

Traumatic Cervical Spine Injury Pattern– A Snapshot

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Abstract

Study design and subjects: Cross-sectional descriptive study of pattern of cervical spine injury at a tertiary care rehabilitation centre in Rajasthan.

Objectives: To observe the socio demographic profile and injury pattern in cervical spinal cord injury.

Methods: One hundred and forty-one clients of traumatic cervical spine injury (CSI) were admitted from 1st December 2010 to 15th October 2011 at the Department of Physical Medicine and Rehabilitation, S.M.S. Medical College and Hospital, Jaipur. Detailed clinical, neurological evaluation as per American Spinal Injury Association Classification (ASIA) and radiological assessment were done along with identification of mechanism of injury, mode of evacuation and presence of associated injuries. Data analysis was done in October 2011 and results were compiled and analysed.

Results: Mean age in our sample was 35.87 ± 14.38 years that comprised 11 females (7.8%) and 130 males (92.2%) of whom 78 (55.3%) fell in the age group of 25 to 55 years. Majority 64 (45.4%) were illiterate, 80 (56.8%) being farmers and labourers. Greater fraction had road traffic accidents i.e., 66 (46.81%) and fall from height 56 (39.72%) as the mechanism of trauma. Only 69 (49.8%) could arrange an ambulance for transport. Majority of the injured i.e., 84 (59.57%) presented with neurologically complete picture as per ASIA classification and the most common involvement being of 5th and 6th cervical segments i.e., 103 (73.15%).

Conclusion: This study evaluated the demographic variables of cervical spine injury for better understanding of impact that it has and further for better allocation of our health resources, distribution and planning

Key words : American Spinal Injury Association classification, cervical spine injury, demographic, rehabilitation.

Introduction:

Spine injury is the most devastating event that can occur in an individual's life, owing to which there is multisystem involvement and long term disability. Despite the ongoing research in the treatment of spinal cord injury (SCI) this condition is not yet amenable to complete restoration of function, which is a big obstacle in independent living of the victim. Due to the non

existence of spinal cord registries in India, no reliable data set is available, on the basis of which the demographics, economic and disability burden of the same can be ascertained. An epidemiological data helps us to make plans for better allocation of resources directed towards preventing SCI and rehabilitating the resulting disabled individuals. This is a hospital based study from a single tertiary care rehabilitation centre in Rajasthan, with a view to give a snapshot of the SCI pattern in this 8th largest state of India.

Material and Methods:

All the patients of traumatic cervical SCI admitted for rehabilitation to the department of PM&R, SMS Hospital, Jaipur, were included in the study and a total of 141 CSCI were admitted from Dec, 2010 to Oct, 2011. This is a cross-sectional descriptive study under which each CSCI individual underwent a detailed clinical evaluation and radiological assessment. All independent variables, on which the admitted patient was examined, were compiled on a database.

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Table 1: *Agewise Distribution of Cases*

Age group (years)	No. of patients	Percentage (%)
10-25	47	33.3
26-40	55	39.0
41-55	23	16.3
56-70	15	10.6
>=70	1	0.7
Total	141	

Table 2: *Distribution of Cases according to Occupation and Income Group*

• Occupation		
Labourer	41	29.1
Farmer	39	27.7
Student	12	8.5
Government job	3	2.1
Business	6	4.3
Lineman	2	1.4
Private job	17	12.1
Driver	8	5.7
Others :- housewife, gas supplier, pensioner	13	9.2
• Income group		
<Rs.5,000	83	59.3
5,000-10,000	42	30.0
11,000-20,000	9	6.4
20,000-50,000	6	4.3
>50,000	1	0.7

Table 3: *Educationwise Distribution of Cases*

Education	No. of patients	Percentage (%)
Illiterate	64	45.4
Up to 5th standard	37	26.2
6th to 12th standard	21	14.9
>12th standard	18	12.8

Results:

Mean age of our sample is 35.87 ± 14.38 years, a significant number i.e., 98 (70%) were from the age group of 18 to 40 years (Table 1). There were 11 females (7.8%) and 130 males (92.2%), with a male to female ratio of 12:1.

Vocation and monthly income (Table 2):

A significant number 80 (56.8%), were farmers and labourers, with an average monthly income of Rs. 5000.

