EPIDEMIOLOGY OF SHAFT OF FEMUR FRACTURE IN A TERTIARY CARE HOSPITAL IN A DEVELOPING COUNTRY

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ABSTRACT

Objective: To describe the epidemiology of femur shaft fracture in a developing country and develop prevention policies considering the findings.

Methodology: This retrospective epidemiological study included all patients with a femur fracture who were admitted between January 2021 and April 2023 at the orthopedic and trauma surgery department of Lady Reading Hospital, Peshawar, Pakistan. The patient's medical records were retrospectively reviewed using electronic medical records in the Hospital information system (HIS). All patients with documented femur shaft fracture who were admitted and operated on with an interlocking nail during the study period, irrespective of age, were included.

Results: A total of 347 patients were identified in HMIS and were included in this study. Mean age was 31.52 ± 15.475 SD (12-91). Male to female ratio was 295:52. According to AO classification, 27 patients had 32A1 injury, 45 patients had 32A2 injury, 74 patients had 32A3 injury, 16 patients had 32B1 injury, 44 patients had 32B2 injury, 22 patients had 32B3 injury, 18 patients had 32C1 injury, 15 patients had 32C2 injury and 27 patients had 32C3 injury. Different surgical options as well as the mode of fixation were used in the management of these fractures with missing data identification in 17% of patients.

Conclusion: Traumatic femur fracture are not uncommon injuries in developing countries which occur due to road traffic accidents and firearm injuries in majority of the cases.

Key Words: Interlocking Nail; Femur Shaft Fracture; AO Classification

INTRODUCTION

Femur fracture following trauma is a significant cause of morbidity, with one to three million individuals affected annually.[1] The epidemiology of fractures, however, is underestimated, though there is lot of available research on management of fractures.[2] Technological advancements have been a double edge sword; on one hand, people are living longer although with weak bones, and on another hand, road traffic accidents have increased as well.[3,4]

Road side accidents incur deaths of approximately 1.3 million people each year and afflict between 20 and 50 million people with injuries that require long-term care. More than half of these deaths and injuries involve pedestrians, cyclists and motorcyclists and their passengers. Young males under 25 years are more likely to be involved in road side accidents than females, with 73% of all road traffic deaths occurring among young males in that age group. Developing economies record higher rates of road traffic injuries, with 93% of fatal outcomes coming from low- and middle-income nations and these injuries account for over 10% of disability adjusted life years.[1] Road traffic injuries have a serious impact on national economies, costing countries 3% of their annual gross domestic product. In this regard, 2030 Agenda for Sustainable Development has set ambitious targets for reducing road traffic injuries.[5]

According to The International Orthopaedic Multicentre Study in Fracture Care (INORMUS) investigators, deficiencies in the prehospital facilities (access to an ambulance, health insurance coverage), contribute substantially to mortality and morbidity due to injuries, and approximately 80% of injury-related deaths occur before patients are admitted to a hospital. The Lancet Commission on Global Surgery determined that essential facilities for surgical care should be available within 2 hours for patients with severe injuries, including open fractures. Beyond 2 hours, risk of complications and mortality increase.[6] The commission developed the Three Delays framework for categorizing delays in accessing surgical care in time. The First Delay is the delay in seeking care, which occurs when a patient

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waits to seek formal health-care treatment due to lack of financial support, distrust of the health-care system, or geographical restrictions. The Second Delay is due to travelling for long distance to find a hospital with sufficient resources or a lack of transportation means. The Third Delay is due to hospital-based deficiencies, such as a lack of capacity to provide care.[6]

According to Ibrahim et al, in their epidemiological study from Somalia on femur fractures, gun shots were responsible for 40% of male patients followed by falls (31%) and road accidents (21%).[7] The rationale of this study is to describe the epidemiology of femur shaft fracture in a tertiary care hospital in a developing country. This data will be useful to develop a comprehensive policy on prevention and management of these injuries.

METHODOLOGY

This retrospective epidemiological study included all patients with a femur fracture who were admitted between January 2021 and April 2023 at the orthopedic and trauma surgery department of Lady Reading Hospital, Peshawar, Pakistan. The patient's medical records were retrospectively reviewed using electronic medical records in the Hospital information system (HIS). All patients with documented femur shaft fracture (AO 32A1,32A2,32A3,32B1,32B2,32B3,32C1, 32C2,32C3), Fig 1, who were admitted and operated on with an interlocking nail during the study period, irrespective of age, were included. Nails used were, ILN (interlocking nail), PFN (proximal femur nail), Gamma nail, Recon nail and Retrograde nail. Open fracture, which needed to be managed with external fixation, were excluded from the study.

