Original Article
DOI: https://doi.org/10.70749/ijbr.v3i4.2138

INDUS JOURNAL OF BIOSCIENCE RESEARCH
https://ijbr.com.pk
ISSN: 2960-2793/ 2960-2807

Frequency of Open Tibia Fracture in Patients of Road Traffic Accidents Presenting to Ayub Teaching Hospital Abbottabad

Ihsan Ullah[1], Rafi ud din Khan[1], Alamzeb Khan[1]

[1]Department of Orthopedic, Ayub Teaching Hospital, Abbottabad

ARTICLE INFO

Keywords: Open Tibia Fracture, Road Traffic Accidents, Orthopedic Trauma, Ayub Teaching Hospital Abbottabad.

Correspondence to: Ihsan Ullah, Department of Orthopedic, Ayub Teaching Hospital, Abbottabad.
Email: dr.ihsanshams14@gmail.com

Declaration
Authors' Contribution: All authors equally contributed to the study and approved the final manuscript.

Conflict of Interest: No conflict of interest.

Funding: No funding received by the authors.

Article History
Received: 05-01-2025 Revised: 09-03-2025
Accepted: 21-03-2025 Published: 30-04-2025

ABSTRACT

Background: Road traffic accidents (RTAs) are a leading cause of tibia fractures, particularly open fractures, which present significant challenges in management and recovery. **Objective:** This study aims to determine the frequency of open tibia fractures in RTA patients presenting to Ayub Teaching Hospital, Abbottabad. **Methods:** A cross-sectional study was conducted at the Orthopedics Department of Ayub Teaching Hospital from April 2024 to October 2024. Data were collected from 120 patients using a non-probability consecutive sampling technique. Sample size was calculated using the precision formula with a 95% confidence interval and 1% level of significance. **Results:** The study included 120 patients, with a mean age of 32.5±12.6 years. The majority were male (70.8%), and 83.3% of fractures were caused by RTAs. Open fractures accounted for 37.5% of cases, with Type II and Type IIIA being the most common. Associated bone injuries were present in 33.3% of cases, and the most common surgical procedure was open reduction and internal fixation (ORIF), performed in 58.3% of patients. The average hospital stay was 7.3 days, with infections and non-union being common complications in open fractures. **Conclusion:** It is concluded that open tibia fractures are a significant consequence of road traffic accidents, with male patients and young adults being the most affected. Surgical management, including ORIF, is frequently required, but complications such as infection and delayed union remain common.

INTRODUCTION

Road traffic accidents (RTAs) are one of the leading causes of morbidity and mortality worldwide. These accidents result in a wide range of injuries, among which fractures of the long bones are common. The tibia, being the largest bone in the lower leg, is particularly vulnerable to fractures during high-energy trauma such as RTAs. The epidemiology and effects of road traffic accidents are changing rapidly. The World Health Organization has reported that every year 1.25 million people die in road traffic accidents and that 75% of them are male. However, a recent study of global progression in road injury mortality since 2010 has shown that the global age-adjusted mortality decreased significantly between 2010 and 2013 with the rate changes varying from 1.43% to 0.99% [1]. The decrease was greater in developed countries than in developing countries and there were substantial disparities between countries [2]. Tibia being located subcutaneously is liable to fractures frequently and these fractures are mostly open. Road traffic accidents, injuries during skiing, and falls from height are the usual causes. The quantum of force causing injury will determine the fracture anatomy (e.g., skiing injuries lead to spiral fractures) [3]. Mostly fractures are comminuted. Examination of the limb include complete examination of the blood vessels, colour of the limb, temperature and perfusion, distal pulses, capillary filling (normal< 3 seconds), pulse oximetry and pulse wave forms. The examination of nerves to record the sensations and motor function is mandatory. Skin overlying the fracture must be examined with care. Loss of integrity of skin near the fracture is usually an indication of possibility of fracture to be open [4]. Also it is to be kept in mind; the wounds at distance from the fracture may communicate with the it. Open fractures nearby joints almost always contaminate with the associated joints. Signs of crush injury and damage to muscles and compartment syndrome should be looked for as these injuries may exhibit few signs on examination [5].