Education (Table 3) and socio-economic status (Fig 1):

Table 4: *Mechanism of Trauma and Mode of Transport*

• Mechanism of trauma	No. of patients	Percentage (%)
I. Road traffic accident	66	46.8
II. Fall from height	56	39.7
o Fall from vehicle/roof	30	21.3
o Fall from tree	4	2.8
o Fall in well/swimming pool	2	1.4
o Fall from height after electric sock	8	5.7
o Fall on ground	12	8.5
III. Fall of heavy weight	13	9.2
IV. Assault	3	2.1
V. Miscellaneous	3	2.1
• Mode of transport		
Ambulance	69	48.9
Private vehicle	72	51.1

Table 5: *Distribution of Cases according to Vertebral Level and Neurological Level*

• Vertebral level	No. of patients	Percentage (%)
C1 - C2	9	5.7
C3	3	1.9
C4	17	10.8
C5	52	33.1
C6	52	33.1
C7	24	15.3
• Neurological level		
A	83	58.9
B	18	12.8
C	13	9.2
D	15	10.6
E	12	8.5

Sixty four i.e. 45.4% were illiterate. Taking into account educational status, income and job profile of each individual, we attempted to find out the socio-economic strata of our sample through Kuppaswamy score. Kuppaswamy score is the most standard tool to calculate the same. A sound number 70% of the sample belonged to the most vulnerable upper lower group.

Mechanism of trauma and mode of transport (Table 4):

Majority 66 (46.81%) had road traffic accidents and fall from height 56 (39.72%) as the cause of injury. Chi-square value was 118.625 at 4 degree of freedom with a

