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TRAUMATIC SPINAL CORD INJURIES IN A DISTRICT HOSPITAL: AN EPIDEMIOLOGICAL AND FUNCTIONAL OUTCOME STUDY

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HOW TO CITE THIS ARTICLE:

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, DOI: 10.14260/jemds/2014/4032

ABSTRACT: OBJECTIVES: 1. To study the risk factors in traumatic spinal cord injuries. 2. To identify preventable risk factors. 3. Study functional outcome of injuries **STUDY DESIGN:** Retrospective study. **SETTING:** Accident and emergency services and department of Orthopaedic Surgery Hassan Institute of Medical sciences. **PARTICIPANTS:** Traumatic SCI patients. **STUDY VARIABLES:** Age, sex, mode of injury, SCI level, seasonal variation, and associated trauma, duration of hospital stay, socio-economic status, and functional independence measures. **RESULTS:** Four hundred and eighty three new traumatic SCI cases reported in 2010-2013. Male to female ratio was 2.83:1 and the average age at injury was 35.4 years. RTA was most common cause of trauma (44.53%), followed by motor vehicle accidents (34.87%). Forty six patients were tetraplegics and 99 patients were paraplegics, while 36 patients had no neurological deficit. Most common level of injury was first lumbar vertebra among paraplegics and fifth cervical vertebra among tetraplegics. There was increase in incidence of SCI during summer and rainy season. Average hospital stay was 39.5 days. **CONCLUSIONS:** This paper shows a correlation linking the epidemiological factors that are responsible for the incidence of SCI in Hassan district. We thus conclude that there is a strong need to identify the risk factors nationally and to take steps to control them by disseminating information to masses, to train paramedical staff in rural areas about initial handling and transportation of patients having spinal cord injuries. **KEYWORDS:** Spinal cord injury, incidence, epidemiology, functional outcomes.

INTRODUCTION: Traumatic spinal cord injury (TSCI) is a catastrophic event that is sudden and unexpected and can be devastating and costly in human and social terms. TSCI in developed (high income) and developing countries primarily affects males aged 18–32 years, and in developed countries, due to an ageing population, males and females over the age of 65 years. Globally, information on the number of people living with TSCI (prevalence) as well as the number of new cases annually (incidence) is minimal, particularly in developing countries, hindering injury prevention, health care and other social planning.

This paper updates the epidemiological information available primarily from published papers and reports, provides ranked data for statistical extrapolation and highlights issues relevant to decreasing the health-care burden of TSCI locally.¹⁻² The high societal costs in developed countries, the high mortality rate in developing countries and the geographic spread in etiology emphasize the importance of regionally targeted primary and secondary prevention programs.

Globally, injuries contribute to around 10% of total deaths and 15% of disability-adjusted life-years (DALYs).³ Recent studies suggest that injuries contribute to 13%–18% of total deaths in India.⁴⁻⁶ Road traffic injuries (RTIs) are included under unintentional injuries. The definition of road traffic fatality varies in different countries and is defined as 'any person killed immediately or dying within 30 days as a result of an injury or accident'.⁷

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According to WHO, RTIs are the sixth leading cause of death in India with a greater share of hospitalizations, deaths, disabilities and socioeconomic losses in young and middle-age populations.⁸ RTIs also place a huge burden on the health sector in terms of pre hospital and acute care, and rehabilitation.⁹ This paper aims to assess the burden and impact of RTIs, identify factors associated with the occurrence of RTIs, examine current policies, mechanisms and interventions for RTI prevention, and highlight the role of the health sector and professionals in road safety in India.

In the Indian setup, as in most developing countries, very little is known about the exact incidence of spinal cord injuries (SCI). Approximate 20, 000 new cases of SCI are added every year. 60-70% of them are illiterate, poor villagers.¹⁰ Most of them sustain this injury by fall from unprotected roofs, trees or fall into uncovered wells, which in fact are preventable causes. A careful epidemiological study can provide information regarding magnitude of the problem of spinal trauma and resultant demand on medical and social resources; and can help identify the risk factors involved and actual causes of SCI. It may help to formulate preventive measures which may modify or eliminate the risk factors and may decrease the incidence of this incapacitating injury.