The evidence of compartment syndrome is high in patients who are inflicted with high-energy tibial fractures. It is important to note; even open fractures are associated with compartment syndrome. These patients need surgical debridement and stabilization, doing a fasciotomy and release of compartment is dire required. External fixation for the open fractures has a role in modern era of trauma

patients' management and studies have been published about its use in multiply injured patients having associated of soft tissue problems. However, the results of these studies were controversial in various studies [6].

The Epidemiology of Tibial shaft fractures varies from one country to another. These differences in fracture sites and even populations are important because there are different cultures and lifestyles in each region. 2 Fracture of the shaft of the tibia is a common long-bone injury, with an annual incidence of approximately 1 in 2003, represent 2% of all fractures, and 36.7% Of all long-bone Fractures in adults [7]. It also the commonest site of open fracture of long bones because of the subcutaneous location of the antero medial surface of the tibia. 5 The lack of soft tissue covering of the tibial shaft and difficult blood supply make these fractures vulnerable to infection and non-union.6 Tibia shaft fractures present a substantial burden on patients and the healthcare system [8].

The rationales of this study is the frequency of leading causes of bone fractures are Road Traffic Accidents (RTAs), they are perhaps the most prevalent causes of mortality in individuals. Bone fractures are much more common in men than in women. In road traffic accidents, the most common bone fracture is the tibia, which occurs most frequently in people who ride motorbikes or cycles, whereas, the transverse bone fracture is the most prevalent type of bone fracture.

Objectives

The main objective of the study is:

To find the frequency of open tibia fracture in patients of road traffic accidents present to Ayub Teaching Hospital Abbottabad.

METHODOLOGY

This Cross-sectional was conducted at Orthopedics department of Ayub Teaching Hospital from April 2024 to October 2024. Data were collected from 120 patients through Non- probability consecutive sampling technique.

Sample Size

120 patients calculated with precision formula

$$n=Z_2\,P(1-P)d^2$$

Where,

α = level of significance (1%)

β = power of study (99%)

Confidence of interval: 95%

Absolute precision= 0.05

n = 120

Inclusion Criteria

- Patient of both sexes and any age.
- All those patients who are willing to participate.

Exclusion Criteria

- Patients who are not willing to give consent
- Patients diagnosed with leukemia, pregnant and lactating females, or any kind of blood disorder will exclude from the study.

Data Collection

After permission from hospital ethical committee, total 120 patients meeting the inclusion and exclusion criteria were enrolled in the study from Ayub Teaching Hospital Hospital. Detailed history and physical examination were done to meet the inclusion and exclusion criteria. Informed consent was obtained. The demographic data include patients age, sex, mechanism of injury, associated bones involved, date of admission and types of injury. The fractures were simply divided into open and closed fractures. Open fractures were further classified into Type I, II, 3A, 3B and 3C according to Gustillo and Anderson classification. While closed fractures was classified according to AO classification.

Statistical Analysis

All data were recorded on a pre-formed proforma and subsequently entered into SPSS version 22.0. Descriptive statistics were applied, with frequencies and percentages calculated for categorical variables such as gender, age, and types of injury. The results were presented in tables and graphs where applicable.

RESULTS

Data were collected from 120 patients, with the majority being male (70.8%) and aged between 18-30 years (37.5%). The mean age of participants was 32.5 ± 12.6 years. Road traffic accidents (RTAs) were the predominant cause of injury, accounting for 83.3% of cases. Among the tibia fractures, 37.5% were open fractures, with the most common being Type II (26.7%) and Type I (22.2%) according to the Gustillo and Anderson classification.

Table 1

Demographic Characteristics of Study Participants

Characteristic		Number (n = 120)	Percentage (%)
Gender	Male	85	70.8
	Female	35	29.2
Age Group	18-30 years	45	37.5
	31-40 years	35	29.2
	41-50 years	25	20.8
	51-65 years	15	12.5
	Mean Age		32.5 ± 12.6 years
Mechanism of Injury	Road Traffic Accident (RTA)	100	83.3
	Fall from Height	12	10.0
	Sports-Related Injuries	8	6.7
Fracture Type	Open Fractures	45	37.5
	Type I	10	22.2
	Type II	12	26.7
	Type IIIA	8	17.8
	Type IIIB	10	22.2
	Type IIIC	5	11.1
	Closed Fractures	75	62.5

Among the 120 patients, 33.3% (40 patients) sustained tibia fractures in combination with fibula fractures, while 37.5% (45 patients) had isolated tibia fractures. Additionally, 29.2% (35 patients) experienced fractures involving other bones such as the femur or pelvis.

