

# Epidemiological and Demographic Characteristics of Patients with Traumatic Spinal Injury and Its Neurological Outcome

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## Citation

Shrestha S, Dhakal GR, Marasini RP, Joshi KM. Epidemiological and Demographic Characteristics of Patients with Traumatic Spinal Injury and Its Neurological Outcome. *Nepal Orthopaedic Association Journal (NOAJ)* 2021;7(2):3-6.

## ABSTRACT

### Background

The number of traumatic spinal injury reports is growing annually. The epidemiological characteristics of TSI in Nepal differ from those in other countries. Thus, we compiled epidemiological and demographic factors from Nepal to compare with those from other countries.

### Method

All the admitted cases of traumatic spinal injury over a period of one year (July 2017-June 2018) were studied regarding their variables like age, sex, occupation, etiology of injury, morphology of the spinal injury, neurological level of injury according to American Spinal Injury Association (ASIA) grading.

### Result

Among the 206 cases studied, 145 were male (70.38%). The mean age of the patients were (40.62 ± 15.2) yrs with the range from 12 yrs to 83 yrs with the maximum number of cases in the age group of 31-40 years(23.3%). Fall from height was the most common cause of injury(72.33%) and lumbar vertebra(42.71%) was the most common involved vertebra and burst fracture(57.76%) was the most common morphology of the fracture. Most of the patients were housewife (19.9%) followed by farmer(18.93%) and student (18.93%). 49.5% of the cases had intact neurology. Multiple vertebra was injured in 27(13.10%) of the cases and 24 cases(11.65%) were associated with injury to other organ.

### Conclusion

Traumatic spinal injury is an important public health problem and a major cause of morbidity. It is important to understand the epidemiology to implement appropriate preventative measures. Epidemiology in our scenario is different from that in other developed countries, so intervention measures must be established according to population specific characteristics.

## KEY WORDS

*Demography, Epidemiology, Traumatic Spinal Injury*

## INTRODUCTION

Traumatic spinal injury (TSI) leading to spinal cord injury is a serious debilitating injury that exerts social, psychosocial and economic stress on the society.<sup>1</sup> Traumatic Spinal Cord Injury (TSCI) is a condition where the neural elements suffer acute trauma, resulting in short-term or permanent sensory and motor problems. TSCI leads to major economic and social burdens for individuals and families.<sup>2</sup> These costs are largely due to a need for high-level acute care in the short term and associated secondary complications that occur in the long term.<sup>3</sup> Spinal trauma can be devastating, and the ultimate solution is the prevention of the original injury. Although injury prevention initiatives have attempted to reduce the occurrence of TSCI, the incidence and prevalence of TSCI have been increasing worldwide.<sup>4</sup>

The incidence of spinal trauma is region-specific due to unique geographic and demographic characteristics.<sup>5</sup> Even in the same region, the epidemiology of trauma may vary, with changes in economic and social factors during different periods.<sup>6</sup> The incidence, prevalence, and causation of TSCI differs between developing and developed countries and thus management and preventative strategies need to be tailored to regional trends.<sup>7</sup>

In general, road traffic accidents (RTA) are the leading cause of injury in developed nations, while falls are the leading cause in developing countries.<sup>8,9</sup> The World Health Organization (WHO) has predicted that TSCIs due to RTA will increase in the foreseeable future for developing countries, as usage increases in urban and rural areas.<sup>10</sup> Men are more prone to TSCI in all countries, although the reported gender ratios vary considerably.<sup>8,11</sup> Also most commonly affected age group are the active age group.<sup>8,12,13</sup> An understanding of demographic and injury-related trends in the spinal injured population helps direct health care plans.<sup>5</sup>

Traumatic fractures of the thoracolumbar spine, especially of the thoracolumbar junction (T10-L2), are the most common spinal column fractures. High activity and lack of stability make the thoracolumbar spine more prone to fracture.<sup>14</sup> Since in most of the cases of traumatic spinal injury, the etiology is mostly fall from height or RTA, associated injuries are common in cases of traumatic spine injury and patients with concomitant injury are more likely to sustain a spinal cord lesion.<sup>15</sup>

