JMU
Jurnal Medika Udayana

ISSN: 2597-8012 JURNAL MEDIKA UDAYANA, VOL. 15 NO.3, MARET, 2026

Received: 2026-01-24 Revision: 2026-01-30 Accepted: 30-02-2026

DEMOGRAPHIC ANALYSIS OF ELBOW FRACTURE PATIENTS AT RSUP PROF. DR. I.G.N.G. NGOERAH

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ABSTRACT

Background: Fractures around the elbow are common musculoskeletal injuries seen in emergency departments, particularly due to both direct and indirect trauma mechanisms to the upper extremity. The elbow joint's complex anatomy, involving the humeroulnar, humeroradial, and proximal radioulnar articulations, makes these fractures prone to functional impairment if not managed appropriately.
Method: This retrospective descriptive study analyzes elbow fracture cases at RSUP Prof. Dr. I.G.N.G. Ngoerah between November 2024 and October 2025. The study focuses on patient demographics, fracture types (open/closed), causes, and management strategies.
Results: A total of 51 patient records were included, with the majority being male (51%) and within the 15-64 age range (84.3%). Most fractures were closed (86.3%), with open fractures occurring in 13.7%. The most frequent causes were unknown (88.2%), followed by traffic accidents (11.8%). Common fracture locations included olecranon, intercondylar humerus, and radial head. Most patients (80.4%) received open reduction internal fixation (ORIF) using plate and screw. The findings highlight the importance of timely, accurate trauma management, particularly for fractures requiring surgical intervention.
Conclusion: The study underscores the need for standardized protocols in emergency departments to improve outcomes for patients with elbow fractures. Further research is suggested to assess long-term functional outcomes and refine treatment strategies.

Keywords : Elbow Fracture, Emergency Department, ORIF, Trauma, Fracture Classification, Surgical Management.

1. INTRODUCTION

Fractures around the elbow are one of the most common musculoskeletal injuries encountered in Emergency Departments (ED), particularly due to both direct and indirect trauma mechanisms to the upper extremity.[1,2] The elbow joint has a complex anatomical structure consisting of the humeroulnar, humeroradial, and proximal radioulnar articulations, making injuries in this area prone to significant functional impairments if not handled quickly and properly. Generally, fractures around the elbow include olecranon fractures, radial head fractures, supracondylar humerus fractures, and intercondylar humerus fractures.[1,2] These four locations have different biomechanical characteristics and stability patterns, which influence treatment choices in the ED as well as the definitive care phase.[1,3]

In the ED, the most common causes of fractures around the elbow are traffic accidents (TAs) and falls, especially in the productive age group.[2,4] High-energy trauma such as TAs more frequently causes unstable or open fractures, while low-energy trauma in non-productive age groups may cause fractures due to bone weakness, such as osteoporosis.[4,5,6] However, it is not uncommon to encounter cases with unclear or unconfirmed causes, especially in elderly patients or cases that arrive without witnesses.[4]

The incidence of elbow fractures shows variation based on gender and age groups. Males aged 15–64 years are more likely to experience fractures due to high-energy trauma such as traffic accidents and work-related injuries.[2,4,7] On the other hand, the group under 15 years old often experiences supracondylar humerus fractures due to falls while playing.[2,8-12] Meanwhile, patients over 64 years old are more susceptible to radial head or olecranon fractures due to changes in bone density.[4,5,7] The division of age groups into non-productive (<15 years), productive (15–64 years), and >64 years (non-productive) is important in orthopaedic epidemiology because it is directly related to injury patterns and patient functional needs.[2,4,7]

From a morphological perspective, fractures around the elbow can be categorized into closed fractures and open fractures. Open fractures require emergency management, including debridement, stabilization, and antibiotic prophylaxis to prevent

infection.[13] Meanwhile, closed fractures focus more on initial stabilization, as well as assessing deformities and vascular status.[1,8] Elbow stability is highly influenced by the complexity of the fragments and the involvement of the articular surface, so initial assessment in the ED plays a significant role in determining treatment priorities.[1,3]

The choice of operative intervention for fractures around the elbow is highly varied and tailored to the type and pattern of the fracture. Common techniques include open reduction internal fixation (ORIF) with miniplate, plate-and-screw (PS), and tension band wiring (TBW), particularly for non-comminuted olecranon fractures.[1,3,4,8] Intra-articular fractures such as intercondylar humerus fractures or certain radial head fractures often require ORIF as the primary choice to restore joint stability and function.[3,5,6] Meanwhile, some non-displaced fractures can be managed conservatively, but unstable fractures generally require internal fixation to prevent elbow stiffness and long-term dysfunction.[3,5,6,8]

In Indonesia, epidemiological data on fractures around the elbow in emergency services is still limited, especially in national referral hospitals. RSUP Prof. dr. I.G.N.G. Ngoerah, as a tertiary service center, receives various trauma cases from Bali and Eastern Indonesia, making patient characteristic analysis in this ED very important to improve triage quality, initial treatment efficiency, and planning of orthopaedic resource needs.

