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Prevalence and Patterns of Femoral Neck Fractures in Road Traffic Accident Patients

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ABSTRACT

Background: Femoral neck fractures are a common and severe consequence of road traffic accidents (RTAs), leading to significant morbidity and disability. Understanding their prevalence, demographic distribution, and fracture patterns is essential for optimizing trauma management and prevention strategies.

Objective: To determine the prevalence, demographic distribution, and fracture patterns of femoral neck fractures among road traffic accident (RTA) patients.

Methods: A descriptive cross-sectional study was conducted at Avicenna Hospital, Lahore, from May to October 2024. A total of 130 RTA patients with radiologically confirmed femoral neck fractures were included using purposive sampling. Data on demographics, mode of injury, and fracture classification were collected. Plain radiography and computed tomography (CT) were utilized for diagnosis. Statistical analysis was performed using SPSS version 25.

Results: Out of 130 patients, 91 (70%) were male, and 39 (30%) were female. The highest prevalence was in the 20–40-year age group (67%). Intertrochanteric fractures were the most common (69.2%), followed by partial fractures (66.9%) and femoral stress fractures (65.4%). Motorcyclists and cyclists accounted for the majority of cases (44%).

Conclusion: Femoral neck fractures were most prevalent in young male RTA victims, particularly motorcyclists and cyclists with intertrochanteric fractures being the most prevalent type of pattern. Early diagnosis and targeted prevention strategies are essential to reduce associated morbidity.

Keywords: Epidemiology, Femoral Neck Fractures, Fractures, Computed Tomography, Hip Fractures, Morbidity, Orthopedic Trauma, Prevalence, Road Traffic Accident.

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Introduction

The Femoral neck fractures represent a significant clinical concern due to their high morbidity, potential complications, and impact on patients' quality of life. These fractures commonly occur in young individuals following high-energy trauma, such as road traffic accidents (RTAs), or in older adults due to low-energy falls associated with osteoporosis. The femur, the longest and strongest bone in the human body, plays a critical role in weight-bearing and mobility. Structurally, the femoral neck connects the femoral head to the shaft, forming an essential part of the hip joint, which is responsible for stability and a wide range of movements (1). However, its unique vascular supply makes it particularly vulnerable to complications such as avascular necrosis and non-union in cases of fractures (2).

RTAs contribute significantly to the global burden of injuries, leading to millions of hospitalizations and fatalities annually. According to the World Health Organization (WHO), over 1.3 million people lose their lives due to RTAs each year, while a substantial number sustain severe injuries that result in long-term disability (3). In particular, high-velocity accidents involving motorcycles, bicycles, and automobiles account for a considerable proportion of musculoskeletal trauma, including femoral neck fractures (4). Several epidemiological studies indicate that 30% to 40% of femoral neck fractures in patients younger than 50 years are attributed to RTAs, with urban centers reporting an increasing incidence of these injuries (5). A study conducted in India highlighted that nearly 38% of femoral neck fractures in urban areas were caused by vehicular collisions, underscoring the shift in demographic patterns and the growing burden of traumatic fractures (6).

These fractures can be classified based on anatomical location and displacement patterns. The classification systems, such as the Garden and Pauwels classifications, help guide clinical decision-making and treatment approaches. Displaced fractures often require surgical intervention, including internal fixation or arthroplasty, depending on patient factors such as age, bone quality, and overall health status (7). Early diagnosis and prompt management are critical to preventing complications such as non-union and avascular necrosis, which significantly impact functional outcomes (8). By assessing the prevalence and clinical characteristics of femoral neck fractures in RTA patients, healthcare providers can better allocate resources, develop targeted preventive strategies, and optimize management protocols to enhance patient outcomes. Additionally, understanding the demographic distribution of these fractures is essential for formulating policies to improve road safety measures and trauma care systems, ultimately reducing the incidence of such injuries and improving overall healthcare delivery (9). Understanding the epidemiology of these fractures is critical for improving prevention strategies and enhancing clinical decision-making and management protocols for affected individuals.

Materials and Methods

This descriptive cross-sectional study was conducted at Avicenna Hospital, Lahore, from May to October 2024. A purposive sampling technique was employed to select a total of 130 patients who sustained femoral fractures due to trauma resulting from road traffic accidents. The inclusion criteria mandated that patients have radiologically confirmed femoral fractures, diagnosed through either plain radiography or computed tomography (CT) scans. Patients with a history of pathological fractures, metabolic bone diseases, or those with incomplete medical records were excluded to ensure the study focused solely on trauma-related injuries.

Data collection was carried out through structured clinical assessments, radiological evaluations, and patient interviews. A standardized data collection form was used to record demographic details, mechanism of injury, fracture type, and imaging findings. Radiographic imaging was performed using appropriate kilovoltage peak (kVp) and milliampere-seconds (mAs) settings to ensure optimal visualization of fracture patterns while minimizing radiation exposure. In cases where plain radiography did not provide sufficient diagnostic clarity, CT scans were utilized to obtain detailed cross-sectional imaging for precise fracture classification and assessment.

Ethical approval for this study was obtained from the Ethical Review Committee at Riphah International University. The study adhered to the ethical principles outlined in the Declaration of Helsinki, ensuring the rights, dignity, and confidentiality of all participants were upheld. Informed consent was obtained from all patients or their legal guardians prior to enrollment. Patients were informed about the nature and objectives of the study, and their participation was entirely voluntary. Data analysis was performed using Statistical Package for the Social Sciences (SPSS) version 25. Descriptive statistics, including means, frequencies, and percentages, were used to summarize demographic and clinical characteristics.