## METHODS

This was a prospective observational study done at National Trauma Centre, Kathmandu for a duration of one year from July 2017 to June 2018. The cases of admitted traumatic spinal injury were considered for study. However patients with pathological fracture, history of previous spine surgery, old traumatic fractures were excluded from the study. Patients meeting inclusion criteria in the study were enrolled and detailed history regarding the

mode of injury, occupation of the patient was taken and meticulous neurological examination of the patient was done to evaluate the neurological injury using American Spinal Injury Association (ASIA) grading. The required information was recorded in the proforma prepared. The level of vertebra involved in the trauma was evaluated by the xray of the involved spine or CT scan done wherever necessary. The presence or absence of injury to other bones (other than spine) or organ was also evaluated to determine the presence of any other associated injuries. Data was entered master chart was prepared in Microsoft Excel 2007. Microsoft word and Microsoft Excel 2007 was used for the creation of tables and graphs. Before commencing the study, the proposal was submitted to the IRB and ethical clearance taken.

## RESULTS

Total of 206 cases were included in the study.

Among the total 206 cases, 145 (70.38%) were male and 61 (29.62%) were female. The mean age of the patient was (40.62 ± 15.2) years with the range from 12 yrs to 83 yrs with the maximum number of cases in the age group of 31-40 years (23.3%). Most of the patients were housewife (19.9%) followed by farmer (18.93%) and student (18.93%).

In our study, out of 206 cases fall from height was the most common cause of injury (72.33%) followed by RTA which comprised 18.93% of all the cases. Others causes include injury by falling objects (4.85%), physical abuse (1.46%) and other causes like crush injury, hit by cattle (2.43%).

Among the total cases, 179 (86.89%) had single vertebra involved whereas, 27 (13.11%) of the cases had multiple (2 or more) vertebrae involved. Combination of spine injury of different level was seen in 8 patients (Lumbar + Sacral - 1, Dorsal + Lumbar - 3, Dorsal + Cervical - 3, Lumbar + Cervical - 1).

Out of the total cases in our study, about half (49.51%) had no neurological deficit (ASIA E), 29.13% had complete neurological injury (ASIA A) and 21.36% had incomplete neurological injury (ASIA B, C and D).

Associated injuries to other bones/organs were seen in 24 patients (11.65%), the common ones being rib, calcaneal and distal radius fractures.

## DISCUSSION

The epidemiological and demographic characteristics of traumatic spinal injury in our scenario seems to be different from the studies done in the western countries.

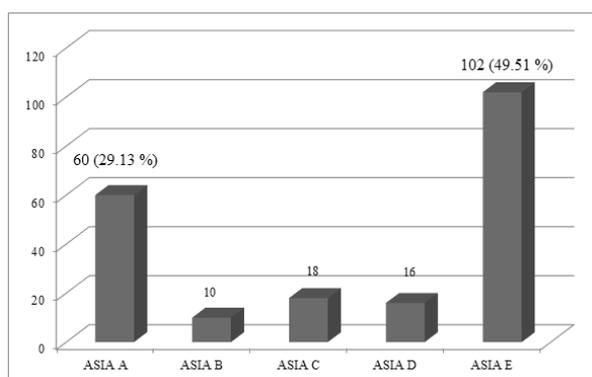
In our study the majority of the cases were male (70.38%). This was comparable to the study done by Yang et al, where they found the male to female ratio to be 3.5:1.<sup>2</sup> Similarly study done by Liu et al showed male to female ratio to be

**Table 1. Age Distribution**

Age (years)	n(%)
11-20	24 (11.65)
21-30	35 (16.99)
31-40	48 (23.30)
41-50	45 (21.84)
51-60	34 (16.50)
61-70	15(7.28)
>70	5(2.44)
Total	206 (100%)

**Table 2. Involved Vertebra**

Vertebra	n (%)
Cervical only	54 (26.21)
Dorsal only	56 (27.18)
Lumbar only	88 (42.72)
Combined	8 (3.89)
Total	206 (100)

**Figure 1. Distribution Of Patients According To Neurological Status**

2.33:1<sup>12</sup> and study done by Shrestha et al in eastern Nepal found male to female ratio to be 4:1.<sup>16</sup> The study done by Dhakal et al on traumatic lumbar spine injury in a trauma hospital in Kathmandu also showed the male to female ratio to be 2.03:1.<sup>17</sup> This is probably explained by the fact that most of male are exposed to outdoor activities in our society and injuries were common in the outdoor activities like fall from height(while doing agricultural work) and RTA.

