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Original Article

Epidemiological Profile of Patients Presenting with Tibia Fractures in a Tertiary Care Center: A Descriptive Cross-Sectional Study

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ABSTRACT

Introduction: There is a lack of epidemiological studies on tibia fractures in our part of the world. This study aims to describe the epidemiological profile of the patients presenting with tibia fractures in a tertiary care center.

Method: A descriptive cross-sectional study was conducted at a tertiary care center between September 1, 2017, and October 30, 2019. Hospital records were screened, and patients admitted with the diagnosis of tibia fractures were included in the study. Records with missing information, incomplete diagnoses, and admissions for non-orthopedic problems were excluded. A convenient sampling method was used. Continuous data were reported as mean ± standard deviation and categorical data as frequency (percentage).

Results: A total of 542 patients with 557 tibia fractures were included. The mean age of the patients was 32.61±14.98 years; 422 (77.85%) were males and 120 (22.15%) were females; 103 (19.01%) were less than 20 years, 271 (50%) were 20-40 years, 139 (25.64%) were 41-60 years, and 29 (5.35%) were more than 60 years. The mechanism of injury included Low-energy fall in 44 (8.12%) patients, High-energy fall in 22 (4.06%) patients, road traffic accidents in 440 (81.18%) patients, and others in 36 (6.64%) patients. Among road traffic accidents, pedestrians were 177 (40.23%), Motorbike accidents were 242 (55%), and Car/heavy vehicle accidents were 21 (4.77%).

Conclusion: Most patients with tibia fractures were 20-40 years old. RTA, especially motorbike accidents, was the most common mechanism of injury. Most findings in this study were comparable to those reported by published epidemiological studies.

Keywords: Epidemiological Studies, Motorbike Accidents, Prevalence, Road Traffic Accidents, Tibia Fractures

INTRODUCTION

Tibia fractures account for around 4% of all adult fractures.[1] However, these fractures are the commonest long bone fractures frequently encountered in clinical practice.[1] Majority of these fractures require operative fixation; several options, including intra-medullary nailing, plating, and external fixators, are available.[2] However, variation in the mechanism of injury due to the increasing incidence of road traffic accidents (RTA) has made the management of these fractures challenging.[3]

There is a lack of enough epidemiological studies on tibia fractures. It is known from the available evidence that there has been a significant change in the epidemiological profile of these fractures over the years.[4–7] A little is known about the epidemiological profile of patients presenting with tibia fractures in our settings.[8] Hence, this study aims to describe the epidemiological profile of the patients presenting with tibia fractures in a tertiary care center.

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METHODS

This was a descriptive cross-sectional study conducted at a tertiary care center between September 1, 2017, and October 30, 2019. The study was conducted following the guidelines of the local institutional review committee (IRC), and informed consent was waived as the study involved the data from clinical records and no active participation of the patients. Hospital records were screened, and patients admitted with the diagnosis of tibia fractures were included in the study. Records with missing information, incomplete diagnoses, and admissions for non-orthopedic problems were excluded. The hospital identification number was used to remove multiple entries of patient data in cases of multiple admissions.

The sample size was calculated using the following formula:

$N=Z^2pq/e^2$

$= 1.96^2 \times 0.5 \times 0.5/ (0.05)^2$

$= 384.16$

Where,

Z= 1.96 for a 95% confidence interval

p= 0.5, 50% prevalence taken to obtain the maximum required sample

q= 0.5, 1-p

e= 0.05, 5% margin of error

The calculated minimum sample size was 385. However, all patients who met the inclusion criteria during the study period were included. A convenient sampling method was used.

Data were extracted using electronic pro forma and recorded in Microsoft Excel 2010. The following data were extracted: age, gender distributions, mechanism of injury, fracture type, location of the fracture, associated injuries, and treatment received.