MATERIAL AND METHODS: Period of study - Study was conducted between January 2010 to Dec. 2013. Setting - Level II trauma center, district hospital attached to the medical college. Inclusion criteria - All cases admitted under emergency department transferred to orthopedics and with stable spine trauma.

Exclusion Criteria: All deceased cases, and unstable spine trauma.

Information was collected in 2013 from case sheets of 238 persons with TSCI admitted from January 2010 to Dec 2013. A telephonic survey was conducted to get further insight into fall from height (FFH) or road traffic accident (RTA) as a mode of injury. All the patients with traumatic spinal injuries reporting to Accident and Emergency Dept. and outdoor and indoor patients of orthopaedics department were included in the study. Patients who died before reaching hospital were not taken into account. Detailed history with respect to age, sex, occupation, socio-economic status and mode of trauma was taken, followed by a clinico-radiological examination to ascertain the exact spinal and associated injuries. Few additional questions were asked about type of pre-hospital care, mode of transfer, time of reporting and whether a trained person accompanied the patient during the transportation.

Outcome measures collected included acute and rehabilitation hospital length of stay (LOS), functional Independent Measure (FIM) score, FIM change (measured as the difference between discharge and admission FIM scores), FIM efficiency (FIM change/LOS), and discharge disposition (private or institutional setting). The FIM focuses on six areas of Arch Phys Med Rehabil Vol 80, June 1999 functioning: self-care, sphincter control, mobility, locomotion, communication, and social cognition. Within each area, two or more specific activities/items are evaluated, with a total of 18 items, each of which is evaluated in terms of independence of functioning, using a 7-point scale, with a higher number indicating increasing independence. FIM motor scores (including self-care, sphincter control, mobility, and locomotion areas) and cognitive scores (communication and social cognition areas) were calculated, with higher scores denoting greater levels of independence. Patients were evaluated with the FIM at admission to rehabilitation (within 72 hours) and again within 24 hours of

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discharge. To maximize inter rater reliability, all FIM ratings were obtained by Uniform Data System certified rehabilitation professionals.

Functional outcome was measured using functional independence measure(FIM METeOR identifier: 495857.Health, Standard 11/04/2014 Independent Hospital Pricing Authority, Standard 31/10/2012.The Functional Independence Measure (FIM™) instrument is a basic indicator of patient disability. FIM™ is used to track the changes in the functional ability of a patient during an episode of hospital rehabilitation care.)

RESULTS:

Age Group	Number of cases(n=238)		
	Males(n=176) No%	Females(n=62) No%	Total No%
0-9	1 (0.5)	Nil	1
10-19	8 (4.5)	7 (11.2)	15
20-29	76 (43.18)	23 (37.09)	99
30-39	48 (27.27)	15 (24.1)	63
40-49	26 (14.77)	11 (17.74)	37
50-59	11 (6.25)	6 (9.6)	17
60-69	5 (2.84)	Nil	5
70+	1 (0.5)	Nil	1

TABLE 1: Age and sex distribution of spinal cord injuries

Two hundred and thirty eight cases of SCI reported between January 1st 2010 to 31st Dec. 2013.

There were 176 males and 62 females; male to female ratio was 2.83:1. The average age at injury was 35.4. The most prevalent age group was 20-29 followed by 30-39.

Mode	Number (%)
Road traffic accidents(RTA)	106 (44.53)
Falls	83 (34.87)
Sports/Recreation	9 (3.18)
Violence/Selfharm	34 (14.2)
Work related	6 (2.12)

TABLE 2: Mode of injury

	Mean FIM Motor scores	
	Admission	Discharge
Tetraplegia-incomplete(n=46)	25.2	54.33
Paraplegia-complete(n=57)	32.1	60.02
Paraplegia-incomplete(n=99)	43.38	69.25

TABLE 3: Functional independence outcome scores, at admission and at discharge

There was significant improvement in the mean FIM score at discharge in all groups.

