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TIBIAL SHAFT FRACTURES;

EPIDEMIOLOGY, A 5-YEAR STUDY IN GHURKI TRUST TEACHING HOSPITAL, PAKISTAN.

1. MBBS, FCPS (Orthopaedics)
Senior Registrar
Ghurki Trust Teaching Hospital, Lahore
2. MBBS, MPH, FCPS-I,
Resident Orthopaedic Surgeon
Ghurki Trust Teaching Hospital, Lahore
3. MBBS, FCPS (Orthopaedics)
Senior Registrar
Ghurki Trust Teaching Hospital, Lahore
4. MBBS, FCPS (Orthopaedics)
Professor of Orthopaedics
Ghurki Trust Teaching Hospital, Lahore
5. MBBS, FCPS (Orthopaedics)
Professor of Orthopaedics
Ghurki Trust Teaching Hospital, Lahore
6. MBBS, FCPS, FRCS, MS (Spine Surgery)
Professor & Head
Department of Orthopaedics & Spine Centre, Ghurki Trust Teaching Hospital, Lahore

C0rrespondence Address:
Dr. Ashfaq Ahmed
MBBS, MPH, FCPS-I,
Resident Orthopaedic Surgeon
ashfaqjadoon40@yahoo.com

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Dr. Muhammad Qazi Amin[1], Dr. Ashfaq Ahmed[2], Dr. Muhammad Imran[3], Dr. Naeem Ahmed[4], Dr. Shahzad Javed[5], Dr. Amer Aziz[6]

ABSTRACT… Background: Tibia is the most commonly fractured bone because of its structure and position. Tibial fractures are increasing with time to time and hence the morbidity and mortality are increasing despite proper public health efforts. There is a lack of national epidemiological data on the characteristics of patients with tibial shaft fractures. Therefore, epidemiological assessment is crucial for fracture. The purpose of this study was to provide up-to-date information about patients baseline demographics, distribution of fracture classification, trauma mechanism and to formulate the preventive measures. **Study Design:** Retrospective study. **Setting:** Emergency or OPD at Orthopaedics and Spine Centre, Ghurki Trust Teaching Hospital, Lahore. **Period:** 1st January 2011 to 31st December 2015. **Material and methods:** Any type of diaphyseal tibial fracture. The data were taken from hospital database and include clinical, epidemiological and radiological records. The results were analyzed using SPSS 20. **Results:** A total of 2120 patients were included in the study. 1980(93.4%) were male and 140 (6.6%) were females. Male to females ratio were 14.14:1 with mean age of 33.28 ± 21.02. Between 0-20 years, 519(24.5%) of patients were admitted, 1021(48.2%) of patients were between 21-40 years, 467(22.0%) were between 41-60 years and only 113(5.33%) were above 60 years. Type A2 in 444(20.9%) were the most common pattern of fracture found. The traumas were most common in months of May, June and July and Motorbike accidents were the main cause. The mid shaft of tibia is the most commonly fractured i-e 1038 (49.0%) followed by distal part i-e 611(28.8%) and the least is the proximal i-e 471(22.22%). **Conclusion:** This study shows AO-type 4A2 was the most common fracture type, representing 20.9% of all tibial shaft fractures. The individuals between 21-40 years were mostly affected and the motorbike accidents were found the main cause for such traumas.

Key words: Diaphysis, Fractures, Epidemiology, Tibial Fractures

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INTRODUCTION

Musculoskeletal injuries are among the most common injuries that occur in rapidly developing countries.[1] 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[3], and 36.7% Of all long-bone Fractures in adults.[4] 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.[7] These fractures are either high energy trauma or low energy trauma. High energy trauma usually occur in young adults. The mechanism of most high energy fractures are accidents i-e automobiles, motorcycle or car pedestrian accidents. Low energy fractures may occur secondary to sports injuries or twisting falls. The amount of energy absorbed by a fracture which can be estimated from the history of injury, strongly influences the timing and the type of treatment. Fracture can be closed and open. Closed fractures are more common than open fracture.[8]

Most of the patients presented with poly trauma. Multiple other bones are also fractured. The fibula is fractured in 75-85 % of cases with fractures of the tibia.[9] The sharp ends of tibial shaft fracture would cut adjacent muscles, nerves, or blood vessels and leads to excessive swelling.