Fracture types were divided into two groups: closed and open type. Open fractures were further classified according to Gustilo Anderson's classification as Grade I, Grade II, Grade IIIA, Grade IIIB, and Grade IIIC.[9] The location of the fracture was grouped into a proximal segment, middle segment, and distal segment. Associated injuries were categorized as polytrauma (if two or more systems are involved), multiple trauma (if associated with multiple fractures, cut injuries, or lacerations), compartment syndrome, and fat embolism syndrome. Treatments received were grouped into non-surgical and surgical.

Subgroup analysis of patients presented with RTA was done. The frequency of patients with the following events was recorded: Motorbike accidents (rider and pillion passengers), Car or heavy vehicle accidents (driver and pillion passengers), and RTA pedestrians.[10]

Continuous data were reported as mean ± standard deviation and categorical data were reported as frequency number (percentage). The data analysis was done using Microsoft Excel 2010 and Statistical Package for Social Science (SPSS) software version 24.

RESULTS

A total of 542 patients with 557 tibia fractures were included in the study. The mean age of the patients was 32.61±14.98 years; 422 (77.85%) were males, and 120 (22.15%) were females.

Table 1: Baseline characteristics of patients (N=542), Injuries

Characteristics	Frequency, n (%)
Age distribution (in years)	
Less than 20	103 (19.01%)
20 to 40	271 (50%)
41 to 60	139 (25.64%)
More than 60	29 (5.35%)
Mechanism of Injury	
Low-energy fall	44 (8.12%)
High-energy fall	22 (4.06%)
RTA	440 (81.18%)
Others	36 (6.64%)
Associated injuries	
Polytrauma	75 (13.84%)
Multiple trauma	48 (8.86%)
Acute Compartment syndrome	38 (7.01%)
Fat embolism syndrome	6 (1.10%)

Among 542 patients, 243 (44.84%) had right-sided, 284 (52.39%) had left-sided, and 15 (2.77%) had bilateral tibia fractures. Of 557 tibia fractures, 460 (82.58%) were closed, 97 (17.42%) were open fractures, 217 (38.95%) were proximal segment, 200 (35.9%) middle segments, and 140 (25.13%) were distal segment fractures. Of 97 open fractures, 15 (15.46%) were Type I, 28 (28.86%) were Type II, 36 (37.12%) were Type IIIA, 11 (11.34%) were Type IIIB, and 7 (7.22%) were Type IIIC. Of 542 patients, 47 (27.12%) had associated injuries. Of 542 patients, 518 (95.57%) underwent surgical management and 24 (4.43%) underwent non-surgical management. (Tables 1 and 2)

Table 2: Subgroup analysis of patients presented with a history of RTA (N=440)

Characteristics	Frequency, n (%)
RTA Pedestrians	177 (40.23%)
Motorbike accidents	242 (55%)
Drivers	226 (51.37%)
Pillion passengers	16 (3.63%)
Car or heavy vehicle accidents	21 (4.77%)
Drivers	7 (1.59%)
Passengers	14 (3.18%)

DISCUSSION

This study identified that the mean age of the patients presenting with tibia fractures was 32.61±14.98 years, half of them were between 20 and 40 years, the majority (77.85%) was male, and the most common (81.18%) mechanism of injury was RTA. The findings were comparable to what was reported in the literature.[10–12] Amin et al. conducted an epidemiological study in Pakistan including 2120 patients with tibia fractures and found that the mean age of the patients was 33.28±21.02 years, and around 48% were between 20 to 40 years, 94% were males, and 68% had RTA.[10] Similarly, Madadi et al. conducted a study in Iran providing the 7-year epidemiological update on 854 patients with tibia shaft fractures and observed that the mean age of the patients was 35±16 years, around 90% were males and 61% had RTA.[11] This suggests that these fractures occur commonly in the productive age group population with male pre-dominance following RTA. This signifies the high socioeconomic burden caused by these fractures.[13]

