

# Epidemiological Study of Tibial Plateau Fractures in Nepal: A Retrospective Descriptive Study of Hospital-treated Cases

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## Abstract

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**Background:** Tibial plateau fractures are complex injuries that need careful evaluation, classification, and comprehensive management to avoid serious complications. We aimed to assess the epidemiological profile of patients with tibial plateau fractures treated at the B & B Hospital, Lalitpur, Nepal.

**Methods:** A retrospective cross-sectional study included 213 patients treated for tibial plateau fractures at the B&B Hospital between 2020 and 2024. We reviewed the medical record data and selected eligible cases. We extracted data on patient demographic characteristics, cause of injury, side of injury, fracture classification, and injury patterns, and analyzed them using descriptive statistics.

**Results:** A total of 213 patients were recorded. Males accounted for 70.9% of cases (n=151), while females accounted for 29.1% (n=62). The most common cause of injury was road traffic accidents (RTA), accounting for 88.7% (n=189), with riders being hit from behind (45, 23.8%) being the most frequent mechanism. Schatzker Type IV fractures were the most common (26.8%), followed by Type II (21.1%). The majority of fractures occurred on the right side (57.3%). Bagmati Province recorded the highest number of cases (47.4%).

**Conclusion:** The results showed that tibial plateau fractures were common among males and the age group between 29 to 30 years. Road traffic accidents were the most common cause. The Schatzker Type IV fractures were observed in the highest proportion, with the predominance of the right side. Findings offered important insight into the demographic and injury patterns.

**Keywords:** epidemiology, injury type, road traffic accidents, tibial plateau fracture

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## Introduction

Tibial plateau fractures have become the most frequent type of traumatic pathology, which presents challenges for orthopedists due to the associated severity of complications.<sup>1,2</sup> The surgical management of high-energy tibial plateau fractures poses an incidence of complications up to 30%, with infection and wound problems being the most common.<sup>2,3</sup> Other complications reported were malunion, leading to abnormal bone healing or deformities.<sup>4</sup> As a result, the stability of the knee and the weight-bearing capacity are highly affected by this complex type of injury.<sup>5,6</sup> Furthermore, Jagdev et al. reported a higher incidence (73.4%) of posttraumatic osteoarthritis among the cases of tibial plateau fractures.<sup>4</sup>

The reported incidence of tibial plateau fractures varies, ranging between 23.3% to 70.7% in different previous studies, particularly affecting young males.<sup>3,7</sup> The majority of the high-energy traumas were caused by road traffic accidents (RTAs), with motorbike accidents being the most common cause, and falls secondary to osteoporosis were reported as a contributor to low-energy trauma, especially among older adults.<sup>1,8</sup>

Tibial plateau fractures present in various patterns, from non-displaced closed fractures to complicated fractures with associated soft tissue and neurovascular injuries.<sup>9</sup> Patient's age, injury force, and the extent of knee flexion at the time of injury determine the morphological patterns of injuries.<sup>10</sup> These parameters must be considered during the clinical evaluation to guide a suitable therapeutic approach.<sup>11,12</sup>

Due to its high burden and multiple associated complications, tibial plateau fractures are a significant public health concern.<sup>1</sup> The epidemiological characteristics of the patients provide evidence for the prevention and effective management of these fractures, leading to improved patient outcomes.<sup>12</sup> Though a few studies in Nepal explored the functional outcomes of tibial plateau fractures treated, we lack epidemiological characteristics of patients.<sup>13-15</sup> Thus, we aimed to assess the epidemiological profile of patients treated with tibial plateau fractures at the B & B Hospital from 2020 to 2024.