The Institutional Review Board of Lady Reading Hospital approved the research (REF. 920/LRH/MTI). In addition, all study participants and a parent of participants under 18 years of age consented to use their medical and surgical data in this study. This study was carried out following the Helsinki Declaration. The data were analyzed using SPSS version 25. The frequencies and proportions were presented as point estimates for categorical variables, while the mean ± SD was employed wherever necessary for quantitative variables. The cross- tabulations were performed to evaluate the association between the variables. Patients with missing data were included in the study but the missing data was excluded from calculations.

RESULTS

We were able to identify 347 in HMIS and they were included in this study. Mean age was 31.52 ± 15.475 SD (12-91). Male to female ratio was 295:52. According to AO classification[18], 27 patients had 32A1 injury, 45 patients had 32A2 injury, 74 patients had 32A3 injury, 16 patients had 32B1 injury, 44 patients had 32B2 injury, 22 patients had 32B3 injury, 18 patients had 32C1 injury, 15 patients had 32C2 injury and 27 patients had 32C3 injury, Table 1. Different surgical options were used in the management of these fractures with missing data identification in 17% of patients, Table 2. Road traffic accident accounted for majority of fractures (48.7%), followed by Firearm injury (20.7%), fall from height (10.7%), bomb blast (1.2%), physical assault (0.9%) and fracture occurring due to wall collapse (0.9%), Table 3. Dynamic locking mode of fixation was used in 15.9% of patients and static mode was used in 66.9% of patients, Table 4.

DISCUSSION

Long bone fracture is a burden not only on individual health but on the collective health of the nation as well arising out of costs. Our study shows that majority of our patients were male and road traffic accidents followed by firearm injuries were responsible for the traumatic fracture in majority of the cases.

Our results showed that mean age was 31.52 years affecting male population predominantly (85%). Ghouri Sl and colleagues reported majority of femur shaft fractures in the males (89.4%) and young with a mean age of 30 years.[2] Natalie et al reported the mean age in their group was 38 and 62% were male patients.[8] Yoshihiro et al reported 41.8 years mean age in high energy group with male preponderance.[9] Another study by Burç et al. also showed a male predominance of femur shaft fractures.[4] Abdullah et al reported in their analysis of femoral fracture post motor vehicle accidents that middle fractures (64%) exceeded proximal (26%) and distal fractures (10%) in femur. Our findings are in line with global results in that majority of these injuries are occurring in younger male population. Our prevention policy should target this population.

Our study showed that 169 patients had road traffic accident followed by firearm injury as the second leading cause of these fractures. Ghouri et al. reported that road traffic accident was the leading cause of femur shaft fracture.[2] Similar findings were also reported by a Nigerian tertiary trauma center with 6.4% of injuries caused by gun shots.[11] Ibrahim et al, in their study from Somalia reported that gunshots were the most common cause of femur shaft fractures followed by road traffic accidents and falls; they attributed it to on-going war in their region.[7] Many developing countries face firearm injury cases owing to local dynamics, ethnic rivalries, political violence, judicial complicity and economic crisis.[12] We are no different from many developing countries due largely to the fact that majority of our younger population has poor access to basic human needs due to poor economic situation and cultural tribalism. And these numbers are not confined to developing countries. In United States, about 5500 more people were killed in 2020 than in 2019, and 5000 of these were by

firearms.[13] In Nov 2018, Pakistan's first National Road Safety Strategy (2018-2030) was launched with the aim of saving 6000 lives that would otherwise have been lost in road accidents. With estimated 25,000 fatalities on Pakistan's roads every month and that 39% of all reported incidents include fatalities, the strategy is a much-needed step towards a better road sector for Pakistan. As well as saving lives, and providing a reliable, safe, and efficient transport sector, the strategy will also help the whole economy. Bonafede et al reported that long bone fractures incur significant direct and indirect costs[19]. Our aim should be to formulate and implement a policy which should address the economic burden of these injuries in a developing country. In this regards, INORMUS study conducted in Africa, Latin America and Asia will address a critical gap in our knowledge regarding the burden of trauma.[6]

Our results showed that static locking mode of fixation was used in majority of the

Table 1: AO Classification

	Frequency	Percent
Missing	59	17.0
32A1	27	7.8
32A2	45	13.0
32A3	74	21.3
32B1	16	4.6
32B2	44	12.7
32B3	22	6.3
32C1	18	5.2
32C2	15	4.3
32C3	27	7.8
Total	347	100.0

