JMU
Jurnal Medika Udayana

ISSN: 2597-8012 JURNAL MEDIKA UDAYANA, VOL. 15 NO.10, OKTOBER, 2026

Received: 2026-10-19 Revision: 2026-10-20 Accepted: 30-10-2026

CHARACTERISTICS OF PATIENTS WITH FRACTURES AROUND THE SHOULDER IN THE EMERGENCY DEPARTMENT OF PROF. DR. I.G.N.G. NGOERAH GENERAL HOSPITAL

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ABSTRACT

Background: Fractures around the shoulder are common musculoskeletal injuries in the Emergency Department (ED) and can cause significant morbidity. Local data from tertiary referral hospitals in Indonesia remain limited. This study aimed to describe the characteristics of patients with fractures around the shoulder in the ED of Prof. Dr. I.G.N.G. Ngoerah General Hospital.
Methods: This was a retrospective descriptive observational study using secondary data from the medical records of patients treated between 1 December 2024 and 30 November 2025. Total sampling was applied, and the data were analysed descriptively using SPSS.
Results: A total of 238 patients were included. Most patients were of productive age (15–64 years; n = 194, 81.5%) and male (n = 147, 61.8%). The clavicle was the most frequently fractured bone (53.9%), followed by the humerus (38.2%) and the scapula (7.9%). Most fractures were closed (97.5%), and traffic accidents were the leading cause (77.7%). Single fractures accounted for 90.3% of cases. The most common procedure was open reduction and internal fixation (ORIF) with plate and screws (75.6%).
Conclusion: Fractures around the shoulder in this ED mostly affected male patients of productive age and were commonly caused by high-energy trauma such as traffic accidents, with the clavicle as the most frequent site. ORIF was the main treatment. These findings emphasise the importance of adequate resource readiness in the ED for shoulder trauma.
Keywords: fractures around the shoulder, emergency department, ORIF, traffic accidents, clavicle, humerus, scapula

INTRODUCTION

Musculoskeletal trauma is a common condition that is increasingly encountered in the Emergency Department (ED). These injuries impose a global socioeconomic burden as a public health problem and can cause significant morbidity and mortality. Among all musculoskeletal injuries, fractures account for a relatively large share of a burden that continues to increase over time [1]. In Indonesia, fractures are the third leading cause of death, with a prevalence of 5.5% [2]. Fractures are often caused by motor vehicle accidents, occupational accidents, and other high-energy mechanisms [3].

Fractures can occur in many bones of the body, including the shoulder. Fractures around the shoulder involve the bones of the shoulder girdle, namely the scapula, the clavicle, and the proximal humerus. The shoulder girdle is a complex structure that combines static and dynamic stability with a wide range of motion. This complexity means that fractures around the shoulder vary in their clinical and therapeutic characteristics, depending on the bone involved and the severity of the injury.

Clavicle fractures are among the most common shoulder fractures and generally result from direct or indirect trauma to the shoulder. Several studies report that clavicle fractures account for approximately 2–5% of all fractures and are often found in physically active, productive-age populations [4]. Epidemiologically, these fractures show a bimodal distribution: in the productive-age group they more often result from high-energy trauma related to sports or traffic accidents, whereas in older adults they more often result from simple falls [5].

Proximal humeral fractures are another important group of fractures around the shoulder, and their epidemiology is closely related to population ageing. Retrospective cohort studies show that proximal humeral fractures are among the most common upper extremity fractures and that their incidence increases significantly in older age groups. These fractures are often complex, involving dislocation and multiple fragments, and therefore require careful management planning [6].

The combination of these fractures in a single patient, for example fractures of the scapula, clavicle, and proximal humerus occurring simultaneously, is relatively rare but indicates a high-energy trauma pattern and is often accompanied by neurovascular injury such as brachial plexus injury. Such complex cases require a multidisciplinary approach to diagnosis and treatment to ensure optimal long-term functional outcomes [7].

The diagnosis of fractures around the shoulder generally begins with conventional radiography, but computed tomography (CT) is increasingly recommended to evaluate complex fractures, particularly of the scapula and proximal humerus, to support more accurate treatment planning [8]. Management can be conservative or operative depending on the type of fracture, the degree of displacement, and the condition of the patient. Conservative treatment is often chosen for fractures without severe displacement, whereas fractures with significant displacement or joint involvement generally require operative intervention, such as open reduction and internal fixation (ORIF) or other appropriate fixation procedures. The optimal indications for surgery in certain fractures, particularly in older patients in whom the risk of surgical complications must be weighed carefully, remain a subject of ongoing clinical debate [9].

