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ORIGINAL ARTICLE

Proximal Humerus Fractures among Patients Presenting with Humerus Fractures in the Emergency Department of a Tertiary Care Center- A Descriptive Cross-sectional Study

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ABSTRACT

BACKGROUND

Proximal humerus fracture is a common injury, with recent studies demonstrating annual incidences ranging from 60.1 to 90.8 per 100,000 person-years. Early initiatives regarding its management with rehabilitation are essential to provide satisfactory functional outcomes. This study aims to determine the prevalence of proximal humerus fractures among adult patients in the emergency.

METHODS

This descriptive cross-sectional study was conducted at a tertiary care centre involving patients with proximal humerus fractures at the emergency department between January 1, 2020, and December 31, 2023. All adult patients diagnosed with the proximal humerus fracture were included in the study. Those with missing clinical records and radiographic images managed in other centres were excluded. The study was approved by B&B IRC (Ref number: B&B IRC-23-25)

RESULTS

Out of 2516 adult patients presented to the emergency department with fractures. 123 (4.89%) had proximal humerus fracture. A total of 109 patients were included in the final analysis. There were 60 (55.05%) males and 49(44.95%) females, with a mean age of 47.87 ± 15.00 years (range, 18 to 85 years). The right side was involved in 74 (67.89%), and the left side was involved in 35 (32.11%). A road traffic accident was seen in 63 (57.80 %) patients, followed by fall injury in 42(38.53%) and direct impact in 4 (3.67%). Open fracture was seen in 2 (1.83%) cases. Association with dislocation was seen in 9(8.26%) cases, and one was associated with nerve injury (axillary nerve injury).

CONCLUSION

Proximal humerus fracture has a prevalence of 4.89% of all fractures presenting to an emergency department. It is common among males in the fourth decade of their life following road traffic accidents. Neer's two-part fracture is the most common, followed by a three-part fracture.

KEYWORDS

fall injury, Neer's classification, proximal humerus fracture, road traffic accidents

INTRODUCTION

Proximal humerus fracture (PHF) is a common injury, with recent studies demonstrating an annual incidence ranging from 60.1 to 90.8 per 100,000 person-years.[1] They are the seventh most frequent fractures in adults.[2] Elderly populations with osteoporosis are most vulnerable, and low-energy trauma, such as falls from standing height, has been the most common mechanism of injury.[2] In 1970, Charles Neer described his four-segment classification system.[3] The four-segment classification system defines PHFs by the number of displaced segments or parts (greater than 1 cm separation or 45° angulation).[3] All PHFs comprised four major segments: the lesser tuberosity, greater tuberosity, articular surface, and humeral shaft. Neer set 45° angulation and 1-cm separation as the thresholds for displacement.[3]

Wider literature shows that PHFs can cause functional disability for numerous activities, and patients may require high treatment costs.[4-6] This suggests these injuries have a significant health care burden. Early initiatives regarding its management with rehabilitation are essential to provide satisfactory functional outcomes.[3] It is essential to understand the epidemiological parameters of these injuries to enhance the preparedness for timely management. However, the epidemiological landscape

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remains underexplored.[1] Few population-based studies have been conducted involving patients with PHFs.[7-9] However, studies have varying inclusion and exclusion criteria, limiting the generalization of study findings. In addition, the literature is scarce in our context. Hence, it is crucial to conduct an epidemiological study of our population. Thus, this study aims to determine the prevalence of PHFs in adult patients presenting to an emergency department in our landscape. In addition, this study will explore demographic parameters, mechanisms of injury, and fracture classification.

METHODS

A descriptive cross-sectional study was conducted at B&B Hospital, Gwarko, Lalitpur, Nepal, after getting formal approval from the institutional review committee (Ref number: B&B IRC-23-25). The study included all adult patients (above 18 years) who presented with PHFs at the emergency department between January 1, 2020, and December 31, 2023. Those patients with missing clinical records and radiographic images managed in other centres were excluded. A convenient sampling technique was used. The sample size was calculated using the following formula:

Minimum required sample (N) = $Z2 \times p \times q / d2$

$= 1.962 \times 0.028 \times (1-0.028) \div 0.052$

$= 41.82$

Where,

Z = 1.96, constant for a 95% Confidence interval

P = prevalence, 2.8% taken from previous study[10]

Q= 1-p

d = margin of error, 5%

The calculated sample size was 42. However, all eligible patients within the study period were included.

The following data were recorded using electronic pro forma: age, gender, side involved, mechanism of injury, injury type (open or close), association with dislocation, fracture classification (Neer's four-segment classification system.[3] The diagnosis of PHFs was made after clinical and radiographic evaluation was done in the emergency department by the principal investigator and verified by the senior author.

