

## Cervical Spine Injuries in a Teaching Hospital of Eastern Region of Nepal: A Clinico-epidemiological Study

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### ABSTRACT

Cervical spine injuries with neural deficits carry significant impact economically, socially and psychologically to the individual and to the society. Risk factors involved, mode of injuries, constraints of management and rehabilitation are different in developing countries.

Total 149 patients of cervical spine injuries presented in B.P. Koirala Institute of Health Sciences, Dharan, Nepal were evaluated prospectively for three years. Demographic details, etiology of injury, method and time taken for transportation and treatment method and progression of recovery were recorded.

Most commonly involved age group was 30-49 years (44%) with male to female ratio of 4:1. Fall related injury especially from trees was the commonest mode of injury (60%). Patients were transported to hospital without neck immobilization (81%) in a vehicle unsuitable for spinal injuries patient with average delay of two days of injury. 79% had neural deficits among which 42% are with quadriparesis, 31% are with quadriplegia. Associated extra spinal injuries were found in 9% patients. Average hospital stay was 31 days. C<sub>5</sub> vertebra was the most commonly injured vertebra.

Cervical spine injuries, which has major impact over patient and society is still not adequately addressed by medical and public health system of developing countries like Nepal. Incidence of spinal injuries and its devastating consequences can be reduced by appropriate preventive measures and management along with rehabilitation.

**Key Words:** *Cervical spine, Clinico-epidemiological study, Injury, Neural deficit.*

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## INTRODUCTION

Acute injuries of the spine and spinal cord are among the most common causes of severe disability and death following trauma. Cervical spine trauma which is complicated by neurological deficit in more than 40% cases carry significant public health impact because of its devastating events on personal and family level, high cost of patient care, loss of productivity and decreased quality of life.<sup>1</sup> Though exact incidence of spinal injuries is not known in most of the developing countries, these injuries are increasing in number. In India, it is estimated that 20000 new patients of spinal cord injuries are added every year, mostly illiterate and belong to village.<sup>2</sup> In USA, incidence of spinal cord injuries is 11000-14000 per year and annual cost of patient care is 4 billion dollars for 200,000 alive patients in each year.<sup>1</sup>

A careful clinico-epidemiological study of spinal cord injuries provides information regarding magnitude of the problem, demand and resources; helps in identifying risk factors involved and planning preventive measures to modify or eliminate risks associated. We present three years clinico-epidemiological prospective study of cervical spine injuries presented in tertiary care teaching hospital in eastern region of Nepal.

## MATERIALS AND METHODS

Patients with suspected cervical spine injuries presented in emergency and accident department of B.P. Koirala Institute of Health Sciences, a tertiary care teaching

hospital in eastern region of Nepal, presented in between 15<sup>th</sup> June 2001 to 14<sup>th</sup> June 2004 were included in the study. Standard trauma care protocol including spinal injuries was followed for emergency management of patient once patient was brought to hospital. Detail history was recorded and clinical examinations, investigations were performed and subsequently followed up in spine clinic on 6<sup>th</sup> week, 3<sup>rd</sup>, 6<sup>th</sup>, 12<sup>th</sup>, 18<sup>th</sup> and 24<sup>th</sup> months of discharge from hospital for evaluation of neurological, functional, ambulatory status and any other associated complications.

## RESULTS

One hundred and forty nine cases of cervical spine injuries were reported in three years period. There were 119 (80%) males and 30 (20%) were females with male to female ratio of 4:1. The average age was 40 yrs (range 6-88 yrs). Figure 1 shows that 44% of the patient falls in age group between 30 to 49 years. 119 (80%) patients were from plain area of eastern region of Nepal and 92% were farmer by occupation. Patient himself / herself was earning person of the family in 58% of cases and in 83% used to support 6 to 10 family members for their daily expenditure.

The most common cause of injury was fall in 90 (60%) patients, among which fall from the tree was 29%, followed by fall from hill slope (15%). Details of mode of injury is shown in table 1. 117(79%) patients were brought to hospital by ordinary vehicles which were not

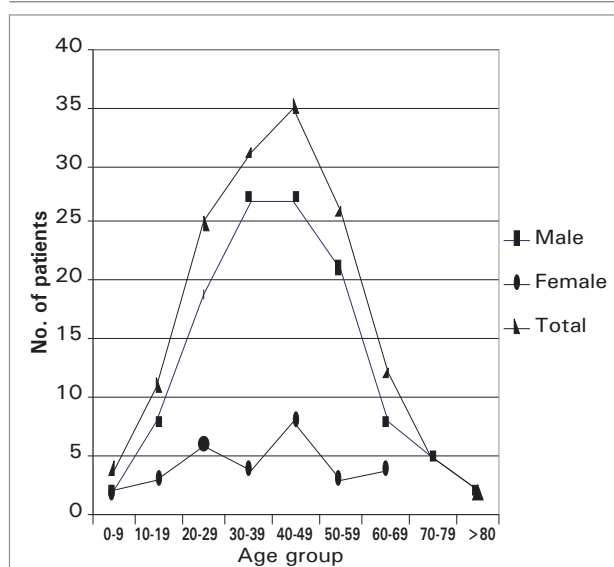


Figure 1. Age and sex distribution

Table 1. Mode of injury.