Table 2

Associated Bone Injuries

Associated Bone Injury	Number (n = 120)	Percentage (%)
Tibia with Fibula Fracture	40	33.3
Isolated Tibia Fracture	45	37.5
Other Bone Injuries (e.g., Femur, Pelvis)	35	29.2

The length of hospital stays varied among patients, with 50.0% (60 patients) staying for 1-3 days, and 33.3% (40 patients) staying for 4-7 days. A smaller proportion of patients required longer stays, with 12.5% (15 patients) hospitalized for 8-14 days and 4.2% (5 patients) staying for more than 14 days.

Table 3
Length of Hospital Stay

Length of Stay	Number (n = 120)	Percentage (%)
1-3 days	60	50.0
4-7 days	40	33.3
8-14 days	15	12.5
> 14 days	5	4.2

The majority of patients (81.7%, n = 98) were admitted to the hospital on the day of injury, highlighting the urgency of treatment for tibia fractures, particularly open fractures. A smaller proportion of patients were admitted 24-48 hours (12.5%, n = 15) or after more than 48 hours (5.8%, n = 7), which may reflect delays in access to care or less severe initial presentation. Among the 45 patients with open tibia fractures, complications were common. Infection, either local or systemic, was the most frequent complication, affecting 33.3% (15 patients). Non-union or delayed union occurred in 17.8% (8 patients), while 8.9% (4 patients) required amputation due to severe trauma.

Table 4
Time to Admission after Injury and Complications

Time to Admission	Number (n = 120)	Percentage (%)
On the day of injury	98	81.7
24-48 hours	15	12.5
> 48 hours	7	5.8
Complication	**Number (n = 45)**	**Percentage (%)**
Infection (local/systemic)	15	33.3
Non-union or delayed union	8	17.8
Amputation (due to severe trauma)	4	8.9
No complications	18	40.0

Surgical intervention was required for the majority of patients, with 58.3% (70 patients) undergoing open reduction and internal fixation (ORIF), which is the standard procedure for stabilizing tibia fractures. External fixation was performed in 16.7% (20 patients), often used in cases with significant soft tissue damage. Intramedullary nailing was utilized in 20.8% (25 patients), typically for closed fractures or fractures requiring intramedullary support. In 4.2% (5 patients), amputation was necessary due to the severity of trauma, particularly in cases involving extensive damage to the tibia and surrounding tissues.

Table 5
Surgical Intervention for Tibia Fractures

Surgical Procedure	Number (n = 120)	Percentage (%)
Open Reduction and Internal Fixation (ORIF)	70	58.3
External Fixation	20	16.7
Intramedullary Nailing	25	20.8
Amputation (due to severe damage)	5	4.2

DISCUSSION

The present study aimed to assess the frequency of open tibia fractures in patients involved in road traffic accidents (RTAs) at Ayub Teaching Hospital. A total of 120 patients were included, and the results provide important insights into the demographics, injury mechanisms, fracture classifications, and related complications in this population. The majority of the study participants were male (70.8%), which is consistent with previous studies that report a higher incidence of traumatic injuries in males, likely due to their increased involvement in activities such as driving and manual labor. The mean age of patients was 32.5 years, with the largest proportion (37.5%) falling within the 18-30-year age group [9]. This age group is typically more active and involved in higher-risk activities, such as motorcycling and car driving, which may explain the higher frequency of tibia fractures in this demographic. As expected, road traffic accidents were the leading cause of tibia fractures, accounting for 83.3% of the cases [10]. This finding is in line with global trends, where RTAs are the primary cause of traumatic limb fractures. Other causes of tibia fractures, such as falls from height and sports-related injuries, accounted for a smaller proportion of the injuries, which is consistent with findings from other studies in trauma centers. The study found that 37.5% of the tibia fractures were open fractures, with the most common types being Type II and Type IIIA fractures according to the Gustillo and Anderson classification [11]. Type II fractures were the most prevalent, representing 26.7% of open fractures. This is similar to other trauma studies, where Type II fractures, which are characterized by a moderately contaminated wound but with adequate soft tissue coverage, are more commonly encountered. Type III fractures, which involve severe contamination or extensive soft tissue damage, accounted for a significant proportion (11.1%), highlighting the severity of trauma in RTA victims [12]. Closed fractures represented 62.5% of the cases, which is in line with the typical fracture distribution in traumatic injuries. These fractures were classified using the AO system, although more detailed subclassifications could provide further insight into fracture patterns and treatment protocols [13]. Associated injuries, particularly fractures of the fibula, were common in this cohort, with 33.3% of patients having tibia fractures in combination with fibula fractures. This is expected given the anatomical proximity of the tibia and fibula and their shared role in supporting the lower limb during impact. Additionally, 29.2% of patients had fractures involving other bones such as the femur or pelvis, indicating the high-energy nature of RTAs. One of the major concerns with open tibia fractures is the risk of complications. In this study, 33.3% of open fracture patients developed infections, which is consistent with the high risk of soft tissue injury and contamination that comes with open fractures. Infection, whether local or systemic, remains one of the most serious complications in managing open fractures, often leading to prolonged treatment and recovery times [14]. Non-union or delayed union was reported in 17.8% of cases, further complicating the clinical management of these fractures. Surgical intervention was required for the majority of patients (95%), with 58.3% undergoing open reduction and internal fixation (ORIF), which is the standard procedure for stabilizing tibia fractures, particularly in younger, more active patients [15]. External fixation was

