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ORIGINAL ARTICLE

Pattern of Traumatic Spinal Cord Injury in a Tertiary Rehabilitation Center of Northern India

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ABSTRACT

Introduction: Spinal cord injury (SCI) causes functional, economic, psychological and social disability. No national SCI registry is available in India to describe its mortality characteristics.

Objectives: To assess the epidemiological pattern and clinical profile of traumatic spinal cord injury and determine gender-wise association with clinical profile.

Methods: A cross-sectional study was conducted in Department of PM and R, King George's Medical University, Lucknow, Uttar Pradesh, India and 68 patients of traumatic spinal cord injury were enrolled. The sociodemographic information and clinical profile of the patients were collected with the help of a predesigned tool, and all relevant data was gathered accordingly.

Results: The most common age group affected in traumatic spinal cord injury is 15–30 years (39.7%). The majority (83.2%) of the study participants were males and fall from height (73.5%) was the most common cause of injury. Most of the patients (55.9%) were of ASIA grade A. Around 68.4% males and 100% females had fallen from a height as the most common cause of injury and this association was statistically significant (p = 0.03).

Conclusion: The study has revealed the epidemiology and clinical profile of traumatic spinal cord injury which will be beneficial in planning and executing strategies for preventing traumatic spinal cord injury.

Keywords: Rehabilitation, Spinal cord injury, Traumatic.

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INTRODUCTION

Spinal cord injury (SCI) is a crucial disabling disease which culminates in functional, psychological, economic and social affliction.[1] Global prevalence rates of traumatic SCI varied from approximately 200 to 1000 per million and data on incidence ranging from approximately 15 to 50 per million. Indian estimates suggest incidence around 15–20 per million per year population.[2] India is confronting a rapid rise in injuries, especially due to road traffic accidents at an unnerving annual rate of 3%.[3]

Majority of the patients are male in the age group of 16–30 years that signifies higher incidence in a young, active and productive population of the society. Demographic data from a study in northern India has also reported that younger males are affected more as compared to females. There has been a substantial decrease in male:female ratio from the past which reflects the changing face of social norms where females are becoming more active and outgoing in the modern era.[4]

Early surgery and comprehensive rehabilitation distinctly minimize the overall morbidity of injured spinal cord patients by enabling them to live an independent life.[5] No national SCI registry are available in India to delineate the mortality attributes of traumatic SCI.

Furthermore, there is no precise estimation of the number of individuals who suffer from SCI in India every year. Hence, there is a paucity of research regarding the epidemiology of traumatic SCI in India.[6]

Since there is non-availability of any curative treatment for SCI, prevention of SCI is of utmost importance. Exploring the epidemiological pattern of SCI is the first step in planning for preventive strategies, resources but also for adequate treatment and rehabilitation. The epidemiology of SCI differs in various countries and the outcome of epidemiological studies from developed countries are not pertinent to developing countries.[7] So, the aim of this study was to assess the epidemiological pattern and clinical profile of traumatic spinal cord injury and determine the gender-wise association with the clinical profile.

MATERIALS AND METHODS

- *Study design:* Cross-sectional study.
- *Study setting:* Department of Physical Medicine and Rehabilitation, King George's Medical University, Lucknow, Uttar Pradesh, India.
- *Study period:* 1 year (2016–2017).

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- *Study participants:* Traumatic spinal cord injury patients admitted to the rehabilitation center during the study period.
- *Sample size:* Sixty-eight patients.
- *Sampling method:* Convenient sampling was done.

Inclusion Criteria

Traumatic spinal cord injury patients who consented to participate in the study.

Exclusion Criteria

Non-traumatic spinal cord injury patients, those who did not consent to participate in the study, non-cooperative patients.

