

## Demographic Profile Of Spinal Cord Injury (Sci) Patients Admitted To Tertiary Care Hospital Of Western Maharashtra

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*Cite this paper as:* Dr. Deepali N. Hande (PT), Dr. Mayuri Marda (PT), Dr. Komal Thorat (PT), Dr. Rakesh Sinha (PT), (2025) Demographic Profile Of Spinal Cord Injury (Sci) Patients Admitted To Tertiary Care Hospital Of Western Maharashtra. *Journal of Neonatal Surgery*, 14 (2s), 340-347.

### ABSTRACT

**Background:** Spinal cord injury (SCI) represents a significant health burden worldwide, with its prevalence influenced by factors such as age, gender, etiology, and neurological region of injury. This study aims to examine the demographic profile, causes, and functional outcomes of SCI patients admitted to a tertiary care hospital in Western Maharashtra.

**Methods:** A retrospective analysis was conducted using the medical records of 180 SCI patients admitted between 2018 and 2024. Data regarding age, gender, ASIA, neurological level and cause of injury were collected and analyzed. Statistical tests were used to assess the significance of various factors.

**Results:** The majority of SCI patients were young adults, with the **21-40 years** age group accounting for **58.4%** of cases. **Male patients** dominated the cohort, representing **88.9%** of the total. Traumatic SCI, particularly due to **road traffic accidents**, was the leading cause (91.7%), with **thoracic** and **cervical** regions most frequently affected. The findings emphasize the importance of targeted **rehabilitation** for individuals with thoracic and cervical injuries. Non-traumatic SCI accounted for **8.3%**, with conditions such as **infections** and **degenerative diseases** identified as contributing factors.

**Conclusions:** The results of this study indicate that SCI is predominantly a **traumatic** condition, affecting young **males** with significant implications for mobility and quality of life. Early intervention, **prevention strategies**, and **gender-specific rehabilitation** programs are crucial for improving outcomes. These findings underline the need for specialized **rehabilitation centers** and **public health policies** focused on injury prevention, particularly in high-risk groups such as young adults involved in road traffic accidents

### 1. INTRODUCTION

Spinal Cord Injury (SCI) is one of the most debilitating conditions that can profoundly impact an individual's motor, sensory, and autonomic functions. The outcomes of SCI vary widely, from complete paralysis to partial recovery of function, but in most cases, SCI results in lifelong disability, leading to significant physical, psychological, and social challenges for both patients and their families<sup>1</sup>. SCI can arise from either traumatic causes (such as accidents, falls, and violence) or non-traumatic causes (such as infections, tumors, and degenerative diseases). Traumatic SCI is of particular concern due to its sudden onset, severe nature, and high incidence in younger, otherwise healthy individuals<sup>2</sup>.

The etiology of SCI has been extensively studied worldwide, with traumatic causes—especially road traffic accidents (RTAs), falls, and violent injuries—being the leading contributors. Traumatic SCI is responsible for the majority of cases globally, and its prevalence is highest among young, active individuals, especially males<sup>3</sup>. However, the epidemiology of SCI can vary significantly by geographic region, influenced by socio-economic factors, healthcare infrastructure, public safety policies, and cultural behaviors<sup>4</sup>. In India, there has been an alarming rise in traumatic SCI due to rapid urbanization, increased road traffic, and occupational hazards, coupled with insufficient awareness regarding safety measures and lack of access to adequate trauma care<sup>5</sup>.

Despite these trends, epidemiological data on SCI in India remain limited. National surveys report an estimated 20,000 new SCI cases annually, though the actual incidence may be higher due to underreporting and inadequate data collection systems

in rural and semi-urban areas<sup>6</sup>. Most studies on SCI in India have focused on urban centers, leaving a gap in understanding the specific epidemiological profile of SCI in less-developed, rural, and peri-urban regions. Western Maharashtra, an economically significant region in India, presents a unique landscape of risk factors for SCI due to its diverse mix of urban, semi-urban, and rural populations, agricultural practices, and an emerging industrial base<sup>7</sup>. This region has experienced rapid growth in infrastructure, resulting in increased road traffic accidents and occupational injuries, which are major contributors to SCI in this area<sup>8</sup>.