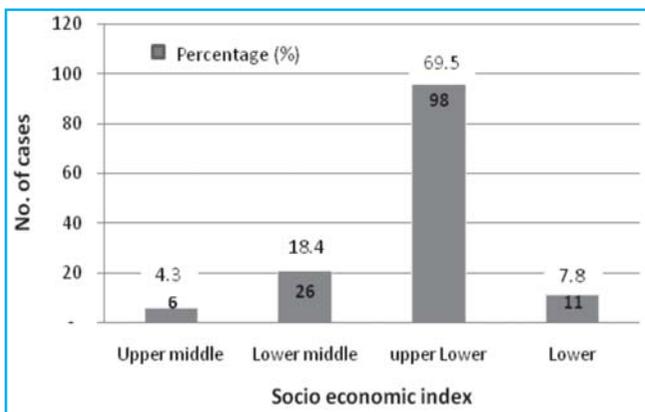


Fig 1- Kuppaswamy Score

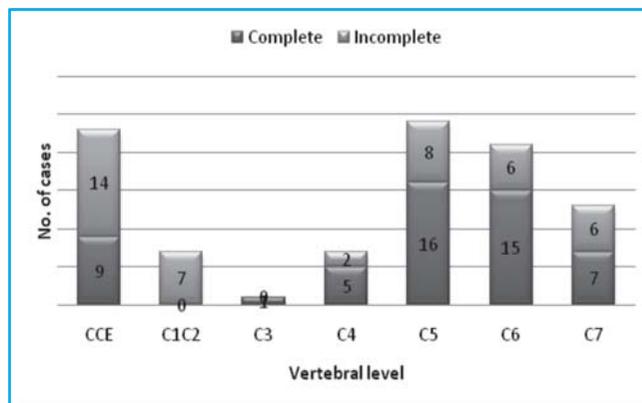


Fig 3- Vertebral and Neurological Level in Road Traffic Accidents

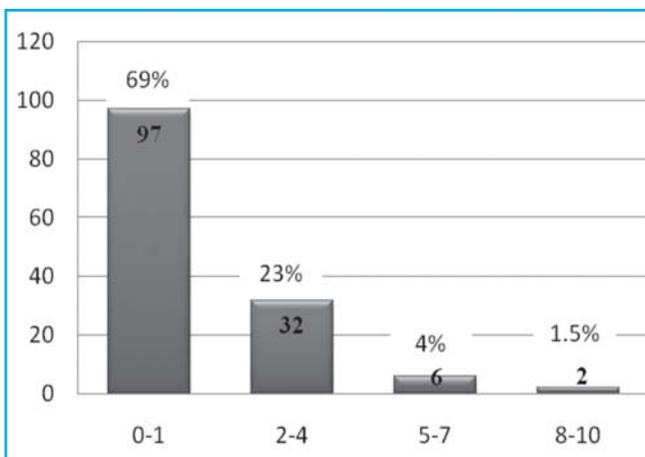


Fig 2- Delay in Admission

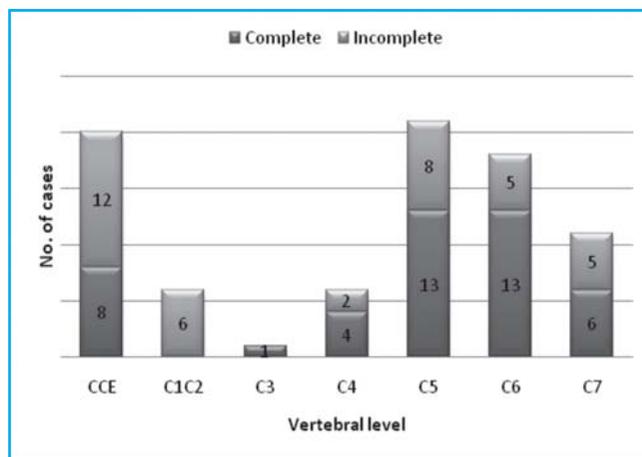


Fig 4- Vertebral Level and Neurological Level in Fall from Height

p value <.001 which suggests it to be highly significant. Only 69 (49.8%) received ambulance for transport, leading to a delay in admission in 97 (68.7%) cases to a tertiary care centre for more than 24 hours (Fig 2).

Vertebral and neurological level (Table 5 & Fig 3-4):

Most of the injured presented with neurologically complete picture 84 (59.57%), ratio of complete and incomplete injuries being 2.8:1 at the time of presentation at tertiary care centre. Most common involvement in, 103 (73.15%) cases was of cervical segments 5 and 6.

Discussion:

In the past two decades, India has witnessed rapid urbanisation, motorisation, industrialisation and migration of people resulting from socio-economic growth and development. Injuries are a major public health problem in India. Gururaj¹ in 2011 stated, that road crashes and deaths have increased from 68,351 in 1995 to 1,26,896 by 2009 with a national average of

110/ million population, though the real incidence of SCI is not yet known because of lack of national registry. Sekhon and Fehlings² reported that the incidence of SCI varies between 15 and 40 per million each year in developed countries.

The rapid and unprecedented motorisation in India, with not so strong health infrastructure of our country, a poor per capita health spending (1.4% of GDP), and insufficient healthcare financing mechanisms, 66% healthcare expenditure being out of pocket, is probably increasing the burden of SCI³. Also, looking at the startling statistics of recovery patterns with less than 12% cases showing some improvement in our study at the end of three months, it is high time to realise that prevention of occurrence of SCI is better than cure. The world over, there is a recognition that more effective preventive health programmes are the only way to reduce spiralling health costs.

Agrawal *et al*⁴ reported a sex ratio of 3.6:1 and Li *et al*⁵ documented a sex ratio of 3.1:1. Sex distribution in our

study is 12:1, which is similar to other recent studies in a sense that males are more commonly injured than females, but the gap in our study was too large which may probably reflect the difference in sociocultural practices decreasing the women's exposure to outside world and subsequent risk of SCI. Most common age group in our study was 20-39 years. The age distribution of patients is comparable with studies⁶⁻¹⁰ from other parts of the world. The prime earning age in which the individuals were rendered completely disabled, emphasises that the focus of our strategies should be towards our work force as they are the once who are at utmost risk on account of their occupation.

Our observation of higher incidence of traumatic cervical SCI in rural population is in close agreement with the previous literature¹¹⁻¹³. Despite the fact that greater than 68.84% of Indian population lives in rural areas¹⁴, comprehensive trauma care in India (including emergency, acute care and rehabilitation services) is in total disarray amid disparities of high technology and sophistication in urban areas and non-availability of even primary care in rural areas.

Data from developed countries clearly establishes road traffic accidents as the main cause of SCI¹⁵⁻¹⁹ in contrast to the study of Singh *et al*²⁰ in India that showed fall from height to be the major cause. Lack of strict implementation of rules in various non-metropolitan cities of India along with lack of awareness among the general population regarding adherence to traffic rules still prevails as an important cause of road traffic accident and spinal trauma. Lack of fencing on the terrace and guarding of the staircase make fall from height a realistic possibility. Habit of sleeping on an unprotected terrace leads to falls. Use of substandard material in the construction of rural houses endangers the lives of people living in them.

Secondary injury to the cord can sometimes be much more catastrophic than the primary injury, and it occurs commonly at the time of transport from the site of trauma to specialised centre. Despite the fact that "108" ambulance facilities have been started by our government in all cities of Rajasthan, less than half of the injured in our study could arrange for an ambulance. These services have definitely improved the transportation but because of lack of awareness, trained paramedical staff, SCI evacuation equipment in the form of spinal board, collar, straps etc, this has failed to do any good to the injured. None of the injured in our study

received the primary management as per SCI protocols, well in concordance with studies of Nguyen *et al*²¹ and Solagberu *et al*²².