## Methods

A descriptive, retrospective study was conducted among 213 patients with tibial plateau fractures treated at the B&B Hospital, Lalitpur, Nepal. We reviewed five years of medical data from 2020 to 2024. By reviewing their clinical histories, we selected 213 patients based on the inclusion and exclusion criteria. Patients older than 18 years with closed and open fractures, including polytrauma cases confirmed and classified by an orthopedic doctor with more than 5 years of professional experience, were included in the study. However, those with periprosthetic fractures, pathological fractures, or revision surgeries, and those with incomplete data were excluded from the study. Patients

presented with bilateral fractures were counted only once. Duplication of patients due to repeated admissions was screened and avoided in the dataset.

The B & B hospital administration approved the study and posed no risk to the participants. Ethical approval for the study was obtained from the B&B Institutional Review Committee (B&BIRC-25-50). Data were extracted considering patients' demographic characteristics (age, sex, and residence) and injury-related characteristics (cause of injury, side of injury, and classification). Descriptive statistics, including mean, standard deviation, and percentage, were calculated using SPSS version 16.

The classification of tibial plateau fractures was based on the Schatzker classification and was done with morphological and radiological evaluation by orthopedic doctors. There are six types of fractures, with higher numbers representing the more severe injuries.<sup>16</sup>

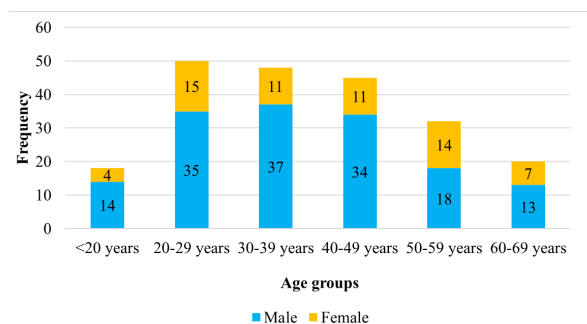
## Results

A total of 213 patients with tibial plateau fractures were analyzed. The highest proportions of patients were aged 20 to 29 years (23.5%), followed by 30 to 39 years (22.5%) (Table 1).

**Table 1. Distribution of patients by age groups (n=213)**

Age Group (years)	Frequency (n=213)	Percentage (%)
<20	18	8.5
20-29	50	23.5
30-39	48	22.5
40-49	45	21.1
50-59	32	15
60-69	20	9.4
<20	18	8.5

Among 213 patients, the majority were males (151, 70.9%) and were predominant across different age groups. In the age group <20 years, males constituted the highest proportion of cases (14, 77.8%), while



**Figure 1** Distribution of patients by gender across age groups

females accounted for only 4, 22.2%. In the age group 50–59 years, a relatively smaller gap in proportion was found, where males comprised 18, 56.3%, and females represented 14, 43.8%. (Figure 1).

Nearly half were from the Bagmati province (101, 47.4%), followed by Madhesh province (59, 27.7%), and the least were from the Karnali province (2, 0.9%) (Table 2).

**Table 2. Regional Distribution of patients with tibial plateau fractures (n=213)**

Provinces	Frequency (n=213)	Percentage (%)
Koshi	8	3.8
Madhesh	59	27.7
Bagmati	101	47.4
Gandaki	19	8.9
Lumbini	19	8.9
Karnali	2	0.9
Sudurpaschim	5	2.3

**Table 3. Mechanism of Injury among patients with tibial plateau fractures (n=213)**

Mechanism of Injury	Frequency	Percentage (%)
Road traffic accidents	189	88.7
Fall from a 2-wheeler	30	15.9
Rider hit from the back	45	23.8
2-wheeler vs. 4-wheeler	23	12.2
2-wheeler vs. 2-wheeler	34	18.0
2-wheeler vs. 6-wheeler	8	4.2
Pillion rider injury	24	12.7
Ground hit injury	8	4.2
Pedestrian hit by a vehicle	16	8.5
Mass casualty	1	0.5
Fall Injury	24	11.3
Trivial Fall	9	37.5
Fall from height	15	62.5