This study also identified that among 440 patients with RTA, the majority (around 55%) were motorbike accidents, followed by RTA pedestrians (around 40%) and car or heavy vehicle accidents (around 5%). The findings were similar to what was reported in Aman et al. study, in which the majority were motorbike accidents with a prevalence of around 67%.[10] However, the prevalence of RTA pedestrians was around 8%.[10] The higher prevalence of RTA pedestrians in our study could be due to various reasons, including suboptimal road conditions, lack of footpaths, road rage, and negligence of traffic safety rules and regulations.[14–17]

This study identified that the prevalence of left-sided tibia fractures was slightly higher than right-sided tibia fractures (52.39% vs. 44.84%). The finding was similar to what was

reported in the literature.[4] The data from the Swedish Fracture Register showed that among 1371 patients, 707 (52%) had left-sided tibia fractures. Similarly, the prevalence of bilateral tibia fractures in this study was only 2.77% (n=15). This was comparable to what was reported in the literature, which was around 1.3-2%.[4,11] Furthermore, in this study, the most common location of the fracture was proximal segment (around 39%), followed by middle segment fractures (36%). The findings were similar to what was reported in the Swedish Fracture Register, in which the prevalence of proximal segment fracture was around 51.93% and the middle segment was around 30.45%.[4] However, Amin et al. reported a higher prevalence of middle-segment tibia fractures (48%) followed by distal-segment fractures (28%).[10] This study identified that the majority (82.58%) of the fractures were closed, and open fractures accounted for only 17.42%. Among open fractures, Gustilo-Anderson Type IA was the most common (37.12%), followed by Type II (28.86%) and Type I (15.46%). The prevalence of open fractures observed in this study was higher than that reported by Amin et al. (2017).[10] Amin et al. reported that the prevalence of open fractures was around 11% (233 out of 2120 tibia fractures), and out of which, Gustilo-Anderson Type III A was most common (68 out of 233). Ten other studies have reported a higher prevalence of open fractures.[11,12] Madadi et al. reported a prevalence of around 46% (388 out of 844 patients), and Grecco et al. reported a prevalence of about 67% (120 out of 179 patients). Furthermore, the overall incidence of around 5.9-51.7 persons per 100,000 person-years has also been reported in the literature.[4,18] This suggests that open tibia fractures are quite common in clinical practice.

This study identified that around 9% of the patients had associated multiple traumas. In contrast, Aman et al. observed that 46% of the patients had associated other bone fractures.[10] The higher prevalence of associated injuries in Aman et al. study was due to the inclusion of fibula fracture as associated with other bone fractures, which was not considered in the present study. Similarly, around 7% of the patients had acute compartment syndrome. The finding was higher than that reported in the literature, around 3%.[19] The higher occurrence of acute compartment syndrome in our study population could be because the diagnosis of acute compartment syndrome is mostly clinical without monitoring the compartment pressure. Furthermore, around 1% of the patients had fat embolism syndrome. The finding was comparable to what was reported in the literature, which was around 0.5%.[20]

The study has several limitations. The study finding lose both internal and external validity because of the single-center descriptive cross-sectional study design. This study has the potential risk of selection bias because a convenient sampling method was used, and the data were collected retrospectively using the keyword “tibia fractures,” which may have lost some patients admitted with different diagnoses, such as both bone leg fractures. Some variables, such as fracture types (morphology), fracture classification, fixation methods, complications (early and late), duration of hospital stay, and fracture union time, which were included in previously published studies, were not included.[10–12] However, this study provides contextual evidence of patients presenting with tibia fractures in a tertiary center. In addition, information on the prevalence of some outcome variables can be used in sample size calculation for future studies..

CONCLUSION

The majority of patients with tibia fractures were of productive age of 20-40 years. RTA, especially motorbike accidents, was the most common mechanism of injury. The most common location of fracture was the proximal segment. The prevalence of open fractures was 17%, and Type IIIA was the most common type. The prevalence of associated injury was 27%, and acute compartment syndrome was observed in 7%. Most findings observed in this study were comparable to the findings reported by previously published epidemiological studies.

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