Based on this background, this study aims to describe the characteristics of patients with fractures around the elbow at RSUP Prof. dr. I.G.N.G. Ngoerah, including variables such as gender, causes of fractures, type of fracture (open/closed), age groups, treatments provided, and fracture locations. The results are expected to serve as a foundation for developing more standardized acute care protocols and help improve the functional outcomes of patients through timely management tailored to clinical needs.

MATERIALS AND METHODS

The research article titled "Description of Elbow Fracture Patients at RSUP Prof. Dr. I.G.N.G. Ngoerah" is an observational study, specifically a retrospective descriptive study using secondary data obtained from RSUP Prof. Dr. I.G.N.G. Ngoerah in Denpasar, covering the period from November 1, 2024, to October 31, 2025. This design was chosen because it can be used to examine the distribution of disease occurrences or health problems based on characteristics. Case data were obtained retrospectively from patient medical records at RSUP Prof. Dr. I.G.N.G. Ngoerah in Denpasar for the period from November 1, 2024, to October 31, 2025, and then processed using SPSS with descriptive analysis (distributive). This study recorded characteristic data including age, gender, causes of fracture, type of fracture, fracture location, and the treatments provided. The sampling method used in this study was total sampling. In this study, all orthopedic patient medical records that came to the ER at RSUP Prof. Dr. I.G.N.G. Ngoerah, which met the inclusion criteria (eligible) and did not have any exclusion criteria, were included in the study, resulting in 51 samples. The patient characteristic data were analyzed using a univariate approach. The univariate analysis aims to describe the distribution of the samples being studied, with a focus on variables such as age, gender, type of fracture, and the management performed. The univariate analysis was carried out using the SPSS application.

RESULTS

Descriptive Analysis of Respondent Characteristics

Table 1. Descriptive Analysis of Elbow Fracture Patient Characteristics at RSUP Prof. Dr. I.G.N.G. Ngoerah

Characteristics	Frequency(n)	Percentage (%)
Age (years)		
<15	1	2,0
15-64	43	84,3
>64	7	13,7
Gender		
Male	26	51,0
Female	25	49,0
Type of Fracture		
Close Fracture	44	86,3
Open Fracture	7	13,7
Cause of Fracture		
Accident	6	11,8
Unknown	45	88,2
Location of Fracture		
Radial Head + Olecranon	9	17,6
Radial Head + Proximal	8	15,7
Intercondylar Humerus	12	23,5
Supracondylar Humerus	4	7,8
Olecranon	11	21,6
Proximal Radius	1	2,0
Distal Humerus	5	9,8
Head Radius	1	2,0
Procedure Done		
ORIF Miniplate + ORIF	6	11,8
ORIF TBW	2	3,9
ORIF Pinning	1	2,0
ORIF CCW	1	2,0
ORIF PS	41	80,4

Based on Table 1, the age distribution of elbow fracture patients at RSUP Prof. Dr. I.G.N.G. Ngoerah shows that the productive age group (15–64 years) is the most dominant, with 43 patients (84.3%). The age group over 64 years is next, with 7 patients (13.7%), while the group under 15 years old has the fewest patients, with 1 patient (2.0%). This finding indicates that most elbow fractures occur in individuals of productive age who

are generally more physically active, making them more prone to trauma, especially due to accidents and work-related activities.

The distribution based on gender shows a relatively balanced percentage between males and females. There were 26 male patients (51.0%) and 25 female patients (49.0%), indicating that the incidence of elbow fractures is almost the same between both genders, although slightly higher in males, which is likely related to exposure to physical activity or certain work-related risks.

Looking at the type of fractures, the majority of patients experienced closed fractures, with 44 patients (86.3%), while open fractures were found in 7 patients (13.7%). The predominance of closed fractures indicates that most injuries did not involve open wounds or severe soft tissue damage, although open fractures remain serious injuries that require emergency management.

Based on the cause of the fractures, most cases were caused by an unknown mechanism, with 45 patients (88.2%), while cases confirmed to be due to traffic accidents (TAs) amounted to 6 patients (11.8%). The high number of cases with unknown causes may be related to patients arriving without complete information or limited documentation during initial management in the ED.

Looking at fracture locations, the most common type of fracture found was olecranon fracture, with 11 patients (21.6%), followed by intercondylar humerus fractures with 12 patients (23.5%) and a combination of radial head + olecranon fractures with 9 patients (17.6%). Other fracture locations included radial head + proximal ulna fractures (15.7%), supracondylar humerus fractures (7.8%), distal humerus fractures (9.8%), proximal radius fractures (2.0%), and isolated radial head fractures (2.0%). This distribution shows that injuries in the elbow joint are quite varied, with intra-articular fractures like intercondylar humerus being among the most common.

