



A Retrospective Study of Injury Epidemiology of Spinal Injury Patients in a Tertiary Care Center of Madhya Pradesh

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ABSTRACT

Introduction: Spinal cord injuries are very disabling and devastating injuries. An understanding of epidemiology of spinal cord injuries is necessary for planning, for public resource allocation, for implementation of preventive measures and for providing better facilities and dedicated expert care. The objective of this study is to know the epidemiology of spinal cord injury along with identification preventable risk factor.

Materials and Methods: A total of 104 patients treated for spinal cord injury were retrospectively analysed by the data and record from hospital between July 2019 to August 2020 at Department of Orthopaedics, Shyam Shah Medical College and S.G.M. Hospital, Rewa, Madhya Pradesh. Parameters analysed were age, gender, and length of hospitalisation, type and mode of injury, seasonal variation of spinal injury, level of spinal injury, neurologic deficit, associated injury, treatment and complication.

Results: A Total 104 cases of spinal injury patients were analysed in one year duration from July 2019 to August 2010. 74 cases (71.1%) of the spinal cord injury patients were male and the mean age was 45.5 years (range 06-85 years). Male to female ratio was 2.46:1, the most prevent age group was 21-30 years (28.8%) followed by 41-50 years (20.1%). Fall from height was most common mode of injuries (42.3%) followed by road traffic accidents (36.5%). Most common level of injury was lumbar spine 45(43.2%) followed by thoracic spine 31(29.8%). Other associated injuries along with traumatic spinal cord injuries were lower limb injuries in 20 cases (19.2%) and upper limb injuries 8 cases (7.6%) followed by head injuries 8 cases (7.6%). Maximum cases of traumatic spinal cord injuries were reported during summer season 44(42.3). Average hospital stay was 27 days (range 1-53 days).

Conclusion: A large proportion of injury was seen among the Young age Male population as result of fall. Prevention program should expand their focus to include safety and avoidance of fall and to suggest step to improve the quality of care of the traumatic cord injury patients. Awareness on the part of general population, attendants of the patients, role of medical and paramedical staff, formulation and implementation of preventive measure regarding spinal cord injury need to be addressed.

Keywords: Spinal Cord Injury, Trauma, Epidemiology, Rehabilitation.

INTRODUCTION

Traumatic spinal cord injuries are major cause of morbidity and mortality around the globe. In India, the average annual incidence of Spinal Cord Injury is 15,000 with a prevalence of 0.15 million¹. According

to the World Health Organization (WHO), the incidence of Spinal Cord Injury is increasing in developing countries including India, and the health-care burden due to Spinal Cord Injury is expected to

be similar to that in the developed world². Epidemiological studies provide local estimate of incidence and prevalence, identify the high-risk group and thus provide insight into priorities for resource allocation, etiologic research and preventive measures, they also provide a baseline from which to monitor the effectiveness of intervention which may modify or eliminate the risk factors and may decrease the incidence of this incapacitating injury³. The physical, personal, financial and social impact of spinal cord injury is such that most patients are lost in follow up or succumb to life-threatening complications associated with spinal cord injury. However, inadequate precaution during transportation can cause further injury to the already compromised spinal cord in spinal injured patients⁴. Spinal cord injury reduces the quality of the life by developing several complications such as decubitus ulcers, chronic pain, spasticity, bowel/bladder dysfunction and compromised sexual function^{5,6}. The objective of this study is to evaluate the associated and preventable risk factor along with epidemiology of traumatic spinal cord injury. Study was done between July 2019 to August 2020 at Department of Orthopaedics, Shyam Shah Medical College and S.G.M. Hospital, Rewa, Madhya Pradesh. It receives patients from geographical area of Rewa, Satna, Sidhi, Singrauli, Shahdol, Umaria, Panna district of Madhya Pradesh. There is a lack of published literature on epidemiology of traumatic spinal cord injury patients from Madhya Pradesh region. A thorough understanding of epidemiology of spinal injuries is essential for formulation and implementation of preventive measures as well as medical and rehabilitation care.

