

# Demographic and Clinical Characteristics of Brachial Plexus Injury at Kirtipur Hospital

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## ABSTRACT

**Introduction:** Brachial plexus injury is a devastating condition causing significant motor and sensory impairment of the upper limb, often resulting in long-term disability. Road traffic accidents, particularly involving motorcycles, are the leading cause of adult brachial plexus injury worldwide. Despite the increasing incidence of trauma in Nepal, there is limited epidemiological data regarding brachial plexus injury. **Aims:** To evaluate the demographic characteristics, mechanisms of injury, and clinical presentation patterns of adult brachial plexus injuries. **Methods:** A retrospective observational study was conducted by reviewing medical records of adult patients diagnosed with brachial plexus injury at Kirtipur Hospital over a five-years period (2019–2025). Demographic characteristics, mechanism of injury, side involved, type and level of nerve involvement, associated injuries, and time from injury to presentation were analyzed. Patients with clinically and/or electromyographically confirmed brachial plexus injury were included. **Results:** A total of 108 patients with adult brachial plexus injury were included. The mean age was 29.02 years, with 87% of patients belonging to the 20–50 years age group. Male constituted 88% of cases. Right-sided injuries were more common (70.4%). Road traffic accidents accounted for 83.3% of injuries, with two-wheeler accidents comprising 96.7% of road traffic accidents. Supraclavicular injuries were the most common type (84.4%). Total plexus palsy (C5–T1) was the most frequent pattern of injury (24.76%), followed by upper plexus (C5–C6) injuries (22.86%). Associated injuries were present in 42.59% of patients, predominantly involving the upper limb. The mean time to presentation was 5.74 months. **Conclusion:** Brachial plexus injury in Nepal predominantly affects young adult males involved in high-energy trauma, particularly two-wheeler accidents. Supraclavicular injuries and total plexus palsy were the most common clinical presentations. These findings emphasize the need for preventive road safety measures, early recognition, and timely referral to specialized centres.

**Keywords:** Brachial plexus injury; Epidemiology; Nepal; Peripheral nerve injury; Road traffic accidents; Upper limb trauma

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## INTRODUCTION

The brachial plexus is a complex network of nerves responsible for motor and sensory innervation of the upper limb. Most common cause of brachial plexus injuries is road traffic accidents.<sup>1</sup> Due to rapid urbanization, road traffic accidents (RTA) has been steadily and steeply increasing in Nepal.<sup>2</sup> Brachial plexus injuries (BPI) are very debilitating affecting quality of life of the patient and in those who don't recover spontaneously, the treatment is a complex process which requires expertise.<sup>3,4</sup> Although we have sufficient global data, in Nepal, the increasing prevalence of road traffic accidents and brachial plexus injuries underscores the need for a comprehensive understanding of epidemiology of the injury to formulate awareness and management plan.

## METHODS

An observational study was conducted, reviewing medical records of patients who presented to Kirtipur Hospital and diagnosed with BPI at over a five-year period (2019–2025). Data collected included patient demographics, mechanism of injury, type and extent of nerve involvement, associated injuries, and time to presentation. All the patients with clinically and/or electromyographically confirmed BPI were included in this study. Patients with birth brachial plexus palsy and incomplete medical records were excluded from the study. Total of 108 patients with adult brachial plexus injuries were studied. Institutional review committee clearance was obtained from the institutional review committee of PHECT- Nepal (Application no : 221-2025)

## RESULTS

A total of 108 patients diagnosed with brachial plexus injury (BPI) were included in this study, presenting to Kirtipur Hospital over the study period.

### Demographic Characteristics

The age of patients ranged from late 16-65 years, with a mean age of 29.02 years (Table I). The majority (87%) of patients were within the 20–50 years age group.

| Age Group | Number of Patients/<br>Percentage |
|-----------|-----------------------------------|
| <20       | 9<br>(8.33)                       |
| 20–29     | 62<br>(57.40)                     |
| 30–39     | 20<br>(18.51)                     |
| 40–49     | 12<br>(11.11)                     |
| 50+       | 5<br>(4.62)                       |

**Table I: Age distribution of brachial plexus injury patient**

Out of the total patients, males constituted the majority, comprising almost 88% of the cohort, while females accounted for the remaining. (Table II)

| Sex    | Number of Patients/<br>Percentage |
|--------|-----------------------------------|
| Male   | 95<br>(87.9)                      |
| Female | 13<br>(12.1)                      |

**Table II: Sex distribution of brachial plexus injury**

Right side, which was the dominant side was injured much more commonly than left sided injury (Table III).

| Sex   | Number of Patients/<br>Percentage |
|-------|-----------------------------------|
| Right | 76<br>(70.37)                     |
| Left  | 32<br>(29.62)                     |

**Table III : Side distribution of brachial plexus injury**

### Mechanism of Injury

The most common cause of brachial plexus injury was road traffic accidents (RTA), particularly involving motorbike collisions. (Table IV) Other mechanisms included fall, physical as-

sault, physical training and so on. Iatrogenic causes included post radiotherapy palsy, post-surgical palsy after thoracic outlet syndrome and proximal humerus fracture fixation surgery.

| Cause             | Frequency | Percentage |
|-------------------|-----------|------------|
| RTA(Two wheeler)  | 87        | 80.55      |
| RTA(Four wheeler) | 3         | 2.77       |
| Iatrogenic        | 4         | 3.7        |
| Fall from Height  | 3         | 2.77       |
| Physical assault  | 3         | 2.77       |
| Physical training | 3         | 2.77       |
| Others            | 5         | 4.6        |