**Table 4. Gender distribution by mechanism of injury (n=213)**

RTA Type	Male (n=151)	Female (n=62)
Fall from a 2-wheeler	22 (14.6%)	8 (12.9%)
Rider hit from Back	35 (23.2%)	10 (16.1%)
2-wheeler vs. 4-wheeler	20 (13.2%)	3 (4.8%)
Pillion rider injury	12 (7.9%)	12 (19.4%)
Ground hit injury	5 (3.3%)	3 (4.8%)
2-wheeler vs. 2-wheeler	30 (19.9%)	4 (6.5%)
2-wheeler vs. 6-wheeler	8 (5.3%)	0 (0.0%)
Pedestrian hit by a vehicle	6 (4.0%)	10 (16.1%)
Mass casualty (bus accident)	0 (0.0%)	1 (1.6%)
Fall injury	13 (8.6%)	11 (17.7%)

A majority of cases sustained injury through RTAs (189, 88.7%). The most common mechanism of injury for RTA was from a rider being hit from behind (45, 23.8%), followed by a 2-wheeler collision with a 2-wheeler in 34 cases (18.0%), and a fall from a two-wheeler (30, 15.9%) (Table 3).

Male patients most commonly sustained RTAs due to being hit from the back (23.2%), bike-to-bike collision (19.9%), and a fall from a bike (14.6%), indicating a higher involvement in active riding and vehicle-to-vehicle crashes. In females, the most frequent causes were back sitter injury (19.4%), fall injury (17.7%), and pedestrian hit (16.1%), showing a relatively higher proportion of passive travel-related and pedestrian injuries (Table 4).

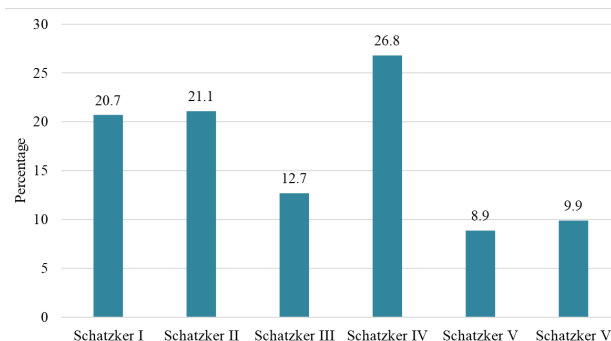
More than half of patients had right-sided tibial plateau fractures (122, 57.3%), while 2 cases (0.9%) had injuries on both sides (Table 5).

**Table 5. Side of Injury (n=213)**

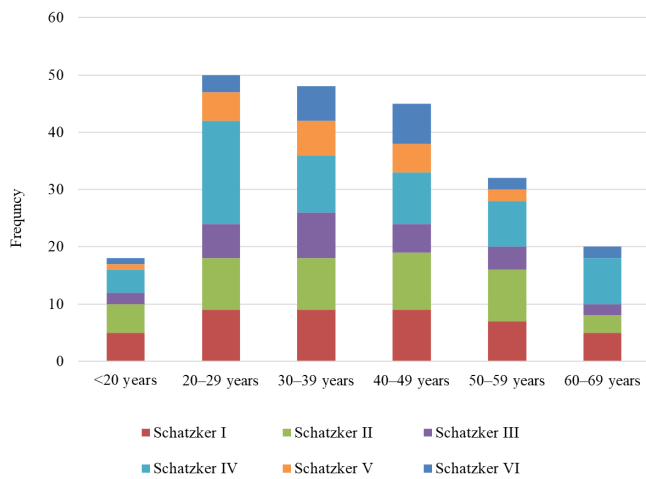
Side	Frequency (n=213)	Percentage (%)
Right	122	57.3
Left	89	41.8
Bilateral	2	0.9

The Schatzker classification of fractures showed that Type IV fractures were the most reported class of tibial plateau fractures (57, 26.8%), followed by Type II (45, 21.1%), and the least common were Type V (19, 8.9%) (Figure 2).