- *Data collection:* All 68 traumatic spinal cord patients were enrolled in the study after getting their informed verbal consent. History-taking and clinical examination was done for all the study participants. The sociodemographic information and clinical profile of the patients were collected with the help of a predesigned tool and all relevant data was gathered accordingly.
- *Variables:* Independent variables included sociodemographic factors like age, gender and employment status, the status of education and residence while clinical profile included the cause of injury, level of injury, neurological category (ASIA classification) and type of paralysis. Gender was considered as a dependent variable. Illiterate were those individuals who were not able to read or write. Employed were those who were earning wages or salary in the last three months. Distribution of patients for the residence was on the basis of the list available on the site of Government of India.
- *Data analysis:* Data were analyzed using statistical package for the social sciences (SPSS) version 24.0. Descriptive statistics using frequencies, percentages, graphs, and cross-tabulations were used to present the study results. Probability (p) was calculated at 5% level of significance. Chi-square test was used to estimate the significance of the association between dependent and independent variables.

Table 1: Epidemiological pattern of traumatic spinal cord injury

Parameter		*Frequency (n = 68)*	*Percentage (%)*
Age (years)	15–30	27	39.7
	30-45	21	30.9
	>45	20	29.4
Gender	Males	57	83.2
	Females	11	16.8
Employment status	Employed	39	57.4
	Unemployed	29	42.6
Status of education	Illiterate	13	19.1
	Literate	55	80.9
Residence	Urban	32	47.1
	Rural	36	52.9

RESULTS

The most common age group affected in traumatic spinal cord injury is 15 to 30 years (39.7%). The majority (83.2%) of the study participants were males. Almost more than half (57.4%) were employed. Most (80.9%) of the patients were literate. The distribution of patients as per their residence was almost equivocal with more than half (52.9%) from the rural area (Table 1). The most common cause of injury was fall from height (73.5%). Most of the patients (55.9%) were of ASIA grade A (neurological category). More than four-fifths (86.8) of them had a lumbar level of injury (Table 2).

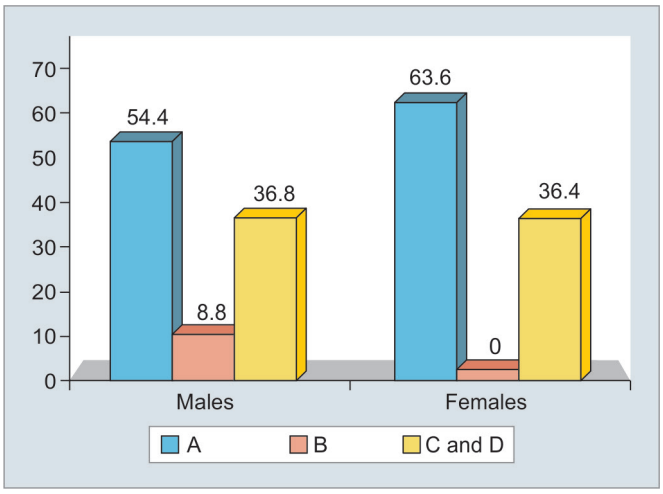
As far as gender-wise distribution was concerned, more than half (54.4%) of the males and approximately two-third females (63.6%) were of ASIA grade A, but this association was not statistically significant ($p = 0.886$) (Graph 1). Among the males as well as females, the most common cause of TSCI was falling from a height with 68.4% males and 100% females reported the same and this association was statistically significant ($p = 0.03$) (Graph 2). Among both males and females, the most common level of spinal cord injury is lumbar as it was seen in the majority, i.e., 89.5% and 72.7% males and females, respectively and this association was also significant ($p = 0.038$) (Graph 3).

DISCUSSION

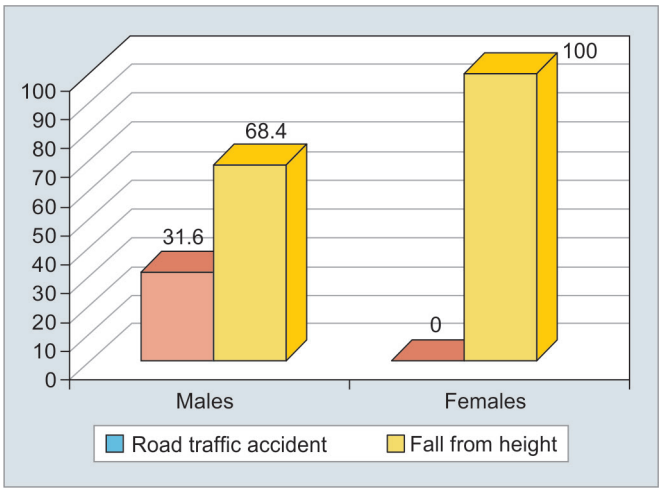
Spinal cord injury has an enormous social and economic burden on society. Often the spinal cord injured patient is in the principal phase of their life and the family is called upon to endure the cost of hospitalization and ongoing care.[1] There are not many specialized centers in northern India for providing rehabilitation to these patients which