**Table IV : Mechanism of injury**

### Type and level of injury

Supraclavicular injuries were the most common type accounting for 84.4 % of injuries and the rest were infraclavicular. (Table V)

The most common type of injury observed was total plexus palsy( C5–T1), comprising 26.85% of the total. This was followed by upper plexus(5,C6) and extended upper plexus type(C5,C6,C7), which accounted for 22.22% and 17.59% respectively. Cord level Injuries constituted 11.11% of the patients in our series.

| Level of Injury     | Count | Percentage % |
|---------------------|-------|--------------|
| C5                  | 9     | 8.57         |
| C5, C6              | 24    | 22.86        |
| C5, 6, 7            | 19    | 18.10        |
| C5, 6, 7, 8         | 6     | 5.71         |
| C6, 7, 8, T1        | 1     | 0.95         |
| C8, T1              | 2     | 1.90         |
| C7, 8, T1           | 1     | 0.95         |
| T1                  | 1     | 0.95         |
| C5–T1               | 29    | 24.76        |
| Cord level          | 12    | 11.43        |
| PIN                 | 1     | 0.95         |
| Long thoracic nerve | 1     | 0.95         |
| SSN                 | 1     | 0.95         |
| Trunk level         | 1     | 0.95         |

**Table V: Type and level of injury**

### Associated Injuries

Of total cases in this series, 42.59% of the patients had other associated injuries. Upper limb injuries including soft tissue loss, fractures and dislocations were the most common associated injuries. (Table VI)

| Injury Type                                 | Number | Percentage |
|---------------------------------------------|--------|------------|
| Upper limb injuries /fracture/ dislocations | 32     | 69.6       |
| Lower limb fractures                        | 8      | 17.4       |
| Cervical spine injury                       | 2      | 4.3        |
| Pelvic fracture                             | 2      | 4.3        |
| Facial Fracture                             | 1      | 2.2        |
| Vascular Injury                             | 1      | 2.2        |

**Table VI: Associated injuries****Time of presentation**

Average time of presentation to hospital was 5.74 months with range of as early as day 1 to 60 months post injury.

**DISCUSSION**

In his landmark study, Narakas stated rule of 70s which included 70% of BPI are due to road traffic accidents and 70% of these are due to cycle or motorcycle accidents, 70% of them are supraclavicular.<sup>1</sup>

Brachial plexus injuries are devastating injuries. In a study conducted in India the economically most active group (20-50) was involved in 80% of the cases.<sup>5</sup> In our study most common age group affected with brachial plexus injury was 20-50 years with 87% of the total cases falling in this group. This has significant effect on socio economic future of the person, family and the country as whole. In a study to evaluate the indirect cost of BPI in United States, only 33% of the patient returned to their previous jobs, 27% returned to a different job leading to impairment of earning and whopping 40% did not return to work at all.<sup>6</sup> Given there is not any strong insurance or disability support system in Nepal, this is going to have enormous effect on socio-economic condition of the family and the society as a whole.

In our study 87% of the patient were male. In a study of road traffic fatalities showed there are far more male deaths in RTA than female. In 2015-2016, for every female death there were 4 male death in year but this trend is changing recently.<sup>7</sup> This might point towards the fact that there are far more number of male riders/drivers in Nepalese road or male riders are more likely to be involved in severe road traffic accidents.

Study by Sabapaty and colleagues showed that amongst the patients with RTA, 90% of the patient with BPI were two wheeler rider. In our study 83% of the BPI cases were from road traffic accidents.<sup>5</sup> Out of them 96.7% were two wheeler accidents. The fact that out of all registered vehicles in Nepal nearly 80% are two wheelers may have influenced the higher incidence of BPI with two wheelers.<sup>8</sup> Uncommon but worth noticing causes of BPI in our study was radiotherapy and iatrogenic cases.

Most common type of brachial plexus injury is pan plexus or total plexus injury involving C5-T1 roots. Study done in a center in India showed total plexus injury accounted for 48% of their

brachial plexus patients.<sup>5</sup> Another study showed that total plexus palsy accounted for 39% of their total brachial plexus patients.<sup>9</sup> In our study also total plexus injury was the most common form of injury but it only accounted for 24.76% of cases.

Most of the brachial plexus injuries are high trauma injuries and bound to be associated with other injuries. In our study 42.59% of the cases had other associated injuries. Upper limb injuries accounted for 69.6% of all the associated injuries. Study conducted in India showed similar rate of associated injuries and upper limb injuries including clavicle fracture was the most common type.<sup>5</sup>

Average time of presentation of patients in our study was 5.74 months with range from day 1 to 60 months post injury. This may not reflect the true picture of the patients presenting to our center as data of many of the patients with late presentations who did not undergo any interventions were missing and not included in this study.

**LIMITATIONS**

It is a retrospective study in which some data on late presenting cases are missing and eventually excluded from the study, this may skew result towards those presenting early and undergoing surgical treatment. This is a single center study at a tertiary center which may have some referral bias and may not completely reflect the true epidemiology.

**CONCLUSION**

This study demonstrates that brachial plexus injuries in Nepal predominantly affect young adult males, particularly those within the economically productive age group. Road traffic accidents, especially involving two-wheelers, were identified as the leading mechanism of injury. Clinically, supraclavicular injuries were the most common type, with total plexus palsy being the most frequent pattern of involvement, and a substantial proportion of patients presenting with associated traumatic injuries. The demographic and clinical profile identified in this study highlights the significant personal and socio-economic burden of brachial plexus injuries. Improved road safety measures, greater awareness for early recognition, and timely referral to specialized centres are essential to optimize outcomes and reduce long-term disability.

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