Neurologically complete injuries (ASIA A) were the most common in our study, as against the higher percentage of incomplete injuries in the developed world^{23,24}. This can be attributed to lack of observation of strict SCI extrication protocols at the site of trauma which reflects in our data, with more than 61% injured presenting to a tertiary care centre with a delay of >8 hours and rest 39% with a mean delay of 6 days.

According to the World Bank report, nearly 39.72% of India's population in 2005 (456 million)³ live just above line of deprivation (<1.25\$ a day). The upper lower group is the most vulnerable to fall into the category of below poverty line as it cannot sustain health, economical, pathological or social pressure. World Bank estimates show that 2.2 % of India's population (around 24 million people) goes into poverty every year because of catastrophic health expenditure that they have to make despite being treated in government hospital where most of the treatment is either free of cost or largely subsidised. The government's share in the healthcare delivery market is 20 per cent while 80 percent is with the private sector. Therefore, it is imperative for the government to increase the per capita health expenditure and provide for greater number of hospitals and specialised centres where facilities for management and rehabilitation of such chronically ill patients can be provided.

SCI management does not end with spinal instrumentation or a decision to pursue a conservative management regime. SCI rehabilitation is the only way that ensures a successful community reintegration of a SCI patient as an active member. There is complete non-existence of hospital and community rehabilitation in India as a whole, even in Rajasthan; there is only one department of physical medicine and rehabilitation with comprehensive care of inpatients and outpatients. This reflects that health planners are focusing all their resources on acute care and least substantial effort on prevention of ever increasing injuries and rehabilitation of chronically injured are being made.

The home visit programme conducted at Ahmadabad by Prabhaka and Thakkar²⁵ for spinal cord injured patients decreased the number of readmissions by improving the status of rehabilitation, which raised the quality of care for patients with SCI. Such programmes can be carried out on a broader basis like national

programmes, by involving lady health workers and multipurpose rehabilitation staff to maximise the number of patients who can be benefited.

Our study shows a joint family versus nuclear family ratio of 1.1:1, depicting the increasing trend towards nuclear families. With an average family size of 5, most being illiterate, when the only earning member of the family is disabled, it leads to dire socio-economic consequences for the entire family. To our knowledge, only one vocational rehabilitation centre is working in Rajasthan which is not able to meet the needs of highly dependent challenged individuals. The disability pension which is being provided by the government is meagre to make the two ends meet. Thus, vocational rehabilitation, counselling and training is a must.

Injury prevention strategies should focus towards the need for better transport facilities, provision of safer roads, greater allocation of public transport and stringent traffic rules, as wearing of safety belts, alcohol awareness in India. In order to prevent fall from height, safety guards should be provided for workers at construction sites and negligence on the part of employers regarding safety precautions should be made a punishable offence under law. People should be made aware of the precautions that should be taken while building their houses. It is imperative that our prevention programmes should be formulated with maximum use of local language, pictorial presentation and stage shows being included in the curriculum for better understanding by the rural, illiterate population of India.

Better ambulance facilities with medical and paramedical staff trained in management of SCI is a must. Training programmes to give an opportunity to health workers to improve their knowledge in the comprehensive management of spinal cord injured patients should be carried out on a regular basis. Hospitals managing spinal trauma must have a comprehensive spinal trauma rehabilitation team, led by rehabilitation medicine specialist.

Most of the studies in medical literature are from developed countries where the problem and presentations are different with respect to the mode of injury and other demographic variables. Though this study may not be a true representation of demography of all spinal injuries in India, as it is restricted to a single institute, it may best give a snapshot of existing scenario. Unfortunately, there is no data on those who present to a private hospital, died at the site of trauma or never presented to any hospital. Therefore, there is a dire need

to establish a national SCI registry system in order to address both the emerging and prevailing trauma care profile. It should be made compulsory to all the private hospitals and government owned institutions to report each and every case of such injuries in order to prepare a national database so that our government is able to better plan, the funding for specialised medical rehabilitation nationwide.

Conclusion:

In this observational study from a single rehabilitation centre, there were 141 patients in a period of eleven months, admitted for cervical spine injury and these patients were from upper lower socio-economic strata and most of them were labourers and farmers. According to the recent World Health Organisation and Government of India survey, this is the most vulnerable strata of the society who are just above the poverty line and drift below the poverty line after being struck by such demanding health problems. Ninety-three per cent of those who were neurologically complete at the time of admission remained complete at the time of discharge as well. As we are aware that cervical spine injury is a lifelong demanding condition which puts heavy burden not only on the health system but also to the carer, it is imperative that a multi-centre observation study should be carried out to document the exact incidence and prevalence of the same. This will not only help us identify the extent of the problem but shall also guide us in its management in detail in coalition with the national health administrators.

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