Mode of injury	No. (%) (n = 149)
Fall injury	90(60%)
Fall from tree	40
Fall from slope	22
Fall from Balcony	8
Fall from house roof	7
Fall from Staircase	4
Fall from bullockart	4
Fall from vehicle roof	3
Fall from bed	1
Slipped inside bathroom	1
Road traffic accident	32(22%)
Fall of heavy objects over neck	14(9%)
Animal related injury	5(3%)
Physical assault	5(3%)
Sports related injury	3(2%)

**Table 2.** Time interval between injury and arrival, reduction and surgery.

<i>Injury-arrival interval</i>	<i>No. (%) (n = 149)</i>	<i>Injury-reduction interval</i>	<i>No. (%) (n = 66)</i>	<i>Injury-surgery interval</i>	<i>No. (%) (n = 31)</i>
≥3 hrs	9(6.04%)	≥8 hrs	1(1.5%)	≥5 days	6(19.35%)
4-8 hrs	27(18.12%)	8-24 hrs	19(28.78%)	6-10 days	8(25.80%)
9-24 hrs	57(38.25%)	1-5 days	23(34.84%)	11-15 days	10(32.25%)
25-48 hrs	13(8.7%)	6-10 days	12(18.18%)	16-20 days	4(12.9%)
49-72 hrs	17(11.4%)	11-15 days	2(3.03%)	20-25 days	1(3.22%)
73-96 hrs	6(4.02%)	16-20 days	7(10.06%)	> 25 days	2(6.45%)
97-120 hrs	6(4.02%)	> 20 days	2(3.03%)		
5-10days	10(6.71%)				
> 10 days	4(2.68%)				

equipped with medical facilities needed for transportation of trauma patients and 81% were without neck immobilization.

More than one level cervical vertebral injury occurred in 124 (43%), among which 54 patients had associated involvement of C6 and 52 had C5. Among single level sub-axial cervical spine injury in 39% of cases, C5 was the commonest vertebra involved. Fracture odontoid was found in 20 patients. 25 (17%) patients presented with pure dislocation or subluxation of cervical spine without associated fracture; 72 patients had both fracture associated with dislocation or subluxation and 3% patients were diagnosed as Spinal Cord Injury Without Obvious Radiological Abnormality (SCIWORA). 29 (20%) patients with neural deficits were subjected for Computed Tomography (CT) Scan evaluation which revealed compression of the cord in 25 cases only.

Among 118 (79%) who had neural deficits, most common neural deficit was quadriplegia (42%) followed by paraplegia (31%). Eight patients had paraplegia; one each had monoparesis and hemiplegia, and 31 had no neural deficits, 13 (9%) were found to have associated extra spinal injury of extremities, ribs or head.

93 (62%) were brought to hospital within 24 hours of

injury (range 24-32 hours). Successful reduction was achieved in 66 cases. Surgery for reduction and/or decompression in 31 patients was carried out in mean time of  $12 \pm 6$  days of injury (range 3-30 days) (Table 2). Posterior fixation along with anterior decompression was done in 16 cases including two anterior cervical plating and posterior stabilization with bone grafting was done in 11 cases. Other surgeries were laminoplasty (2), fusion of C1 and C2 (1), fusion of occiput and C2 (1).

Mean hospital stay was  $31 \pm 13$  days (range 2-50 days). 6 (4%) cases died in 2-10 days duration of hospital admission. Commonest cause of death was high cervical injury with respiratory paralysis followed by complication related with aspiration pneumonitis.

Table 3 shows distribution of Frankel's grading of patient throughout the study period. Among 30 patients available for final follow up, 18 patients were ambulating independently, 19 patient returned to work and 18 patients had no neck pain.

## DISCUSSION

The consequences of cervical spine injury with neural deficits over individual, family and society are profound both in terms of morbidity and mortality. Clinico-

**Table 3.** Distribution patients according to Frankel Grade during study period.

<b>Frankel Grade</b>	<b>At arrival</b>	<b>6<sup>th</sup> weeks</b>	<b>3<sup>rd</sup> months</b>	<b>6<sup>th</sup> months</b>	<b>12<sup>th</sup> months</b>	<b>18<sup>th</sup> months</b>	<b>24<sup>th</sup>+ months</b>
A	54	22	8	3	2	1	-
B	20	12	5	7	2	3	4
C	22	12	7	5	6	1	2
D	19	30	23	17	10	10	5
E	34	30	20	17	15	10	19
<b>Total</b>	<b>149</b>	<b>106</b>	<b>63</b>	<b>49</b>	<b>35</b>	<b>25</b>	<b>30</b>

epidemiological information of these injuries in a country is important for planning and implementing both prevention strategies and management protocol because the data of developed countries where magnitude of the problem, mode of injury, risk factors associated and available health care facilities are different and may not be applicable for developing countries.