Table 2: Clinical profile of traumatic spinal cord injury patients

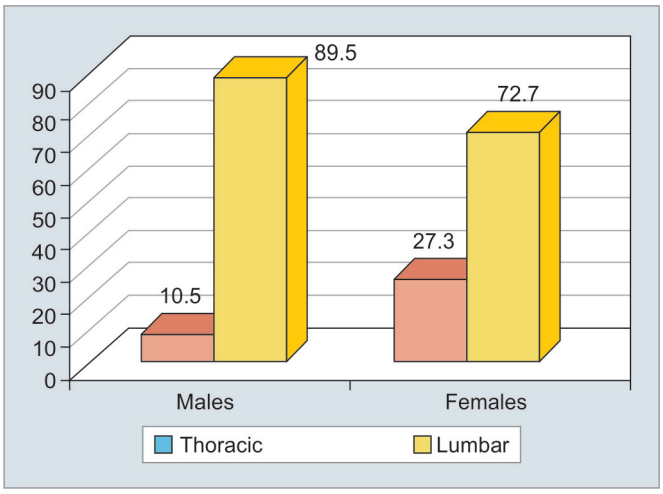
Parameter		*Frequency (n = 68)*	*Percentage (%)*
Cause of Injury	Road traffic accident	18	26.5
	Fall from height	50	73.5
Neurological category (ASIA grading)	A	38	55.9
	B	5	7.4
	C and D	25	36.8
Level of injury	Thoracic	9	13.2
	Lumbar	29	86.8



Graph 1: Gender-wise distribution of neurological category



Graph 2: Gender-wise distribution of cause of injury



Graph 3: Gender-wise distribution of level of injury

further increases their morbidity and mortality. Those rehabilitation centers which exist are not well equipped and lack the adequate infrastructure and resources that are required for the proper care of TSCI patients. So, it is very essential to understand the epidemiological pattern and clinical profile of these patients so that appropriate measures can be taken in planning prevention strategies, treatment, and rehabilitation of these patients.

Our study has observed that the majority of the traumatic SCI were in the age group of 15–30 years which comprises the younger adults. This is similar to Chanu et al. as they had observed that most of the TSCI patients in their study were of 20–39 years.[1] Our results are also comparable with Agarwal et al., who in their hospital-based study about the demographic profile of SCI patients, observed that 41.5% of patients were of 20–39 years.[8] Adult people are more prone to spinal cord injuries as they are the most active and energetic age group of any community.[5] Srivastava et al. have revealed in their study that age is a significant predictor of discharge from a hospital. Age affects the neurological recovery of the traumatic SCI patients but also the length of stay in the rehabilitation center.[9] Experiencing TSCI at such a young age leads to many years lost to disability and reduced plausibility to pursue one's career to contribute to the family and national economy.[10]

In our study, the majority of patients with TSCI were males. This is in concordance with Shrestha et al. who reported that 73.5% were males with TSCI. A literature search has revealed that many researchers have observed male predominance in TSCI.[5,11,12] The cause for this is that males are more involved in the outdoor activity and hence are more susceptible for spinal cord injuries and/or other trauma which amounts to a serious economic loss to the society and females mostly remain indoors and do not go out for work.[5]

Our study revealed that majority of the patients were literate (80.9%), employed (57.4%) and were from the rural area (52.9%). This is similar to that Razzak et al. in which 74% of patients were literate and 72.8% were from the rural area. However almost, 95% of patients were involved in some daily money earning occupation which was contrary to our results.[13] It was observed that employment rates show notable disparity depending on the type of definition used for employment. For instance, employment was reported in few studies as "working for pay", "working for a living", "employed or actively looking for work", and "performance of significant, productive physical or mental work for pay or profit".[14] Our study has focussed entirely on two sharply distinguished indicators of vocational status, i.e., employed and unemployed since many study participants were college-going and were designated as unemployed.