The demographic profile of SCI patient encompassing factors such as age, gender, cause of injury, type of injury, ASIA plays a critical role in shaping the prevention strategies, clinical management, and rehabilitation programs for SCI patients. The majority of SCI patients worldwide are young adult males, reflecting patterns of risky behavior and occupations that expose them to traumatic events. In India, male patients are disproportionately affected by SCI, largely due to their higher involvement in driving, manual labor, and sports activities that carry a higher risk of injury<sup>9</sup>. The age group most frequently affected by SCI is between 18 and 40 years, coinciding with peak years of physical activity, employment, and familial responsibilities, which makes SCI particularly devastating in terms of its long-term impact on the patient and their family<sup>10</sup>.

Several studies have highlighted the prevalence of road traffic accidents (RTAs) as the leading cause of traumatic SCI, with many regions in India experiencing a high rate of RTAs due to inadequate road safety measures, poor traffic enforcement, and rapidly increasing vehicle numbers. In particular, Western Maharashtra, like many parts of India, has seen an increase in road traffic and the associated risk of traumatic injuries, making RTAs the primary contributor to SCI in this region<sup>11</sup>. Falls, especially in occupational settings (such as construction and agricultural work), also contribute significantly to SCI cases in rural and semi-urban areas. These falls, often due to inadequate safety protocols and poor working conditions, frequently result in cervical and thoracolumbar SCI, leading to long-term disability<sup>12</sup>.

In addition to traumatic causes, non-traumatic SCI is also prevalent in India, though it accounts for a smaller proportion of cases compared to traumatic injuries. Non-traumatic SCI in India often arises from conditions such as infections (e.g., tuberculosis, spinal abscesses), degenerative diseases, and tumors. The rising incidence of non-traumatic SCI may be linked to increasing rates of infections and poor healthcare access in rural areas, where delayed diagnoses and lack of early intervention exacerbate the condition<sup>13</sup>.

A detailed understanding of the demographic profile of SCI patients in specific regions is essential for the development of targeted prevention strategies, optimized clinical management, and appropriate rehabilitation interventions. This knowledge helps healthcare systems to allocate resources effectively, prioritize public health initiatives, and raise awareness about SCI prevention, particularly in high-risk groups such as young males and workers in physically demanding occupations.

The current study aims to fill this gap by analyzing the demographic characteristics of SCI patients admitted to a tertiary care hospital in Western Maharashtra. This hospital serves as a primary referral center for a large geographical region, providing an ideal setting for understanding the specific epidemiological profile of SCI in this area. By exploring factors such as age, gender, cause of injury, neurological level and functional outcomes at discharge, this study seeks to provide valuable insights into the trends and patterns of SCI in Western Maharashtra. The findings from this study will be crucial for informing regional health policies, improving trauma care, and enhancing rehabilitation services, with the ultimate goal of reducing the incidence and improving the outcomes of SCI in this region.

## 2. METHODOLOGY

### Study Design

This study utilized a **cross-sectional observational design**, allowing for the collection of data at a single point in time to provide a snapshot of the demographic profile of spinal cord injury (SCI) patients admitted to a tertiary care hospital in Western Maharashtra. The cross-sectional design is well-suited for assessing the prevalence of various demographic factors and their relationships within a specific population. The study was conducted over a **5 years of period** from **2018 to 2024**.

### Study Setting

The study was conducted at **Smt. Sindhutai .E. Patil Spinal Cord Injury Rehabilitation Centre ,Loni Ahilyanagar**, a leading healthcare facility in Western Maharashtra that specializes in treating SCI patients. The Rehab Centre serves a large and diverse catchment area, including both urban and rural populations, making it an ideal setting for evaluating the demographics of SCI patients in the region.