Material and method: A Retrospective study was conducted between July 2019 to August 2020 at Department of Orthopaedics, Shyam Shah Medical College and S.G.M. Hospital, Rewa, Madhya Pradesh. All the patients with traumatic spinal cord injuries admitted in our medical college hospital were included in this study. Inclusion criteria -All traumatic Spine injury patients come to Department of Orthopaedics. Exclusion criteria- Underlying life threatening systemic disorders and Prior history of any surgery, infection, malignancy, metastasis. Detailed history with respect to age, gender, mode of trauma, type and mechanism of injury, associated spinal fracture, neurologic deficit, length of hospital

stay, treatment, complication, education, socio-economic status, occupation, was taken. All the cases were graded according to ASIA scale. Primary and preoperative care was taken in all the patients in the form of immobilisation (crutch field tong, cervical hard or soft collar, lumbosacral belts), all routine investigation, X-ray, MRI, and supportive care like catheterisation, IV fluids, regular physiotherapy (bed rolling) to prevent bedsores along with bedsores care. Operative treatment was done with implants according to need of different level of injury. Postoperative care along with physiotherapy was done. Patient discharged from hospital with proper home care advice, follow up and rehabilitation.

RESULTS: Total one hundred and four (104) patients with traumatic spine injury included in our study. Out of these 74 patients (71.1%) were male and 30 (28.9%) patients were female. Male to female ratio in our study was 2.46:1. The most prevalent age group in our study 21-30 years (28.8%) followed by 41-50 years (20.1%). In our study most common mode of injury was fall from height like unprotected roof, construction building, uncovered well, tree, electric pole in 44 cases (42.3%), followed by road traffic accident in 38 cases (36.5%). Other cause of injuries were fall on ground in 14 cases (13.4%) and assault in 4 cases (3.8%) and fall of heavy object in 4 cases (3.8%). In our study lumbar spine vertebra was fractured in 45 cases (43.2%) followed by thoracic spine vertebra in 31 cases (29.8%). Cervical spine injuries noted in 28 cases (26.9%). No patient with sacral spine injuries noted in our study. 84 (80.7%) Patients were presented with neurological deficit. Out of these 104 patients, 44 patients were having complete neurological deficit in the form of quadriplegia and paraplegia and 40 cases were having incomplete neurological deficit in the form of quadriparesis and paraparesis. These cases of spinal cord injury were graded as per ASIA grades. Grade A (complete motor and sensory weakness) in 44 cases, Grade B (incomplete) in 10 cases, Grade C (incomplete) in 13 cases, Grade D (incomplete) in 17 cases and Grade E (normal) in 20 cases. Out of 104 cases of Traumatic Spinal Injuries 41 cases (39.4%) had other associated body injuries. Most common of these injuries was lower limb injuries in 17 cases (16.3%) and upper limb injuries 8 cases (7.6%) followed by head injuries 8 cases (7.6%), pelvic injuries 4 cases (3.8%), abdominal injuries 2 cases

(1.9%) and chest injuries in 2 cases(1.9%). We also notated seasonal variation in traumatic spinal injuries cases. There is high incident of spinal trauma in summer 44 cases(42.3%). Out of 104 patients 45

(43.2%) cases were managed surgically and 59 (56.7) cases were managed conservatively. Average hospital stay was 27 days (range 1-53 days).

Table 1- Age and Sex distribution of spinal injury cases

Age Group in years	Males(74)	Females(30)	Total(104)
0-10	2	1	3
11-20	5	7	12
21-30	24	6	30
31-40	16	3	19
41-50	15	6	21
51-60	3	3	6
61-70	2	3	5
71-80	2	2	4
>80	1	3	4

Table 2-Mode of Injury

Mode	Number	Percentage%
Fall from height	44	42.3
RTA	38	36.5
Fall on ground	14	13.4
Fall of heavy object	4	3.8
Assault	4	3.8

Table 3- Level of Spine Injury

Level of Spine	No. of cases
Cervical spine	28(26.9)
Dorsal spine	31(29.8%)
Lumbar spine	45(43.2%)

Table 4-Grade of Injury According to ASIA Scale

Grades	No. of Cases	Percentage%
A Complete	44	42.3
B Incomplete	10	9.6
C Incomplete	13	12.5
D Incomplete	17	16.3
E Normal	20	19.2