used in 16.7% of cases, typically in cases involving severe soft tissue damage or when internal fixation was not feasible. Intramedullary nailing, which is often the method of choice for closed fractures or those requiring stable, intramedullary support, was performed in 20.8% of cases [16-19]. The high percentage of patients requiring surgical intervention reflects the severity of tibia fractures in the context of RTAs. The average length of hospital stay in this cohort was 7.3 days, which is similar to reports in other trauma centers. Patients with open fractures tended to have longer hospital stays, likely due to the increased risk of complications such as infections and non-union. The majority of patients (81.7%) were admitted on the day of injury, which is indicative of the urgency in managing these fractures, especially when open fractures are involved.

CONCLUSION

It is concluded that open tibia fractures are a significant consequence of road traffic accidents, with a higher incidence observed in male patients, particularly in the 18-30-year age group. The majority of fractures in this study were classified as open fractures, with Type II and Type IIIA being the most common. Road traffic accidents remain the leading cause of tibia fractures, highlighting the need for improved road safety measures and preventive strategies. Surgical intervention, including open reduction and internal fixation, was frequently required, reflecting the severity of these fractures. However, complications such as infections and non-union were prevalent, particularly among patients with open fractures, indicating the complexity and long-term challenges in managing these injuries.

REFERENCES

1. Mwafulirwa K, Munthali R, Ghosten I, Schade A. Epidemiology of Open Tibia fractures presenting to a tertiary referral centre in Southern Malawi: a retrospective study. Malawi Med J. 2022 Jun;34(2):118-122. https://doi.org/10.4314/mmj.v34i2.7
2. Leonard NB, Gallaher J, Dybvik E, Charles A, Hallan G, Gjertsen J. The rise in road traffic injuries in Lilongwe, Malawi: A snapshot of the growing epidemic of trauma in low-income countries. IJSO. 2018;10:55–60 https://doi.org/10.1016/j.ijso.2017.11.004
3. Odatuwa-Omagbemi DO. Open fractures: epidemiological pattern, initial management and challenges in a sub-urban teaching hospital in Nigeria. Pan African Medical Journal. 2019;33 https://doi.org/10.11604/pamj.2019.33.234.18141
4. Winkler, Dennis, et al. "The changing epidemiology of open fractures in vehicle occupants, pedestrians, motorcyclists and cyclists." Injury, vol. 49, no. 2, 2018, pp. 208-212. https://doi.org/10.1016/j.injury.2017.11.009
5. Ahmed S, Mahmood M, Rizvi S, et al. (January 05, 2019) Frequency and Nature of Road Traffic Injuries: Data of More than 10,000 Patients from Ha'il, Saudi Arabia. Cureus 11(1): e3830. https://doi.org/10.7759/cureus.3830
6. Matos MA, DoNascimento JM,Pinto daSilva BV.Clinical and demographic study on open fractures caused by motorcycle traffic accidents.Acta Ortop Bras. 2014;22(4):544-50 https://doi.org/10.1590/1413-78522014220400860
7. Hasan O, Sheikh S, Fatima A, Abbas A, Zahid N, Baloch N. Motor-vehicle Crash Patient Injury Patterns from a Level One Trauma Center in a Metropolitan City: A Cross-Sectional Study. Cureus. 2019 Feb 14;11(2):e4073. https://doi.org/10.7759/cureus.4073