The data was then stored in Microsoft Excel version 2019. Descriptive statistic was used. Continuous data was reported as mean ± standard deviation and categorical data was reported as number (percentage). The data analysis used the Statistical Package for Social Sciences (SPSS) version 26.0.

RESULTS

The study period shows 2516 adult patients presented to the emergency department with fractures. Out of the total patients, 123 (4.89%) had PHFs. Out of these, 109 were included, and 14 were excluded. Among excluded patients, 8 had missing information in their clinical records, 4 had missing radiograph images, and two were managed in another centre. There were 60 ((55.05%) males and 49(44.95%) females, with mean age of years 47.87±15.00years (range, 18 to 85 years). The right side was involved in 74(67.89%), and the left was involved in 35 (32.11%). RTA was seen in 63(57.80 %) patients, followed by fall injury 42(38.53%), and direct impact 4 (3.67%). Open fractures were seen in 2 (1.83%) cases. Association with dislocation was seen in 9 (8.26%) cases, 1 (0.91%) had an association with nerve injury (axillary nerve injury), and 29 (26.6%) had other associated injuries, such as polytrauma or multiple fractures. [Table 1, 2]

Table 1: Age distribution of included patients (n=109)

Age distribution	Frequency, n (%)
Above 60	23 (21.10%)
40-60	52 (47.71%)
18-40	34 (31.19%)

Table 2: Neer's classification (n=109)

Neer's classification	Frequency, n (%)
Minimally Displaced	7(6.42%)
Neer's Two-Part Fracture	47 (43.12%)
Neer's Three-Part Fracture	40 (36.70%)
Neer's Four-Part Fracture	15 (13.76%)

DISCUSSION

This study identified that the overall prevalence of PHFs was 4.89 %. The finding was comparable to what was reported in the literature, around 2-4% of all fractures.[10-11] A multicentre study conducted in Malawi involving 23,734 patients with fractures found that PHFs were seen in 657 (2.76%).[10] However, a study conducted in a single trauma centre in the United Kingdom involving 5,953 fractures found that PHFs were seen in 4% of the patients.[11]

This study also identified that male predominance was 55%. However, a female predominance was seen in the literature, with prevalence ranging from 63-77%. A study in Portugal involving 19,290 patients with PHFs found that 63.5% were females.[7] A study conducted in the United Kingdom involving 1,015 patients found that 73% were females, and the study conducted in Spain, which included 638 patients, found that 77% were females.[8,9] The female predominance seen in the literature could be because of the inclusion of elderly patients with PHFs. This could be explained by the mean age of participants in those studies conducted in Portugal, the United Kingdom, and Spain, which were 62.6 years, 66 years, and 70.4 years, respectively.[7-9] In contrast, in this study, the mean age of the patients was 47.85 years. The reason could be due to the increased number of patients visiting the hospital following high-energy trauma, such as RTA. This can be explained by the common mechanism of the injury, which was RTA in this study, with a prevalence of 57.8%, whereas the most prevalent mechanism of low-energy falls in studies conducted in the United Kingdom and Spain, with prevalence of 91% and 97%, respectively.[8,9]

Neer's classification is the most widely used classification system in classifying these injuries.[12] This study found that Neer's two-part fracture was the commonest fracture type, followed by three-part and four-part fracture, with prevalence of 43.12%, 36.70%, and 13.76%, respectively. The findings vary in the literature, as the study conducted in the United Kingdom found minimally

displaced fracture as common fracture type followed by two-part fracture with prevalence of 49% and 28%, respectively, and the study conducted in Spain found two-part fracture as common fracture type followed by three-part fractures with prevalence of 32.3% and 30.9%, respectively.[8,9] If the fracture pattern is classified broadly into two classes: simple fracture pattern including minimally displaced and two-part fractures, and complex fracture pattern including three-part and four-part, these studies found that most of the fractures were simple fracture patterns.[8,9] This coincides with the common mechanism of injury. In contrast, this study found that most fractures were complex fracture patterns, with a combined prevalence of 50.4%. This suggests that high-energy trauma usually results in complex fracture patterns, as suggested by three-part and four-part, and low-energy trauma results in simple fracture patterns.

This study has several limitations. This was a single-centre descriptive cross-sectional study, which contains inherent study design-related biases. Patients presented to the outpatient clinic were not included. The principal author did fracture classification. Other epidemiological parameters were not evaluated, such as associated injuries and treatment commenced. The findings cannot be generalized.

CONCLUSION

PHFs have a prevalence of 4.89% of all fractures presenting to an emergency department. It is common among males in the fourth decade of their life following RTA. Neer's two-part fracture is the most common type, followed by a three-part fracture.

CONFLICT OF INTEREST

None

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