There is very limited data on epidemiology of tibial fractures in population of Pakistan. The aim of this study is to determine the pattern of tibial fractures in our setup.

MATERIAL & METHODS

This retrospective study was carried out at Department of Orthopaedics and Spine centre, Ghurki Trust Teaching Hospital, Lahore. The data had been collected from hospital database record and from the patient hospital charts after hospital ethical committee approval and permission from concerned department. The data from 2011 to 2015 were taken. All patients of either sex and of any age who utilized medical services after tibial diaphyseal fractures and were admitted between 1st Jan 2011 to 31st Dec. 2015 either through OPD or emergency department at Orthopaedics and Spine unit were included in the study. The data include patients age, sex, mechanism of injury, associated bones involved, date of admission and types of injury. A total of 2120 patients were included in our study. Patients were divided into 5 groups according to yearly distribution i-e 2011, 2012, 2013, 2014 and 2015. 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[4]. While closed fractures were classified according to AO classification[5]. All data were initially recorded on a pre-formed proforma and then were entered into SPSS version 17.0.Frequencies and percentages were calculated. Data presented in tables and graphs where necessary.

RESULTS

A total of 2120 patients were included in the study. 1980 (93.4%) were male and 140 (6.6%) were females .Male to females ratio were 14.14:1 with mean age of 33.28 ± 21.02 (table I).

Gender	Frequency	Percent
Male	1980	93.4
Female	140	6.6
Total	2120	100.0

Table-I. Frequency of gender distribution

The total number of patients admitted with any type of fractures during 2011 were 1703.Out of which 13.56% were the patients with tibial fractures. During 2012, 1794 patients were admitted and the patients with tibial fractures were 21.29%. Similarly in 2013, 2014 and 2015, the total number of patients admitted with any type of fracture were 1795, 2247 and 3040. Out of which the tibial fractures were 21.73%, 20.43% and 21.64%. (Table II)

Year	Total number of fractures	Tibial fractures n(%)
2011	1703	231(13.56%)
2012	1794	382(21.29%)
2013	1795	390(21.73%)
2014	2247	459(20.43%)
2015	3040	658(21.64%)
Total	10579	2120(20.04%)

Table-II. Frequency of tibial fractures

Patient of all ages were included in the study. Below 20 years, 519 (24.5%) of patients were admitted, 1021(48.2%) of patients were between 21-40 years, 467(22.0%) were between 41-60 years and only 113(5.33%) were above 60 years. (Table III)

Age in Years	Frequency	Percent
≤ 20	519	24.5
21-40	1021	48.2
41-60	467	22.0
>60	113	5.33
Total	2120	100

Table-III. Frequency of age Distribution

The fractures were divided into open and close. Among open fractures Type I fractures were found in 35(2.3%), Type II in 28(1.9), Type 3A in 52 (3.5%), Type 3B in 33(2.2%) and Type

3C were found in 17(1.1%) of the patients. The close fractures were classified according to AO classification. Among Type A, A1 were fractures were found in 241(16.0%) of the patients, type A2 in 311(20.6%) and Type A3 in 205(13.5%). Among Type B fractures, B1 were found only in 81(5.4%), B2 in 91(6.0%) and B3 in 58(3.8%). Type C1 fractures were found in 136(9.0%), C2 in 126(8.4%) and C3 in 92(6.1%). (Table IV, V)

Open fractures	Frequency	Percent
Type I	57	2.7
Type II	39	1.8
Type III A/3A	68	3.2
Type III B/3B	41	1.9
Type III C/3C	28	1.3
Total	233	11.0

Table-IV. Frequency of open fractures (Gustillo and Anderson)

Type	Frequency	Percent
A1	375	17.7
A2	444	20.9
A3	279	13.2
B1	125	5.9
B2	111	5.2
B3	70	3.3
C1	195	9.2
C2	168	7.9
C3	120	5.7
Total	1887	89.0

Table-V. Distribution of close fractures; (AO Classification)

Table VI shows site of limb involvement.72.2% having right side involvement, 26.5% having both limb involvement while only 1.3% having bilateral involvement.