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	Mechanism and level of lesion			
Mechanism of trauma	Cervical	Thoracic	Lumbar	Total
Flexion	51	18	24	93
Flexion/Rotation	7	5	19	31
Extension	32	1	3	36
Compression	8	19	15	42
Direct Blow	1	8	9	18
Uncertain	7	5	6	18
Total	106	56	76	238

TABLE 4: The most pronounced mechanism of the trauma in relation to the primary area of the bony lesion

DISCUSSION: The most common cause of injury was during road traffic accidents (RTA) (44.53%) followed by fall from height including roof, trees or electricity poles (34.87%). RTA was more prominent in third and fourth decades. RTA accidents were commoner in second and third decade.¹¹⁻¹³

Forty six were tetraplegic and 156 patients had paraplegia (incomplete paraplegia - 99 and complete paraplegia - 57). Thirty six patients had no neurological deficit. Dorsolumbar spine injury was the commonest with L1 being the most common fractured vertebra followed by T₁₂ vertebra, cervical spine injury was next with most common site being C₅ and C₆ vertebrae (cervical fractures were commonly associated with hyoid bone fractures n=27).

Seasonal variation was observed. Frequency of SCI showed an increase during rainy followed by summer season.

An examination of pre-injury marital status revealed that patients with a traumatic injury were more likely to be married (57%) or previously married (31%). An analysis of pre-injury work status revealed between-group differences. Patients with a traumatic injury (67%) were more likely to be working.

In 24.2% cases no associated trauma was identified. Most prevalent associated injury was head injury (20.8%) followed by extremity fractures (38%), chest injury (3.1%), abdominal injury (4.2%) and pelvic injury (9.7%).

According to modified B. G. Prasad classification, 40 patients belonged to SES 3, 93 patients were belonging to SES 2, 19 patients belonged to SES 1 and remaining 86 SES 5. Seventy patients were graduate and above, 116 patients had studied up to middle or high school, 52 patients had less than primary school education or were illiterate.

One hundred and eighty-one patients (76.05%) reported to institute directly with an average lag time of 6 – 8 hours. Forty five patients (18.9%) were initially seen by village quacks or unqualified practitioners. Only 12 patients (5.04%) were referred after initial care by qualified doctors. Seventy one percent patients used an ambulance for transfer, whereas, 39% patients were transported by vehicles unsuitable for a spinal patient such as car, jeep or maxi cabs. 81% of the patients reported within 6 hours of injury, 90.3% within 24 hours and 9.7% reported late. Most of the patients had accompanying trained personnel with them during transfer.

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As discussed above, dorsolumbar spine injury was the commonest type of spinal injury. The common mechanism of injury at the lumbar level was the flexion type (31.57%). It was followed by rotation (25%) and compression (19.73%). The flexion type of mechanism of injury was also common among the cervical spinal injuries and thoracic spinal injuries amounting to 48.11% and 32.14% respectively. In cervical injuries, the extension type of mechanism of injury stood next to flexion type (30.18%) whereas in the thoracic region it was the compression type (33.92%).

Average duration of hospital stay was 39.5 days (range 7 to 93 days). Those without neurological deficit or stable injuries were discharged early and had a short stay. Eight cases died during the study period. Out of these eight, 3 cases were of cervical spine injury with complete neurological deficit.

CONCLUSION: This paper shows a correlation linking the epidemiological factors that are responsible for the incidence of SCI in Hassan district.

Out of the 238 cases, the most prevalent age group was 20-29 which signified 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 occupation.

It is possible to reduce these factors through various prevention methods. 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 trends.

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 valuable. The acute care of spinal injuries in a general hospital is far from ideal, resulting in an unacceptably high incidence of complications.

We thus conclude that there is a strong need to identify the risk factors nationally and to take steps to control them by disseminating information to masses, to train paramedical staff in rural areas about initial handling and transportation of patients having spinal cord injuries.

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Date of Submission: 06/12/2014.
Date of Peer Review: 07/12/2014.
Date of Acceptance: 15/12/2014.
Date of Publishing: 17/12/2014.