In Indonesia, epidemiological data on fractures around the shoulder remain limited, particularly from tertiary referral facilities. Prof. Dr. I.G.N.G. Ngoerah General Hospital, as a teaching hospital and the main referral centre in Bali, plays a strategic role in trauma care. Local data are therefore important as a basis for improving service quality, developing clinical protocols, and planning health resources more effectively. This study aims to describe the characteristics of patients with fractures around the shoulder in the ED of Prof. Dr. I.G.N.G. Ngoerah General Hospital from 1 December 2024 to 30 November 2025.

MATERIALS AND METHODS

This was a retrospective descriptive observational study using secondary data from the medical records of patients treated in the Emergency Department (ED) of Prof. Dr. I.G.N.G. Ngoerah General Hospital, Denpasar, Bali, between 1 December 2024 and 30 November 2025. A descriptive design was chosen because it allows the distribution of a health problem to be described according to its characteristics. The study population comprised all patients with orthopaedic cases who presented to the ED during the study period. Total sampling was used: all patients who met the inclusion criteria and did not meet any of the exclusion criteria were included. Eligible patients were identified by searching the ED patient register and the hospital medical record database for a diagnosis of fracture of the clavicle, scapula, or humerus (ICD-10 codes S42.0, S42.1, and S42.2). The medical records of the identified patients were then reviewed individually to confirm the diagnosis and to assess eligibility. The inclusion criteria were patients of any age with a fracture of the clavicle, scapula, and/or humerus who presented to the ED during the study period and whose medical records were available. The exclusion criteria were patients with incomplete, unreadable, or unavailable medical records; patients with pathological fractures caused by tumour or metastasis; patients with duplicate records and patients referred out of the hospital from the ED without any documented management. This process yielded 238 patients.

The variables recorded were age (<15, 15–64, and >64 years), sex, nature of the fracture (open or closed), cause of the fracture, fracture location, fracture type (single or multiple), fracture classification, and management. Fractures were classified using the Gustilo–Anderson classification for open fractures, the Neer and AO/OTA classifications for humeral fractures, the Allman classification for clavicle fractures, and the Ideberg and AO classifications for scapular fractures, as documented in the medical records. The data were collected by the authors using a standardised data collection form; confirm.

The data were processed and analysed using SPSS. Univariate analysis was performed to describe the distribution of the sample, and the results were presented as frequencies and percentages. Permission to collect the data was obtained from Prof. Dr. I.G.N.G. Ngoerah General Hospital. Patient identities were anonymised, and the data were used only for the purposes of this study to maintain patient confidentiality.

RESULTS

A total of 238 patients with fractures around the shoulder were included. The characteristics of the patients are shown in Table 1. Most patients were in the productive age group (15–64 years; 194 patients, 81.5%), followed by those aged >64 years (42 patients, 17.7%) and <15 years (2 patients, 0.8%). Male patients predominated (147 patients, 61.8%), while 91 patients (38.2%) were female.

Table 1. Characteristics of patients with fractures around the shoulder (n = 238)

Characteristic	n	%
Age group (years)		
<15	2	0.8
15–64	194	81.5
>64	42	17.7
Sex		
Male	147	61.8
Female	91	38.2
Nature of fracture		
Closed	232	97.5
Open	2	0.8
Unknown	4	1.7
Cause of fracture		
Traffic accident	185	77.7
Fall from height	13	5.5
Slip at home	40	16.8
Fracture type		
Single fracture	215	90.3
Multiple fractures	23	9.7

Percentages are calculated from the total number of patients (n = 238).

Most fractures were closed (232 patients, 97.5%). Open fractures were found in 2 patients (0.8%), and the nature of the fracture was unknown in 4 patients (1.7%). Traffic accidents were the cause of fracture in 185 patients (77.7%), followed by slips at home in 40 patients (16.8%) and falls from height in 13 patients (5.5%). Single fractures were found in 215 patients (90.3%) and multiple fractures in 23 patients (9.7%).

By location, the 238 patients had a total of 254 fractures, and the clavicle was the most frequently fractured bone (137 fractures, 53.9%), followed by the humerus (97 fractures, 38.2%) and the scapula (20 fractures, 7.9%) (Table 2).