Site of limb	Frequency	Percent
Right	1531	72.2
Left	562	26.5
Both	27	1.3
Total	2120	100.0

Table-VI. Frequency of limb involvement

Table-VII shows the percentages and frequency of different diaphyseal parts involvement. The mid shaft was the most commonly fractured i-e 1038(49.0%) followed by distal part i-e 611(28.8%) and the least is the proximal i-e 471(22.22%).

Site of Diaphysis	Frequency	Percent
Upper 1/3rd	471	22.22
Middle 1/3rd	1038	49.0
Lower 1/3rd	611	28.8
Total	2120	100.0

Table-VII. Frequency of part of diaphysis fracture

Figure 1 shows yearly distribution.10.90% were in 2011, 18.02% were in 2012, 18.40% were in 2013, 21.65% of patients were admitted with tibial fractures in 2014 and 31.04% in 2015.

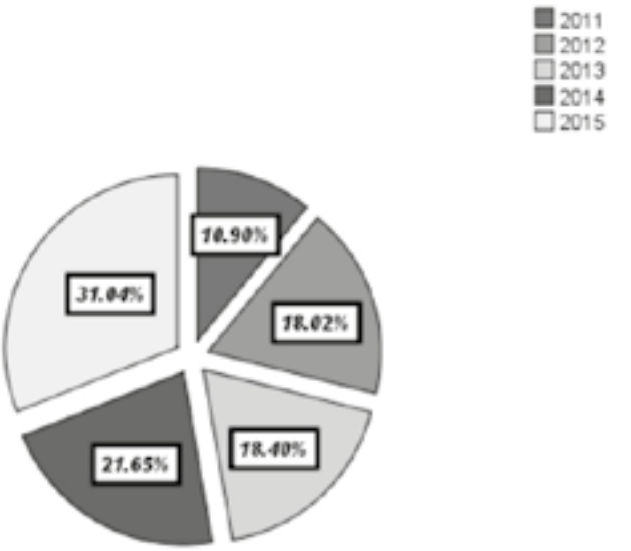

Fig-1. Distribution according to year

Among the mechanism of injury, Road Traffic Accidents among the motorbike were found in 67.15%,RTA among Pedestrians were in 7.43%,among passengers were 8.03%,among other vehicle drivers were 4.64%,fall were found in11.02%,sports injury in 1.0% and assault in 0.73%.(Figure 2)

Figure 3 shows patients admission in different months. June, July and August having maximum number of admissions i-e, 247 (11.7%), 275 (13.0%) and 238 (11.2%) while October having least i-e 106(5.0%).