The most vulnerable age group for cervical spine injury in present study is 30-49. This is period of life which is most productive and individual can contribute maximum to society and country. Singh *et al* has reported age group of 20 to 39 as most prevalent with average age of 35.4 years at the time of injury to spinal cord among 483 patients.<sup>2</sup> Male dominance in all the series (table 4) indicates risk factors are usually related to outdoor activities and males are exposed more to these factors. But decreasing ratio of male: female over period of time indicates increased involvement of females also in outdoor activities.

Unlike in western countries where road traffic accident plays major role in cervical spine injuries, fall related injuries are commonest mode of injury in developing countries (Table 5). Fall from tree and hill slope accounted for 37% of all injury in present series. Most of the people involved in agriculture as an occupation climb the trees or hill slopes to collect fodder for their livestock in Nepal. Thus, this is a life-style related injury and occupational hazard for the people living in this area. Some of the etiological factors are preventable if adequate attention can be provided, for example fall from bed in paediatrics age group and fall from Balcony because of inadequate fencing, road traffic injuries

because of poor safety measures, fall from tress and hill slopes because of no safety precautions etc.

This study also reveals very poor infrastructure of transportation of trauma victims in Nepal. Patients were brought to hospital after average delay of 2.16 days of injury. Most of them were brought without neck immobilization and unattended by paramedics in the vehicles unsuitable for spinal injury patients such as bus, jeep, auto-rickshaw and sometime using homemade hammock or over the back of the person. This is due to inaccessible roads, inadequate referral system, and illiteracy of general people in the country. Even if people realize need of urgent medical service for these patients, poor socio-economic condition is a major constraint which prevents them coming to hospital early because medical facilities are not affordable to most of the general people.

Longer hospital stay increases financial expenditure which is loss to the patient and the society. Patients with complete neural deficits, multiple level cervical spine and associated trauma show poor prognosis in functional as well as neural recovery. Role of surgery for neural improvement is still debatable. Urinary tract infection, insensate bladder and pressure sores are common

**Table 4.** Comparison of sex ratio in different series.

Series	Year	Male: Female
Harris P <i>et al</i> (England) <sup>3</sup>	1980	3.39:1
Chacko V <i>et al</i> (India) <sup>4</sup>	1986	13.5:1
Lan C <i>et al</i> (Taiwan) <sup>5</sup>	1993	4:1
Shingu H <i>et al</i> (Japan) <sup>6</sup>	1994	4.3:1
Dave PK <i>et al</i> (India) <sup>7</sup>	1994	3.7:1
Karacan I <i>et al</i> (Turkey) <sup>8</sup>	2000	2.5:1
Singh R <i>et al</i> (India) <sup>2</sup>	2001	2.96:1
Present study (Nepal)	2001	4:1

**Table 5.** Comparison of mode of injury in different series

Series	Mode of injury (%)	
	Fall related injury	Road traffic accident
Colterjohn NR <i>et al</i> (Canada) <sup>9</sup>	26.54	48.46
Grant GA <i>et al</i> (USA) <sup>10</sup>	22	50
Harris P <i>et al</i> (UK) <sup>3</sup>	not specified	46
Chacko <i>et al</i> (India) <sup>4</sup>	55.2	14
Lan C <i>et al</i> (Taiwan) <sup>5</sup>	23.3	61.6
Shingu H <i>et al</i> (Japan) <sup>6</sup>	29.2	44.6
Dave PK <i>et al</i> (India) <sup>7</sup>	49.4	36.5
Karacan I <i>et al</i> (Turkey) <sup>8</sup>	36.5	48.8
Present study (Nepal )	60	22

complications associated with cervical spinal cord injuries which is accounted for 6% in present study.

Due to poor educational and low socio-economic background, most people living in rural set up of developing countries get priority in malnutrition related problem, antenatal care, immunization and infectious diseases. Prevention, treatment and social or occupational rehabilitation of spinal cord injury patients and poly trauma patients with disabilities fall behind in the priority as compared to gravity of the problem. Analysis of risk factors, appropriate preventive measures, education and

awareness of safe and early transportation of trauma patients are some of the factors that can reduce cervical spine injury patients and its dreadful complications. Need of spine care centers to look after patients and carry out researches for appropriate management should be emphasized.

Due to lack of proper record system and poor follow up, we could not include all types of spinal injuries and could not cover all parts of the country in this study which would have provided extensive clinico-epidemiological information regarding the magnitude of the problem.

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