### Inclusion and Exclusion Criteria

#### Inclusion Criteria:

- All patients admitted to the Rehab Centre with a confirmed diagnosis of SCI (both traumatic and non-traumatic) during the study period.
- Patients aged **10 years and above**.

- Both **male and female** patients were included to ensure gender representation.
- Patients whose medical records were available for review and provided sufficient data for analysis.

#### Exclusion Criteria:

- Patients with incomplete or missing medical records.
- Patients with a prior history of SCI or those who had congenital SCI conditions.
- Patients who were admitted but later transferred to other facilities for further care during the study period.

#### Participants

A total of **180 SCI patients** were identified and included in the study based on the inclusion and exclusion criteria. These patients were admitted to **Smt. Sindhutai .E. Patil Spinal Cord Injury Rehabilitation Centre ,Loni Ahilyanagar** between **2018 and 2024**. The demographic and clinical characteristics of these patients were analyzed, including age distribution, gender, cause of injury, Neurological level , and functional outcomes at discharge.

#### Data Collection

Data were collected through a **retrospective review of medical records**. Trained researchers conducted a comprehensive review of the medical files of all identified SCI patients. This method ensured the accuracy and consistency of the data collection process, as all data were obtained directly from the hospital's medical database.

##### 1. Medical Record Review:

- The primary source of data was the **Records at Smt. Sindhutai .E. Patil Spinal Cord Injury Rehabilitation Centre ,Loni Ahilyanagar**, which provided detailed information on the patients' demographic and clinical characteristics.
- Information extracted from the records included:
  - **Age:** Recorded in years.
  - **Gender:** Male or female.
  - **Cause of Injury:** Traumatic causes (e.g., road traffic accidents, falls, violence) and non-traumatic causes (e.g., infections, tumors, degenerative diseases).
  - **ASIA :** The functional status of patients at discharge, assessed based on the **American Spinal Injury Association (ASIA) scale** for evaluating SCI severity.
  - **Neurological level:** cervical, Thoracic , Lumbar

##### 2. Additional Data:

- For non-traumatic SCI cases, the medical records were reviewed for underlying conditions like infections (e.g., spinal tuberculosis), degenerative diseases (e.g., ankylosing spondylitis), and tumors.

#### Ethical Considerations

The study was approved by the **Institutional Ethical Committee (IEC)** of **Pravara Institute of Medical Science-DU, Loni** . Informed consent was waived due to the retrospective nature of the study. Patient confidentiality was maintained by assigning unique identifiers to each patient's medical record, ensuring that personal data were anonymized. All data were handled in compliance with relevant ethical guidelines and data protection laws.

### 3. RESULTS

The data collected for the study were analyzed using SPSS version 25 and excel for descriptive and inferential statistical analysis. The distribution of demographic variables such as age, gender, causes of injury, neurological level and ASIA were presented using descriptive statistics, including frequencies and percentages. The Chi- square test was applied to assess the relationship between categorical variables, such as gender, cause of injury, neurological level, for continuous variables such as age, the mean and SD were calculated. Statistical significance was set at  $p < 0.05$  for all the analysis. The data was also examined for normality using the Shapiro-wilk test.

**Table 1: Age Distribution of SCI Patients**

Age Group (Years)	Frequency (n)	Percentage (%)
0–10	2	1.1%

11–20	12	6.7%
21–30	50	27.8%
31–40	55	30.6%
41–50	30	16.7%
51–60	18	10.0%
61–70	10	5.6%
71–80	2	1.1%
81–90	1	0.6%