Table 5- Associated Injuries

Associated Injuries	No. of cases-(41)	Percentage % (39.4%)
Lower Limb	17	16.3
Upper Limb	8	7.6
Head	8	7.6
Pelvic	4	3.8
Chest	2	1.9
Abdomen	2	1.9

Table 6- Complication

Complication	No of cases (35)	Percentage (32.6%)
Decubitus Ulcer	5	4.8
Pulmonary	10	9.6
Abnormal Temp. Control	14	13.4
UTI	4	3.8
Electrolyte	2	1.9

DISCUSSION: Traumatic spinal cord injuries produce profound emotional and psychological impact on personal and family's life. Epidemiological and demographic distribution data of TSI in our country is essential for strengthening the health care facility, taking preventive measure along with conservative treatment and rehabilitation of patients⁸. In time, this will allow local areas to understand

likely causes of SCI in their regions, develop models or programs to address and compare the effect of prevention strategies as well as epidemiological and societal trend⁷. Rescue and retrieval systems for spinal injured patients are woefully lacking in India, and are likely to remain so for some time to come; but education of the public regarding precautions during transportation would be valuable⁷.

So many studies from developed countries available in the matter of traumatic spinal injuries but their epidemiological data are different to Indian scenario. This is because of difference in literacy, occupation, available health care facilities and demographic distribution of population in developed countries⁸.

The most prevalent age group in our study was 21-30 years (28.8%) followed by 41-50 years (20.1%). that is similar to other studies^{9,10,11}. In previous studies younger age male are more prone to spinal injury due to more outdoor, occupational activity and driving

activities^{12,13,14}. In older age group female is more risk than male for traumatic spinal injuries due to osteoporotic bony changes⁸. In our study Sex distribution has shown a male predominance with Male to female ratio was 2.46:1 that is comparable to other recent studies^{8,11,15,16}. Signifying higher incidence in young, active and productive population of the society. Higher incidence in males can be explained by examination of etiological factors, men being more exposed to risk factors since they are more active on account of occupation¹⁶.

Table 7- Compare of sex ratio in different series

David chen (India)	3.7:1
Karachan et al (Turkey)	2.5:1
Roop singh et al (India)	2.96:1
Malav et al (India)	2.16:1
Present study (India)	2.46:1

In our study most common mode of injury was fall from height 44 cases (42.3%), followed by road traffic accident in 38 cases (36.5%). In study of Malav et al⁸ most common mode of injury was fall from height (44.9%), and road traffic accident (43%). In study of R.Singh et al¹⁶ also most common cause of injury was fall from height (44.5%) followed by Motor vehicle accidents (34.7%). Possible cause of variation could be houses lack essential fencing of the terrace and guarding of the staircase, thereby making fall from height, a realistic possibility in study¹⁷. In our study lumbar spine vertebra was fractured in 45 cases (43.2%) followed by thoracic

spine vertebra in 31 cases (29.8%). Cervical spine injuries noted in 28 cases (26.9%). No patient with sacral spine injuries noted in our study. In study of Malav et al⁸ lumbar spinal column was fractured (55%) followed by thoracic spine (22.78%) and cervical spine injuries noted in (20.8%). Study of ville niemi et al¹⁸, also represent similar results¹⁸. In our study highest incidence of traumatic spinal injuries noted in summer season that is similar to studies of G J Singh et al¹⁹ and Malav et al⁸. It can be explained by more agriculture and social activities in summer season and people try to confined in their home in rainy and winter season^{16,19}.

Table 8- Comparison of mode of injuries in different series

Series	Fall from height in %	RTA in %
Chacko et al ⁶	52.2	12.8
G J Singh et al ¹⁹	59.42	35.08
Dave et al ²⁰	49.4	36.5
Malav et al ⁸	44.9	43
Present study	44.5	34.7

Conclusion: Traumatic spinal cord injury is major cause of morbidity and mortality in Indian subcontinent. Male with young age were more commonly affected as compared with older age population and female. Fall from height and RTA are the two major cause of traumatic spinal cord injury. Prevention remains the most effective way to reduce the burden of the traumatic spinal cord injuries. Awareness and orientation on the part of general population, attendants of the patients, medical and paramedical staff team work regarding spinal cord injury management, along with formulation and implementation of preventive strategies and rehabilitation.