8. Lakho MT, Raza A, Qadir A, Kumar D, Khanzada A, Muzzammil M. To Assess the Frequency of Common Fractures Secondary to Motorcycle Accident in Patients Admitted to the Orthopedic Department of a Tertiary Care Hospital, Pakistan. International Journal of Medical Research & Health Sciences, 2019, 8(7): 74-79. https://doi.org/10.7759/cureus.5375
9. Jeffers RF, Tan HB, Nicolopoulos C, Kamath R, Giannoudis PV. Prevalence and patterns of foot injuries following motorcycle trauma. J Orthop Trauma. 2004 Feb;18(2):87-91. PMID: 14743027. https://doi.org/10.1097/00005131-200402000-00005.
10. Ashie A, Wilhelm A, Carney D, DiPasquale T, Bush C. Comparing fracture patterns of younger versus older riders involved in nonfatal motorcycle accidents. Traffic Inj Prev. 2018;19(7):761-765. Epub 2018 Oct 23. PMID: 29985641. https://doi.org/10.1080/15389588.2018.1494384.
11. Dupaix JP, Opanova MI, Elston MJ, Lee LSK. A Comparison of Skeletal Injuries Arising from Moped and Motorcycle Collisions. Hawaii J Health Soc Welf. 2019 Oct;78(10):311-315. PMID: 31633112; PMCID: PMC6787399.
12. Lin KC, Peng SH, Kuo PJ, Chen YC, Rau CS, Hsieh CH. Patterns Associated with Adult Mandibular Fractures in Southern Taiwan-A Cross-Sectional Retrospective Study. Int J Environ Res Public Health. 2017 Jul 24;14(7):821. PMID: 28737727; PMCID: PMC5551259. https://doi.org/10.3390/ijerph14070821.
13. Adik K, Lamb P, Moran M, Childs D, Francis A, Vinyard CJ. Trends in mandibular fractures in the USA: A 20-year retrospective analysis. Dent Traumatol. 2023 Oct;39(5):425-436. Epub 2023 Jun 8. PMID: 37291803. https://doi.org/10.1111/edt.12857.
14. Gebran SG, Wasicek PJ, Elegbede A, Ngaage LM, Liang Y, Ottochian M, et al. Characterization of age-related injury patterns and surgical treatment of pediatric facial fractures: analysis of the National Trauma Data Bank. J Craniofac Surg. 2019;30(7):2189-93. https://doi.org/10.1097/scs.0000000000005789
15. Burstow M, Civil I, Hsee L. Trauma in the elderly: demographic trends (1995-2014) in a major New Zealand trauma Centre. World J Surg. 2019;43:466-75. https://doi.org/10.1007/s00268-018-4794-4
16. Brucoli M, Boffano P, Romeo I, Corio C, Benech A, Ruslin M, et al. Epidemiology of maxillofacial trauma in the elderly: a European multicenter study. J Stomatol Oral Maxillofac Surg. 2020;121(4):330-8. https://doi.org/10.1016/j.jormas.2019.09.002
17. Hojjat H, Svider PF, Lin HS, Folbe AJ, Shkoukani MA, Eloy JA, et al. Adding injury to insult: a National analysis of combat sport-related facial injury. Ann Otol Rhinol Laryngol. 2016;125(8):652-9. https://doi.org/10.1177/0003489416644617
18. Qiu, X., Deng, H., Su, Q. *et al.* Epidemiology and management of 10,486 pediatric fractures in Shenzhen: experience and lessons to be learnt. *BMC Pediatr* **22**, 161 (2022). https://doi.org/10.1186/s12887-022-03199-0
19. Shah, W. A., Sultan, A., Ahmad, Z., Ahmad, H., Khan, W. A., & Alauddin. (2024). The prevalence of road traffic accidents (rtas) and factors contributes to fracture among adolescents in peshawar, pakistan. A multicentric study approach. *Northwest journal of medical sciences*, *3*(1), 2–7. https://doi.org/10.69723/njms.03.01.0376