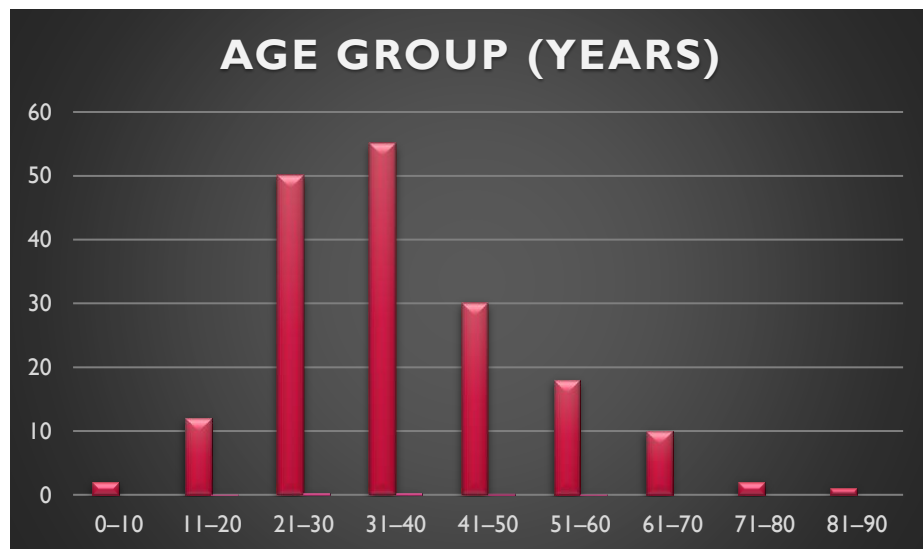
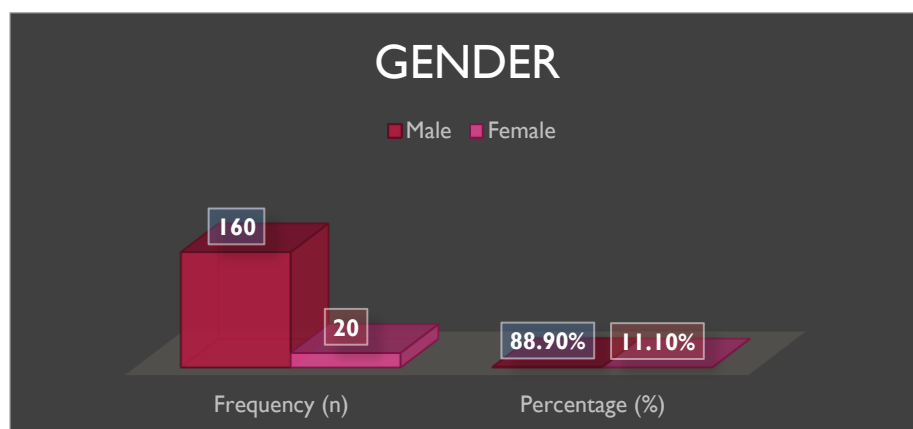