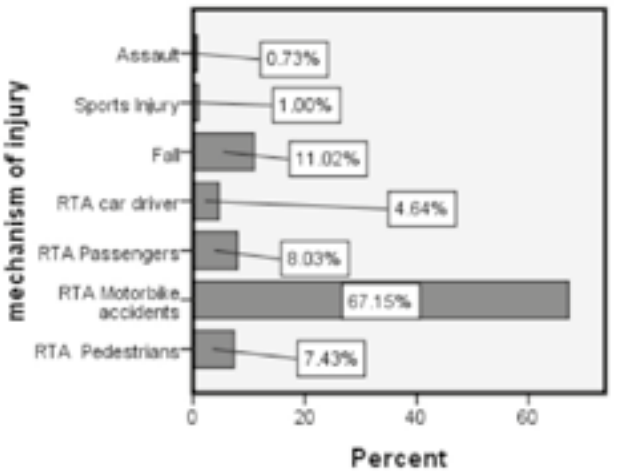

Fig-2. Distribution according to mechanism of injury

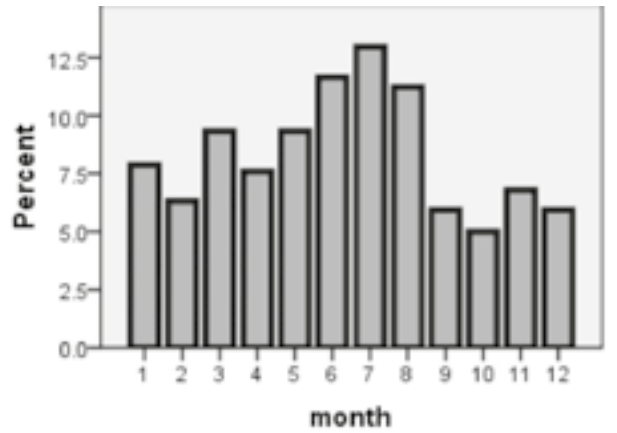

Fig-3. Distribution by monthly

Bones involvement were different in different patients. 1145(54.0%) had no other bone fractured. 24(1.1%) patients had humerus fracture, 37(1.7%) patients had radius and ulna isolated or both fracture, 18(0.8%) patients had carpals and metacarpals fractures and 6(0.3%) for clavicle, 176(8.3%) patients had Femur fracture, 5(0.2%) patients had tarsals and metatarsals fracture, 652(30.8%) patients had associated fibula fracture, 12(0.6%) patients had patella fracture, 19(0.9%) patients had pelvic fracture, 12(0.60%) patients had spine and 14 (0.7%) patients having some other bone fracture (table VIII).

DISCUSSION

The diaphysis of tibia has to play many roles. The most important are to maintain proximally and distally joint in their correct relationship and also provide attachment for muscles. Tibial shaft fractures were epidemiologically evaluated in patients admitted to our service in a period of 5 years. To our knowledge this is the first study in Pakistan on Epidemiology of Tibial Shaft Fractures on such a large number of patients several aspects were evaluated aiming characterize these injuries among us.

Bone	Frequency	Percent
No associated bone fracture	1145	54.0
Clavicle	6	0.3
Humerus	24	1.1
Radius And Ulna	37	1.7
Carpals And Metacarpals	18	0.8
Femur	176	8.3
Fibula	652	30.8
Tarsal And Metatarsals	5	0.2
Patella	12	0.6
Spine Injury	12	0.6
Pelvic Injury	19	0.9
Others	14	0.7
Total	2120	100.0

Table-VIII. Frequency of associated bones fracture

In this study males were affected more than females. Similar situation had been reported in other studies also.[1,2,13,16] In Greeco et all[10] study the women were affected more than male especially those who age greater than 50 while in our study in all age groups the males were prominent. The predominance of males is because of the high outdoor activities as compared to females.

The mean age of patients in our study were 33.28 and the males in the third and forth decade were mostly found to have tibial fractures which constitutes about 48.2% which is almost half of the population affected. In Larsen et all [11]study the highest incidence in males were found in 10-20 years while in females in 30-40 years while in Greeco et all[10] study the highest incidence found in 21-30 years old individuals. Antonova et al all study the highest incidence in males were in their forth` decade while in females it were in sixth decade. While in Baral et all[8] the highest incidence were found in children less than 15 years.

The independent right tibial fractures are found in 72.2% of the all fractures. The study conducted in India[14] the right tibial fracture were found in 64.81%, left in 31.48% while both tibial fractures in 3.71% which is almost similar to other study.

Our study shows that the mid shaft of the tibia were most commonly involved followed by lower third and least is the upper third. Similar findings were found in Greeco et all.[10] Raghavendra Babu Y P et al[14] and Madadi[2] study while in Baral et al[8] and study conducted in Ethiopia[13] the distal 1/3rd were mostly fractured.