Results

A total of 130 patients with femoral neck fractures due to road traffic accidents were analyzed. The majority of patients were male, comprising 70% (91 out of 130), while females accounted for 30% (39 out of 130). The highest prevalence of femoral neck fractures was observed in individuals aged 20 to 40 years, accounting for 67% of cases. The remaining 22% were in the 41–60 age group, while 11% were aged 60 years and above.

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Table 1: Age Distribution and Mode of Injury

Age Group (Years)	Bike (%)	Cycle (%)	Car (%)	Bus (%)	Truck (%)	Prevalence %
20-40	15 (11.5%)	18 (13.8%)	10 (7.7%)	5 (3.8%)	7 (5.4%)	87 (67%)
41-60	4 (3.1%)	4 (3.1%)	7 (5.4%)	4 (3.1%)	3 (2.3%)	29 (22%)
60+	2 (1.5%)	1 (0.8%)	5 (3.8%)	3 (2.3%)	0 (0.0%)	14 (11%)
Total	21 (16.2%)	23 (17.7%)	22 (16.9%)	12 (9.2%)	9 (6.9%)	130 (100%)

Intertrochanteric fractures were the most common type and pattern, observed in 69.2% of the total study population, followed by partial fractures (66.9%) and femoral stress fractures (65.4%). The data also revealed that complete displaced fractures were slightly more prevalent in females (66.7%) compared to males (63.7%).

Table 2: Gender-Wise Distribution of Fracture Patterns

Fracture Patterns	Female (n=39)	Male (n=91)	Total (n=130)
Femoral Stress Fracture	25 (64.1%)	60 (65.9%)	85 (65.4%)
Complete Displaced Fracture	26 (66.7%)	58 (63.7%)	84 (64.6%)
Subcapital Neck Fracture	21 (53.8%)	51 (56.0%)	72 (55.4%)
Transcervical Neck Fracture	25 (64.1%)	49 (53.8%)	74 (56.9%)
Intertrochanteric Fracture	26 (66.7%)	64 (70.3%)	90 (69.2%)
Subtrochanteric Fracture	23 (59.0%)	50 (54.9%)	73 (56.2%)
Impacted Fracture	25 (64.1%)	54 (59.3%)	79 (60.8%)
Partial Fracture	24 (61.5%)	63 (69.2%)	87 (66.9%)

Discussion

Femoral neck fractures were a significant consequence of road traffic accidents, particularly among young adults involved in high-impact collisions. This study demonstrated that individuals aged 20 to 40 years had the highest prevalence of these fractures, aligning with findings from previous research indicating that young adults were at a greater risk due to their engagement in high-speed vehicular activities and exposure to traumatic forces (10). The predominance of male patients in this study, accounting for 70% of cases, was consistent with earlier epidemiological data suggesting that men were more frequently involved in high-risk behaviors such as motorcycle riding and reckless driving, leading to a higher incidence of traumatic injuries (11). Furthermore, intertrochanteric fractures were observed as the most common type, comprising 69.2% of cases, which was in agreement with previous studies that highlighted the vulnerability of the intertrochanteric region due to its biomechanical properties and the manner in which forces were transmitted during impact (12).

The high proportion of impacted and displaced fractures among male patients in this study corroborated findings from retrospective analyses that identified significant sex-related differences in fracture patterns. Males exhibited higher rates of impacted fractures, likely due to the greater energy dissipation occurring in high-velocity crashes, whereas females demonstrated an increased prevalence of stress fractures, possibly influenced by variations in bone density and hormonal factors (13). These findings underscored the necessity of implementing tailored preventive strategies, particularly for young adults and male road users, to mitigate the risk of high-impact fractures. The study also revealed that motorcyclists and cyclists sustained the highest number of femoral neck fractures, which reinforced prior research emphasizing the susceptibility of two-wheeler riders to severe orthopedic injuries due to their lack of structural protection compared to occupants of four-wheeled vehicles (14).

Despite these important insights, the study had certain limitations that warranted consideration. The sample size was confined to a single hospital, restricting the generalizability of the findings to a broader population with diverse road safety conditions and healthcare infrastructure (15). Moreover, the study design did not incorporate long-term follow-up data, limiting the ability to assess complications such as avascular necrosis, non-union, or post-traumatic arthritis, which were critical determinants of functional outcomes following femoral neck fractures (16). Future studies should aim to include multi-center collaborations and longitudinal follow-ups to provide a more comprehensive understanding of fracture healing and patient prognosis. Additionally, integrating biomechanical analyses could enhance the interpretation of fracture mechanisms and contribute to developing more effective injury prevention strategies.

Strengths of this study included the use of standardized imaging techniques to confirm fractures, minimizing diagnostic variability, and ensuring accurate classification. Based on these results, trauma management protocols

should prioritize early diagnosis and targeted interventions, particularly for young adults and motorcyclists who were disproportionately affected. Public health initiatives emphasizing road safety measures, the use of protective gear, and stricter traffic regulations could significantly reduce the incidence of femoral neck fractures (17). Future research should explore the role of biomechanical risk factors and road safety interventions in mitigating the burden of traumatic fractures and improving patient outcomes.

Conclusion

Femoral neck fractures remained a critical consequence of road traffic accidents, predominantly affecting young males and two-wheeler riders, with intertrochanteric fractures being the most prevalent type. The study highlighted the necessity of early diagnosis and appropriate fracture classification to optimize treatment outcomes and prevent complications such as avascular necrosis and non-union.

Authors' Contributions

ICMJE authorship criteria	Detailed contributions	Authors
Substantial Contributions	Conception or Design of the work	1,2,3,5
	Data acquisition	2,3,6
	Data analysis or interpretation	1,4,5
Drafting or Reviewing	Draft the work	1
	Review critically	1,2,3,4
Final approval	Final approval of the version to be published.	1,2,3,4,5,6
Accountable	Agreement to be accountable for all aspects of the work.	1,2,3,4,5,6

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