Table 2. Distribution of fractures by location (n = 254 fractures)

Location	n	%
Clavicle	137	53.9
Humerus	97	38.2
Scapula	20	7.9

Percentages are calculated from the total number of fractures (n = 254)

The fracture classifications are shown in Table 3. One open humeral fracture was classified as Gustilo–Anderson type I (0.4%). Among humeral fractures, the most frequent categories were Neer 3-part (32 fractures, 12.6%), Neer 2-part (23 fractures, 9.1%), and Neer 4-part (14 fractures, 5.5%), and 2 fractures (0.8%) were AO/OTA segmental fractures; the classification was not stated for 25 humeral fractures (9.8%). Among clavicle fractures, Allman group 1 was the most common (95 fractures, 37.4%), followed by group 2 (19 fractures, 7.5%) and group 3 (10 fractures, 3.9%), and the classification was not stated for 13 fractures (5.1%). Among scapular fractures, the classification was not stated for 12 fractures (4.7%); the remaining fractures were Ideberg type 2 (3 fractures, 1.2%), Ideberg type 3 (2 fractures, 0.8%), Ideberg type 5A (2 fractures, 0.8%), and AO segmental (1 fracture, 0.4%).

doi:10.24843.MU.2026.V15.i10.P07

Table 3. Fracture classification by bone (n = 254 fractures)

Classification	n	% of all fractures	% within bone
Humerus (n = 97)			
Gustilo–Anderson type I	1	0.4	1.0
AO/OTA segmental	2	0.8	2.1
Neer 2-part	23	9.1	23.7
Neer 3-part	32	12.6	33.0
Neer 4-part	14	5.5	14.4
Not stated	25	9.8	25.8
Clavicle (n = 137)			
Allman group 1	95	37.4	69.3
Allman group 2	19	7.5	13.9
Allman group 3	10	3.9	7.3
Not stated	13	5.1	9.5
Scapula (n = 20)			
AO segmental	1	0.4	5.0
Ideberg type 2	3	1.2	15.0
Ideberg type 3	2	0.8	10.0
Ideberg type 5A	2	0.8	10.0
Not stated	12	4.7	60.0

Percentages of all fractures are calculated from n = 254 fractures; percentages within bone are calculated from the number of fractures of each bone. Gustilo–Anderson classifies open fractures.

Regarding management (Table 4), the most frequently performed procedure was ORIF with plate and screws in 180 patients (75.6%). Other management included conservative treatment in 12 patients (5.0%), implant removal in 9 patients (3.8%), arthroplasty in 4 patients (1.7%), and debridement in 1 patient (0.4%); other procedures were performed in 32 patients (13.4%).

Table 4. Management of patients with fractures around the shoulder (n = 238)

Management	n	%
ORIF with plate and screws	180	75.6
Other	32	13.4
Conservative	12	5.0

ORIF, open reduction and internal fixation. Percentages are calculated from the total number of patients (n = 238).

DISCUSSION

The results show that most patients belong to the productive age group (15–64 years), namely 194 patients (81.5%). This finding is consistent with studies showing that fractures around the shoulder frequently occur in active adults because of high mobility and exposure to physical and occupational activity. In this age group, the injury mechanism is generally related to moderate- to high-energy trauma, such as traffic accidents and falls with direct impact on the shoulder [10].

In contrast, the proportion of older patients (>64 years), 17.7% in this study, may be related to the decrease in bone mineral density caused by osteoporosis. A study reported that proximal humeral fracture is one of the most common osteoporotic fractures in the older population, and that fractures in this population more often result from low-energy trauma, such as a fall from standing height [11]. This age difference has important implications for management, because productive-age patients generally have higher functional demands than older patients, so the therapeutic approach often differs.

Male patients predominate (147 patients, 61.8%) compared with female patients (91 patients, 38.2%). This finding is consistent with reports that clavicle fractures and

doi:10.24843.MU.2026.V15.i10.P07

injuries of the shoulder girdle occur more often in men, particularly because of involvement in strenuous physical activity, high-risk occupations, and traffic accidents. One study showed that behavioural factors and higher risk exposure in men play an important role in the high incidence of fractures, particularly in the productive age group [12]. This suggests that sex influences the incidence, the injury mechanism, and the preventive and clinical management required in the ED.

Most fractures in this study are closed (97.5%), whereas open fractures account for only 2 patients (0.8%). Several studies report that closed fractures are more prevalent than open fractures. However, although fewer in number, open fractures are more severe than closed fractures because of the involvement of muscle and skin and the higher risk of infection. The type of fracture is influenced by many factors, such as the location, the activity performed before the injury, and the type of fracture itself [13]. The difference in the proportion of closed and open fractures reflects the variation in injury mechanisms in the study population.

The clavicle is the most frequently fractured bone (137 fractures, 53.9%), followed by the humerus (38.2%) and the scapula (7.9%). This variation reflects the spectrum of fractures that commonly occur around the shoulder. The pattern is in line with global epidemiological findings that the clavicle is the bone most commonly fractured in the shoulder region because of its superficial position and its role as a link between the upper limb and the axial skeleton. Most clavicle fractures occur in the middle third of the bone, which is the area most vulnerable to bending forces and direct trauma [14].