Figure 3 illustrates that the highest number of cases occurred in the 20–29 years age group (n=50), where Type IV fractures were also most frequent (n=18, 36.0%). Similarly, older age groups, particularly 60–69 years, also showed a relatively higher proportion of Type IV injuries (n = 8, 40.0%). Simpler fracture types, such as Schatzker I and II, were more evenly distributed across age groups.



**Figure 2** Schatzker classification of patients with tibial plateau fractures



**Figure 3** Distribution of patients by age and Schatzker classification

## Discussion

The present study assessed the epidemiological characteristics of 213 patients with tibial plateau fractures treated at a private institution in Nepal. Males (151, 70.9%) were more affected than females (62, 29.1%). Consistently, previous studies also reported a higher proportion of males being victims of tibial plateau fractures.<sup>13-15</sup> Unlike our findings, Bormann et al. and Herteleer et al. revealed that these fractures were more predominant among females than males.<sup>7,17</sup>

The present study found that almost half (47.4%) of cases were from Bagmati Province. Since the study site is located within Bagmati Province, this can reflect referral bias and may not represent the overall population of Nepal. RTAs are the most common cause (189, 88.7%), with a rider being hit from behind (45, 23.8%), followed by a 2-wheeler collision with a 2-wheeler. This highlights that tibial plateau fractures are common, indicating the serious issue of RTAs and risky driving, causing injury in our setting. RTAs cause an alarming rate of 14 deaths per 100,000 in Nepal, particularly in the Terai regions.<sup>18</sup> The fatality rate of RTAs is on an increasing trend from 7.70 in FY 2019-2020 to 9.89 in FY 2021-2022 per 100,000 population in Nepal.<sup>19</sup> Though RTAs were the most common mode of injury reported among patients with tibial plateau fractures, the proportion is lower (44.6%) than in the present study.<sup>15</sup> The discrepancy in the result might be attributed to the study site being a major referral center and located in an urban setting, serving the population living in high vehicular traffic. Similarly, supporting findings of the present study, Tharu et al. also reported that Motorbike accidents were the most common type of RTAs in Nepal.<sup>20</sup>

The present study found that tibial plateau fractures are most commonly found in people aged 20 to 29. However,

Reátiga et al. reported that younger people aged 30 to 40 were primarily affected.<sup>1</sup> In contrast, Herteleer et al. reported that the burden of tibial plateau fractures increased among the elderly in Belgium.<sup>17</sup> The present study found that nearly half of the cases had injuries to the tibia on the right side (57.3%). Mishra et al. also reported the injuries predominantly on the right side.<sup>14</sup> The highest proportion of cases was classified as Schatzker Type IV fractures (26.8%). The predominance of this type of fracture may be attributed to the highest proportion of high-energy trauma, i.e., RTAs, in our study cohort. Moreover, the majority of younger patients (20-29 years) affected in the present study also reflects the likelihood of high-energy trauma due to their risk-taking behavior and high exposure to road traffic. In line with our result, Thapa et al. in 2022 also reported a similar finding.<sup>15</sup> However, evidence showed that Type II fractures are the most common type and require sophisticated management.<sup>21</sup> In contrast, Borman et al. also reported Type II as the most common tibial plateau fracture.<sup>7</sup> The findings of Reátiga et al. also contradict the present result, as Type VI was the most common fracture in the previous study.<sup>1</sup>

This study highlights that young males were highly affected by the tibial plateau fracture, particularly due to road traffic accidents, leading to the Schatzker Type IV fracture pattern. The results are also supported by previous studies, and the evidence may help in clinical assessment and future research. However, a few limitations of the study are worth noting. The results may not be generalized to the wider population due to the study being conducted in a single center located in an urban region of Nepal, reflecting referral bias. Additionally, the retrospective cohort design might lead to documentation bias.

## Conclusion

Tibial plateau fractures are common among young people aged 20 to 29 years, and men are most commonly affected. Primarily, the fracture was caused by road traffic accidents. The Schatzker IV was found in the highest proportion. The findings highlight patient profiles and injury patterns, which may guide the clinical assessment and future research work.

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