References:

1. Rehabilitation Council of India. Spinal Cord Injury. Available from: <http://www.rehabcouncil.nic.in/writereaddata/spinal.pdf>.
2. Woolf AD, Pfleger B. Burden of major musculoskeletal conditions. Bull World Health Organ 2003;81:646-56.
3. Pickett GE, Campos-Benitez M, Keller JL, et al. Epidemiology of traumatic spinal cord injury in Canada. Spine (Phila Pa 1976) 2006;31(7):799-805.
4. Burney RE, Waggoner R, Maynard FM. Stabilization of spinal injury for early transfer. J Trauma 1989;29(11):1497-1499.
5. Scovil CV, Ranabhat MK, Craighead IB, Wee J. Follow-up study of spinal cord injured patients after discharge from inpatient rehabilitation in Nepal in 2007. Spinal Cord. 2012;50:232-7.
6. Chacko V, Joseph B, Mohanty SP, Jacob T. Management of spinal cord injury in a general hospital in rural India. Paraplegia. 1986;24:330-5.
7. Shankara K, Halesha B. R. "Traumatic Spinal Cord Injuries in a District Hospital: An Epidemiological and Functional Outcome Study". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 71, December 18; Page: 15098-15103.
8. Malav RA, Chand G. A retrospective study epidemiological analysis of traumatic spinal injuries in Rajasthan, India. IP Indian J Neurosci 2021;7(1):1-4.
9. Sinha DK. Manual of Patna Model for the care of Spinal cord injury patients Patna. SPARSH. 2000;9(13).
10. Annamalai K, Chinnathambi R. Spinal cord injuries -The challenges and the achievements. Chennai: Deptt. of Orthopaedic Surgery. 1998;p. 1-50.
11. Karacan I, Koyuncu H, Pekel Ö, Sümbüloğlu G, Kınap M, Dursun H, et al. Traumatic spinal cord injuries in Turkey: a nationwide epidemiological study. Spinal Cord. 2000;38(11):697-701. doi:10.1038/sj.sc.3101064.
12. Bouyer B, Vassal M, Zairi F, Dhenin A, Grelat M, Dubory A, et al. Surgery in vertebral fracture: Epidemiology and functional and radiological results in a prospective series of 518 patients 1 year's follow-up. Orthop Traumatol Surg Res. 2015;101(1):11-15.
13. Akmal M, Trivedi R, Sutcliffe J. Functional outcome in trauma patients with spinal injury. Spine (Phila Pa 1976). 1976;28:180-5.
14. Hasler RM, Exadaktylos AK, Bouamra O, Benneker LM, Clancy M, Sieber R, et al. Epidemiology and predictors of spinal injury in adult major trauma patients: European cohort study. Eur Spine J. 2011;20(12):2174-80. doi:10.1007/s00586-011-1866-7.
15. David C. Medical complications during acute rehabilitation following spinal cord injury - current experience of model systems. Arch Phys Med Rehabil. 1999;80:1397-401.
16. Singh R, Sharma S, Mittal R, Sharma A. Traumatic Spinal Cord Injuries in Haryana : An Epidemiological Study. Indian J Community Med. 2003;28(4).
17. Pandey VK, Nigam V, Goyal TD, et al. Care of posttraumatic spinal cord injury patients in India: an analysis. Indian J Orthop 2007;41(4):295-299.

18. Niemi-Nikkola V, Saijets N, Ylipoussu H, Kinnunen P, Pesälä J, Mäkelä P, et al. Traumatic Spinal Injuries in Northern Finland. *Spine*. 2018;43(1):45–51.
19. Singh GJ, Munda VS, Murmur NN. Epidemiology of Spinal Injury in North East India: A Retrospective Study. *Asian J Neurosurg*. 2018;13(4):1084–6.
20. Dave PK, Jayaswal A, Kotwal PP. Spinal cord injuries -A clinicoepidemiological study. *Ind J Orthop*. 1994;28:39–45.