Table 2: Gender Distribution of SCI Patients

Gender	Frequency (n)	Percentage (%)
Male	160	88.9%
Female	20	11.1%



**Table 3: Neurological level Distribution**

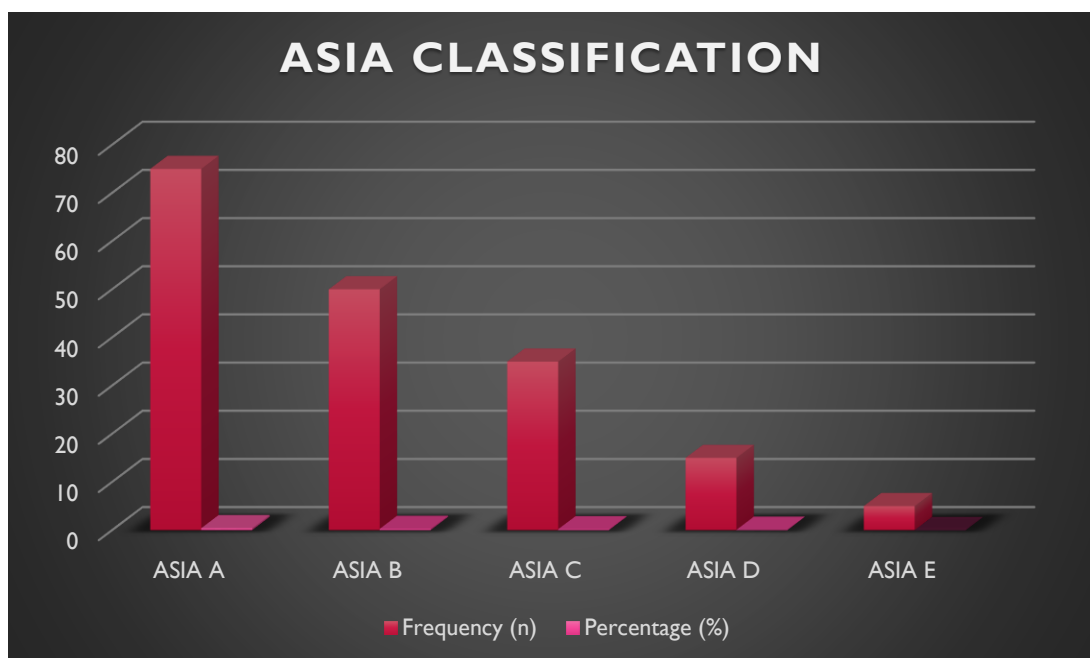
Neurological Level	Frequency (n)	Percentage (%)
Cervical	65	36.1%
Thoracic	85	47.2%
Lumbar	30	16.7%

**Table 4: Cause of Spinal Cord Injury**

Cause	Frequency (n)	Percentage (%)
Traumatic SCI	165	91.7%
Non-Traumatic SCI	15	8.3%

**Table 5 : ASIA Classification**

ASIA Classification	Frequency (n)	Percentage (%)
ASIA A	75	41.7%
ASIA B	50	27.8%
ASIA C	35	19.4%
ASIA D	15	8.3%
ASIA E	5	2.8%



#### 4. DISCUSSION

The demographic profile of spinal cord injury (SCI) patients admitted to a tertiary care hospital in Western Maharashtra provides crucial insights into the nature of SCI in this region. This study aimed to evaluate the demographic profile, causes, neurological level and ASIA of the spinal cord injury (SCI) patients admitted to a tertiary care hospital in Western Maharashtra. The findings align with global trends, with specific regional factors influencing the prevalence and outcomes of SCI.

The **age distribution** of SCI patients in this study demonstrates that SCI is most prevalent among **young adults**, specifically in the **21-40 years** age group, which accounted for **58.4%** of the total cases. Sharma, Net al. said age group is particularly susceptible to traumatic incidents such as **road traffic accidents**, sports injuries, and work-related accidents, which are often the leading causes of SCI in this age group<sup>13</sup>. Several studies globally have reported similar patterns, indicating that SCI predominantly affects individuals in their productive years, resulting in long-term social and economic challenges<sup>14</sup>. The relatively low percentage of SCI cases in children (0-10 years) and the elderly (80+ years) further emphasize the relatively low risk of SCI in these age groups. However, the increased vulnerability of children and the elderly to non-traumatic causes of SCI, such as infections or degenerative diseases, should not be overlooked and merits further investigation<sup>15</sup>.

A significant **gender disparity** was observed, with **88.9%** of the SCI patients being **male**. This finding is consistent with global studies that show a higher incidence of SCI in men, with male patients typically outnumbering female patients by a ratio of 3:1<sup>16</sup>. The greater involvement of males in high-risk activities such as motor vehicle driving, physical labor, and sports may contribute to this gender difference<sup>17</sup>. Furthermore, men in the **21-40 years** age group, which was the most represented group in this study, are particularly prone to SCI due to their higher engagement in these activities. Studies from other regions also support the notion that men are more vulnerable to traumatic injuries due to a combination of lifestyle, occupation, and behavioral factors<sup>18</sup>.