Table 2: AO Classification, Procedure Performed

Ao_Classification	Gamma nail	ILN	PFN	RECON NAIL	Retrograde nail	
Missing	0	39	11	4	5	59
32A1	0	20	3	0	4	27
32A2	0	43	1	0	1	45
32A3	0	67	2	1	4	74
32B1	0	14	1	1	0	16
32B2	0	38	4	0	2	44
32B3	1	10	4	0	7	22
32C1	1	12	4	0	1	18
32C2	1	4	4	3	3	15
32C3	0	13	9	0	5	27

Table 3: Mechanism of Injury

	Frequency	Percent
Missing	59	17.0
BBI	4	1.2
FAI	72	20.7
HOF	37	10.7
PHYSICAL ASSAULT	3	0.9
RTA	169	48.7
WALL COLLAPSE	3	0.9

Table 4: Mode Of Fixation

	Frequency	Percent
DYNAMIC	55	15.9
STATIC	232	66.9
Missing	60	17.3

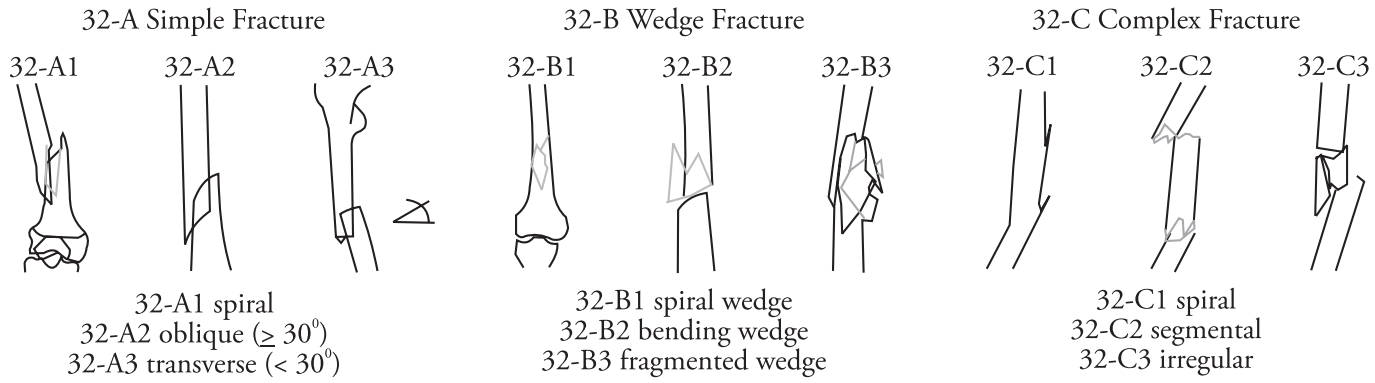

Figure 1: AO Femur shaft fracture classification[18]

cases. The only fracture pattern, where dynamic mode was also utilized more frequently was in 32A2(oblique) and 32A3(transverse) fractures respectively. Interlocking nail was used in majority of cases (260/347), followed by PFN (43/347), Retrograde nail (32/347), Recon nail (9/347) and Gamma nail (3/347). Interlocking nail has been the standard of care since 80s with more than 95% healing rates.[14,15] The choice of approach, antegrade vs retrograde, depends on the location of the fracture whether it is near the hip or knee. According to study by Salminen et al, there were 48% type A fractures, 39% type B and 13% type C fractures,[15] while our study showed 146 patients had type A fractures, 82 patients had type B fracture and 59 patients had type C fracture. It is important to verify adequate reduction before fixation. Generally, patients recover well from femur shaft fractures. These patients need to be followed until union is achieved.[16,17]

LIMITATIONS

It is a retrospective study, we did not report on the outcome of the patients who were included in this study. The issue of missing data is unique to any chart review/ registry study which could not be addressed as well.

CONCLUSIONS

Traumatic femur fracture are not uncommon injuries in developing countries which occur due to road traffic accidents and firearm injuries in mostly younger male population.

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Author's Contribution

SIB conceived the idea, designed the study and collected the data, performed data analysis, helped in the write up of the manuscript. SU designed the study and collected the data, NA performed data analysis, performed data analysis All authors made substantial intellectual contributions to the study. All authors made substantial intellectual contributions to the study All authors made substantial intellectual contributions to the study.

Conflict of Interest

Authors declared no conflict of interest

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Data Sharing Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.