We also found the high presentation of patients with tibial shaft fractures during the month of June, July and August. This is because of the summer season and vacations from schools. People mostly came out from their homes because of the weather mostly on motorbikes, that's why the motor bike accidents were found the main mechanism of injury in our study. 67.15% of individuals suffered because of using motorbike for transportation. The study conducted in South Korea cocluded that there is no seasonal variation in the tibial shaft fractures ,however there is dramatically seasonal variations in the humeral and clavicle fracture.[17] The Grecco MAS et all[10] study the most frequent causes of these fractures were motorcycle accidents (35.75%), overrun (28.50%), car accident (17.32%), bicycle accidents (4.47%), fall from high (2.23%) and others (11.13%). The study conducted in Sweden by Weiss RJ[12] observed that 48% of the fractures were due to fall and only 21% due to traffic accidents. Road traffic accidents were also found main culprit in other studies. Maddi et al[2] study classified mechanism of road traffic accidents into three subgroups. Independents bike accidents were less than car accidents in their study. The reason behind the low traffic accidents were the strict rules and regulations of the traffic controlling authority as compared to our system.

Our study also concluded that the trauma is increasing every year. 10.90% were in 2011, 18.02% were in 2012, 18.40% were in 2013, 21.65% of patients were admitted with tibial fractures in 2014 and 31.04% in 2015. Weiss et al[15] have shown that the incidence of tibial diaphyseal fractures in Sweden declined from 18.7/105/year in 1998 to 16.1/105/year in 2004 and in 2007/8 it was 14.3/105/year. The reason behind this is the increasing population and the availability of motorbikes on low cost in Pakistan .The poor people of Pakistan can afford its price and hence it is the main culprit. Similar in South Korea the study conducted between 2005-2009 there is decreasing incidence in tibial shaft fractures.[17]

In our study close fractures were most commonly found. Among close fractures AO Type A2 taken the lead from others. Similar A2 fractures were found dominant in the study of India.[14] Larsen P et all[11] study and study conducted in China[15] the Type A1 most common fracture pattern while in Maddi [2]study the Type C were mostly observed. While in open fractures Gustillo and Anderson Type 3A were mostly found while in our study Type 3B were most common pattern of open fracture. The overall incidence of open fractures were 11.0% in our study .Similar to our findings Weiss RJ study having 12% open fractures while in Greeco MAS et all[10] it were 67.0% and Maddi F et all[2] study it were 45% .The low incidence of open fractures were because of the low over runs injuries. In Papakostidis et al[4].study in which they reviewed the type 3B were the most common fractures among open and close fractures.

Most of the patients presented were found to have associated fractures. One third of the patients were found to have associated fibula fracture and the next most commonly associated fracture were femur fracture in poly trauma patients. The study conducted in U.S the associated lower limbs fractures were found in 71.70% of the individuals[7] which is quite higher than our study.

Some limitations need to be addressed. First, the age groups were divided on the basis of administrative factors rather than for management purpose. Second, the data of this study included only those individuals who were admitted in ward while the patients who were managed as an OPD case were excluded as no data available of it.

Therefore future studies are required which will provide more valuable clinical information.

CONCLUSION

This study is the first to give an overview of the epidemiology of tibial fractures in Pakistan. According to the present data, closed mid shaft tibial fractures are more common and the incidence is increasing every year. The individuals between 20-40 years are more at risk as compared to European countries and major culprit is the motor bike accidents. Our aim should be towards decreasing the incidence of tibial shaft fractures and hence the traumas by decreasing the motor bike accidents. Proper traffic rules and regulations, education and information, knowledge of the traffic, road management with proper pedestrian's pathway and zebra crossings are the preventive measures to be reinforced upon.

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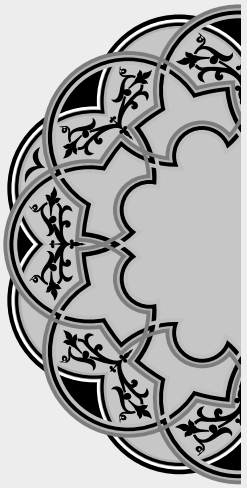

"The trouble with the rat race is that even if you win, you're still a rat."

Lily Tomlin

AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	Dr. Muhammad Qazi Amin	Data collection	
2	Dr. Ashfaq Ahmed	Data analysis	
3	Dr. Muhammad Imran	Article Writing	
4	Dr. Naeem Ahmed	Article Review	
5	Dr. Shahzad Javed	Supervision	
6	Dr. Amer Aziz	Fianl Approval	