Proximal humeral fractures are also found in a considerable proportion in this study. An epidemiological study in Qatar showed that proximal humeral fracture is one of the most common upper extremity fractures, with a distribution of fracture types that is influenced by age and injury mechanism [15]. Scapular fractures, on the other hand, are a relatively rare finding in this study. This is consistent with the literature, which describes scapular fractures as uncommon injuries [16] that generally require high energy and are accompanied by associated injuries, such as thoracic and multisystem injuries. Scapular fractures often indicate a severe trauma mechanism and require further evaluation for other injuries [7].

Single fractures (90.3%) are more frequent than multiple fractures (9.7%). This suggests that most patients sustain relatively localised trauma without severe multisystem involvement. An experimental study in mice showed that multiple fractures cause a worse systemic inflammatory response and increase bone resorption, resulting in worse systemic bone loss than single fractures [17].

For clavicle fractures, the Allman classification remains widely used in clinical practice and divides fractures into the medial third (group III), the middle third (group I), and the lateral third (group II). In this study, most clavicle fractures occur in the middle third (95 of 137 clavicle fractures, 69.3%; 37.4% of all fractures). This is consistent with the literature, which states that this area is the most vulnerable to bending forces from direct or indirect trauma, so that about two-thirds of clavicle fractures occur at this site [18].

For proximal humeral fractures, the Neer classification is widely used to assess fracture complexity based on the number of fragments and the degree of displacement. In this study, Neer 3-part (12.6% of all fractures) and 2-part (9.1%) fractures together account for more than half of the humeral fractures (55 of 97; 56.7%). This is consistent with reports that most proximal humeral fractures lie in the mild-to-moderate complexity spectrum. The literature describes Neer 2-part fractures as the most common type, particularly in productive-age patients because of moderate-energy trauma, whereas fractures of higher complexity are more often found in older people [15]. In this study, 3-part fractures are slightly more frequent than 2-part fractures.

Scapular fractures in this study are few in number. Of the 20 scapular fractures, 12 (60.0%) are not classified, and the classified fractures consist of 7 glenoid fossa fractures according to the Ideberg classification and 1 AO segmental fracture. Classification is important to identify glenoid involvement, because intra-articular fractures have greater functional implications and often require operative management [7].

With regard to management, 75.6% of patients receive operative treatment in the form of ORIF with plate and screws. This high proportion of operative treatment may be explained by cases that tend to be more complex and that meet the indications for surgery. Globally, the proportion of operative management varies with the facility and the complexity of the fracture, but the literature shows a trend towards increased operative management of clavicle and proximal humeral fractures, particularly in active adults, because ORIF with plate and screws is considered to provide better functional outcomes and faster recovery [18].

This study has several limitations. It was conducted in a single centre and relied on secondary data from medical records, so some variables, particularly fracture classification, are not recorded in all cases. In addition,

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because the study is descriptive, it does not assess associations between variables or functional outcomes.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This study has several limitations. It was conducted in a single centre and relied on secondary data from medical records, so some variables, particularly fracture classification, are not recorded in all cases. In addition, because the study is descriptive, it does not assess associations between variables or functional outcomes.

Based on clinical and radiological characteristics, most cases are closed fractures, with the clavicle as the most common fracture location, followed by the proximal humerus and the scapula. This pattern is in line with the anatomical and biomechanical characteristics of the shoulder. The predominance of single fractures indicates that most patients sustain relatively localised trauma without severe multisystem involvement, although the small proportion of multiple fractures still requires vigilance.

Based on classification and management, clavicle fractures most often belong to the Allman middle-third group, whereas proximal humeral fractures are dominated by Neer 2-part and 3-part fractures. Most patients undergo operative management with ORIF with plate and screws, which indicates a tendency towards surgical management in cases of high complexity and high functional demand, particularly in productive-age patients.

Reccomendations

Human resources, equipment, and service flow in the ED should be optimised, particularly during periods of high patient volume, so that fractures around the shoulder can be managed efficiently and in a timely manner.

The competence of medical personnel, particularly in applying the principles of Advanced Trauma Life Support (ATLS) and techniques for the initial management of musculoskeletal injuries, is essential to maintain the quality of orthopaedic emergency care.

Further research is needed to assess the long-term functional outcomes of patients with fractures around the shoulder, including the effectiveness of operative and non-operative management and their effect on work capacity and quality of life in productive-age patients.

ACKNOWLEDGEMENTS

The authors would like to thank Prof. Dr. I.G.N.G. Ngoerah General Hospital for the permission and support given in collecting the research data. The authors also thank Dr. dr. Made Bramantya Karna, Sp.OT Subsp. T.L.B.M(K), as the supervisor, and all medical and administrative staff in the Emergency Department who provided valuable information and assistance. The authors also thank colleagues and others who contributed and gave input in the preparation of this manuscript.

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