse L, O'Connor KC, et al. Traumatic spinal cord injury in the United States, 1993-2012. JAMA. 2015;313:2236-43. doi:10.1001/jama.2015.6250 PMC+1
23. Agarwal P, Upadhyay P, Raja K. A demographic profile of traumatic and non-traumatic spinal injury cases: a hospital-based study from India. Spinal Cord. 2007;45:597-602. doi:10.1038/sj.sc.3102005.

Author Contribution:
NB: Concept, data collection, analysis, interpretation and report writing.
NA: Critical evaluation, revision, proof reading and final approval.