In our study, both males and females have reported fall from height as the most common cause of traumatic spinal cord injury. Similar findings were reported by Agarwal et al.,[8] Pandey et al.,[15] Chanu et al.[1] and Shrestha et al.[5] from India as they observed that fall

from height was the commonest cause of injury with more than half of the patients affected because of it. This can be attributed to the fact that most of the houses in both rural and urban areas of India have an absence of necessary safety precautions like fencing of the terrace and guarding of the staircase, due to which the plausibility of fall from height becomes pragmatic. Moreover, people have a practice of resting on an unprotected terrace which makes them more susceptible to fall while sleeping. Indian wells of rural areas mostly lack important safety precautions thereby risking the lives of people working in close range. Due to use of inferior quality material in the construction of houses in the rural areas (mostly mud is used to construct the walls of the house), the lives of people living in them are put at risk. On the contrary motor vehicle accidents is the leading cause of death in the developed countries.[16]

However, in a systematic review of TSCI in developing countries, the two leading causes were found to be motor vehicle crashes (41.4%; 95% CI: 35.4–47.4) and fall (34.9%; 95% CI: 26.7–43.1).[7] Countries like Bangladesh, Nepal, and Pakistan have more than 80% TSCI due to fall from height.[2] Developing countries like Nigeria and Jordan have reported road traffic accidents as the most frequent reason for spinal cord injury which is dissimilar from our findings.[17-19] So, with increased urbanization, a shift in the cause of injury can be seen in future.

In our study ASIA grade A was found to be the neurological category in the majority of males and females. Our study has observed that both males and females had a lumbar level as the most common level of injury. Similarly, Shrestha et al. observed that more than half of the patients of Northeast India were of ASIA grade A while Bajracharya et al. in eastern Nepal also found 34% had Frankel grade A.[5,11] In our study, the majority of males and females were having lumbar as the common level of injury. This was in concordance with Kumar et al. who also observed the majority of the spinal cord injury cases were having lumbar as the common level of injury.[4]

Our study also shows that the majority of the males and females were paraplegics. This is in consensus with Agarwal et al. who observed a higher incidence of paraplegics (63.8%) among the TSCI patients. Chhabra and Arora also described 66.6% paraplegics among the SCI patients.[20] However, few studies have observed tetraplegia as the most common type of paralysis in TSCI patients.[1,21] This might be elucidated by the fact that their study was conducted at a tertiary referral center, admitting patients with a relatively higher level of injuries and various complications.[21]

CONCLUSION AND RECOMMENDATIONS

Majority of SCI patients are of age group of 15–30 years. Males are more prone to TSCI. More than half of TSCI patients were from rural area. The most common cause and level of spinal cord injury was fall from height and lumbar spine. Most of the males and females were paraplegics and had ASIA grade A.

The study has revealed foremost data on epidemiology and clinical profile of traumatic spinal cord injury which will be beneficial in planning and executing strategies for preventing TSCI. There is an urgent need to increase awareness among people regarding occupational safety precautions, reinforce the transportation network of pre-hospital care and treatment in well-equipped spinal trauma units to circumvent the loss of young energetic manpower. For promoting comprehensive rehabilitation care of spinal cord injured patients, there is a requirement of the increasing number of tertiary spinal trauma units with the latest technologies and multidisciplinary approach in patient care.

What we already knew and what we learn from this article: Spinal cord traumatic injury is a disabling condition which results in social, economic and financial loss to the patient as well his family and by knowing its epidemiological pattern, we will be able to plan strategies for its prevention and rehabilitation.

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