The mean age of the patient in our study was (40.62 ± 15.2) years with the range from 12 yrs to 83 yrs with the maximum number of cases in the age group of 31-40 years (23.3%) . Also the active age group 21-50 years age group in total comprised of 62.13% of all the cases. This is comparable to the study done by Liu et al where they found that 79.32% of spinal trauma occurred in the patients between 20 and 60 years of age group.<sup>12</sup> Similarly study done by Farhad Pirouzmand on 12192 trauma patients with 23.2% having

spinal injury found the median age of patients with spinal injury was 36 years.<sup>18</sup> This is probably explained by the fact that patients of productive age group were mostly involved in outdoor activities where the trauma occurred.

Fall from height (72.33%) comprised the most common mode of injury in our study. This was followed by RTA (18.93%) and injury by falling object (4.85%). Similarly Yang et al on his study on 1340 patients from 2003-2011 found fall from height to be the most common mode of injury(41%).<sup>2</sup> Also Dhakal et al on his study on found fall injury to be the most common mode of injury (84%).<sup>17</sup> Similarly other study done in our scenario by Shrestha et al and Bajracharya et al found fall injury to be the common mode of injury accounting for 60%<sup>16</sup> and 39% respectively.<sup>13</sup> This was in contrast to the study done by Liu et al<sup>12</sup> and Pickett et al<sup>19</sup> where they found the leading etiological factor to be RTA (33.61% and 35%). Lim et al on their study on Traumatic Spinal Injury from 2000 to 2016 found that RTA, followed by falls, were the most common mechanism of TSI worldwide.<sup>20</sup> The mode of injury in our scenario may be different from that of developed countries because in our scenario most of the cases sustained injury because of fall from height while doing household work like cutting grass from trees for livestock farming, cutting wood from trees etc. So the injuries in our scenario were common in farmers, housewife as they were involved more in such activities of house hold work. Unlike our scenario, western countries had RTA as common mode of injury.

In our study we found the most common involved vertebra was lumbar vertebra ( 42.72%) followed by dorsal vertebra (27.18%), single vertebra was involved in 86.89% of the cases whereas 13.11% had injury in multiple level . Similarly Liu et al<sup>12</sup> found lumbar vertebra to be the most commonly involved (56.09%), Kristindottir et al<sup>21</sup> in their study in 2007-2011 found fractures of the lumbosacral spine as the most common( N= 201, 41 %), and Wang et al<sup>22</sup> in their study on a total of 3142 patients found thoracolumbar spine (54.9%) to be the most common affected. In contrast to our study Yang et al found cervical spine (61%) to be the most common injured vertebra in their study of 1340 patients from 2003-2011.<sup>2</sup>

In our study we found the associated injury to other bones/ organs to be 11.65%. Similarly Yang et al on his study found 24.0% had other fractures and 13.7% had brain injuries.<sup>2</sup> Associated extra spinal injuries were found in 9% patients in a study done by Shrestha et al on total of 149 cervical spine injuries.<sup>16</sup> Also Saboe et al in his study of spine trauma and associated injuries in 508 patients in 1991 found that there was presence of associated injuries in 240 (47%) individuals, most frequently involving head (26%), chest (24%), or long bones (23%).<sup>23</sup> This shows that traumatic spinal injury has concomitant injury to other bones/organs often.

Although all the cases in our study had spinal injuries about half (49.51%) had no neurological deficit(ASIA E) whereas

29.13% had complete neurological injury (ASIA A) and 21.36% had incomplete neurological injury (ASIA B, C and D). Study done by Kattail et al on total of 569 patients with spinal trauma found that 47.1% had no neurological injury (ASIA E) and 12% had complete neurological injury and rest had incomplete neurological injury.<sup>24</sup> Similarly study done by Shrestha et al in the year 2007 on total of 149 patients of cervical injury found that 22.82% had no neurological injury and 36.24% had complete neurological injury and 40.94% had incomplete injury at the time of presentation.<sup>16</sup>

## CONCLUSION

TSI leading to neurological injury is an important public health problem and a major cause of morbidity, therefore prevention has been emphasized. It is important to understand the epidemiology to implement appropriate preventative measures. Epidemiology in our scenario is different from that in other developed countries, so intervention measures must be established according to population-specific characteristics.

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