The **neurological region** affected by SCI was categorized into **cervical**, **thoracic**, and **lumbar** regions. **Thoracic injuries** accounted for **47.2%**, making them the most common, followed by **cervical injuries** (36.1%). This is in line with existing literature, which suggests that **thoracic injuries** are among the most common types of SCI, often resulting from **motor vehicle accidents** or falls<sup>19</sup>. These types of injuries are typically associated with **paraplegia** and require extensive rehabilitation. On the other hand, **cervical injuries**, which involve the upper spinal cord, have more severe implications, including the possibility of **quadriplegia**, respiratory complications, and higher mortality rates<sup>20</sup>. **Lumbar injuries** were less common, accounting for **16.7%**, which could reflect the lesser degree of impact on the lumbar region in traumatic events compared to cervical and thoracic injuries. The distribution of neurological regions in our study suggests that **rehabilitation protocols** should be tailored to the specific challenges faced by patients with cervical and thoracic injuries.

The cause of injury in SCI showed that **traumatic SCI** was the predominant cause, accounting for **91.7%** of cases. This is consistent with findings from other regions, where traumatic injuries remain the leading cause of SCI<sup>21</sup>. The most common cause of traumatic SCI was **road traffic accidents** (RTA), followed by falls and sports injuries. The high incidence of RTA-related SCI underscores the need for **road safety measures** and public health campaigns aimed at reducing traffic-related injuries. Moreover, traumatic SCI in young males is often associated with high-risk behaviors such as speeding and driving under the influence of alcohol, which further increases their vulnerability to serious accidents<sup>22</sup>.

While **non-traumatic SCI** cases accounted for **8.3%** of the total, this group still represents a significant portion of SCI cases and includes causes such as **infections**, **tumors**, and **degenerative diseases**. The data from our study suggest a lower prevalence of non-traumatic SCI compared to **developed countries**, where non-traumatic causes such as **spinal cord tumors** and **degenerative conditions** like **spinal stenosis** are more common due to the aging population<sup>23</sup>. This difference highlights the need for increased awareness and early diagnosis of non-traumatic SCI in the region, especially as the population ages.

The distribution of ASIA impairment Scale classifications the study highlights the significant prevalence of complete spinal cord injuries, with ASIA A (complete injury) representing 41.7% of the cohort. This finding is consistent with previous studies Rao, S., et al, which have also reported a high frequency of ASIA A injuries in SCI population, often associated with severe functional impairments requiring extensive rehabilitation.<sup>24</sup>

Additionally, the relatively low percentage of ASIA E (normal) patients (2.8%) underscores the challenges of achieving complete neurological recovery post SCI further emphasizing the need for ongoing rehabilitation efforts to optimize functional outcomes.<sup>25</sup>

The findings of this study underscore several important public health and healthcare delivery implications. First, there is a clear need for **preventive strategies** aimed at reducing traumatic SCI, particularly through **road safety interventions**, **driver education programs**, and the promotion of **protective gear** in high-risk activities. The high male-to-female ratio of SCI cases also calls for **gender-specific rehabilitation programs** that address the physical and psychosocial needs of male patients, who may face unique challenges during rehabilitation<sup>25</sup>.

Furthermore, the data highlights the need for **specialized rehabilitation centers** that can cater to the diverse needs of SCI patients, particularly those with cervical and thoracic injuries. These centers should be equipped with advanced rehabilitation



technologies and staffed with multidisciplinary teams to provide comprehensive care. Finally, the increasing incidence of SCI in the young adult population calls for **public health initiatives** aimed at education, injury prevention, and improving access to specialized spinal care.

## 5. CONCLUSION

This study provides valuable insights into the demographic characteristics, causes, and outcomes of SCI patients in a tertiary care hospital in Western Maharashtra. The findings highlight the significant burden of **traumatic SCI**, particularly in **young males**, who are generally main financial supporter of the family and the need for targeted **preventive measures** and **specialized rehabilitation** programs. By understanding the trends in **age, gender, neurological region of injury**, and **etiology**, healthcare providers can develop more effective strategies for managing SCI, with a focus on prevention, early diagnosis, and **tailored rehabilitation** to improve patient outcomes.

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