Based on the operative treatments provided, the majority of patients underwent ORIF Plate and Screw (PS), with 41 patients (80.4%), making it the most commonly used fixation technique for fractures around the elbow. Other procedures included the combination of ORIF Miniplate + ORIF PS for 6 patients (11.8%), tension band wiring (TBW) for 2 patients (3.9%), ORIF pinning (2.0%), and ORIF CCW (2.0%). The predominance of ORIF PS indicates that most fractures require strong stabilization to restore elbow function and prevent joint stiffness.

DISCUSSION

Fractures around the elbow are one of the most challenging upper extremity injuries in orthopaedic practice due to the complex anatomy of the elbow and its critical role in the function of the upper extremity. The elbow is a ginglymoid joint, involving three articulations: humeroulnar, humeroradial, and proximal radioulnar, which work harmoniously in flexion-extension as well as pronation-supination. The stability of the joint heavily relies on the integrity of the distal humerus, proximal ulna, radial head, and the collateral ligament complex. Therefore, fractures in the elbow region are generally intra-articular and carry a high risk of causing instability and long-term functional impairment.[14] Optimal management requires careful initial evaluation, adequate stabilization, and early mobilization to prevent complications such as joint stiffness, which is the most common complication in elbow fractures.[15] ,[16]

In this study, the age distribution shows that the productive age group (15–64 years) is the most dominant in the cases, accounting for 84.3% of the total patients. The dominance of the productive age group can be understood as this age range represents the group with the highest activity level, both in work, transportation mobility, and physical activity. Exposure to high-energy trauma, especially traffic accidents and other mechanical trauma, is higher in this group. The literature reports that high-energy trauma is the leading cause of elbow fractures in adults, particularly in distal intercondylar humerus trauma and olecranon fractures, which often require operative management.[4] ,[15] This is relevant to the findings of this study, where the majority of patients in the productive age group required surgical intervention using the ORIF technique.[15] ,[17]

On the other hand, the elderly group (>64 years) accounts for only 13.7% of the total cases. Although the number is smaller, injuries in the geriatric population have significant clinical implications. Most elbow fractures in the elderly occur due to low-energy trauma mechanisms, such as falling with a hand impact, which is exacerbated by conditions like osteoporosis, sarcopenia, and reduced protective reflexes.[4] ,[18] In this population, poor bone quality often complicates internal fixation procedures, so the operative technique must be adjusted to ensure sufficient stability to allow early mobilization without increasing the risk of fixation failure.[4] ,[15]

The distribution based on gender in this study shows a nearly balanced pattern, with 51.0% males and 49.0% females. This data indicates that elbow fractures are not injuries dominated by a particular gender. In the productive age group, males are slightly more exposed to risky activities and jobs that involve heavy equipment or high mobility. Meanwhile, in elderly females, fractures are often associated with decreased bone density, which increases the risk of injury even with minimal trauma. This aligns with the global epidemiological pattern of elbow fractures.[4] ,[7] ,[19]

Looking at the type of fractures, the majority of cases were closed fractures (86.3%), while open fractures accounted for only 13.7%. The predominance of closed fractures indicates that severe soft tissue injuries were not the majority in this population. However, open fractures in the elbow area are considered an orthopaedic emergency due to the risk of infection, joint contamination, and soft tissue damage, which often require aggressive cleaning (irrigation and debridement) along with stable fixation. The principles for managing open fractures still follow the orthopaedic trauma guidelines, with the administration of initial antibiotics and comprehensive neurovascular evaluation.[13]

In this study, the cause of fractures was dominated by the "unknown" category (88.2%), while cases due to traffic accidents (TAs) made up only 11.8%. The high number of unknown causes is likely due to incomplete documentation of the patient's history during the emergency phase, especially when patients arrive in severe pain, altered consciousness, or when the medical team's priority is focused more on hemodynamic stabilization. However, according to the literature, traffic accidents remain the presumed dominant cause of elbow fractures in the productive age group.[4] ,[15] Therefore, the findings of this study more reflect limitations in medical record documentation rather than differences in epidemiological patterns.

In terms of fracture locations, the recorded injuries include olecranon fractures, radial head fractures, intercondylar humerus fractures, and supracondylar humerus fractures. The variation in these locations reflects the spectrum of injuries commonly occurring in the elbow, each with its own biomechanical characteristics. Olecranon fractures, for example, often result from a direct mechanism such as impact on the proximal ulna or an indirect mechanism from sudden contraction of the triceps muscle.[4] ,[20] Distal intercondylar humerus fractures are complex intra-articular injuries that often require dual plate fixation to achieve anatomical stability and allow early mobilization.[15] ,[17] Meanwhile, supracondylar humerus fractures are more common in the pediatric population, but they can still occur in adults, particularly due to fall-related trauma with a flexed elbow.[8] ,[9]

From the operative aspect, this study shows that ORIF Plate and Screw (PS) is the most commonly used technique (80.4%). ORIF PS is the primary choice for intra-articular elbow fractures requiring rigid stability to allow early rehabilitation and minimize the risk of joint stiffness.[15] ,[17] Other techniques, such as TBW (tension band wiring), miniplate, pinning, and cable cerclage wiring (CCW), are used selectively according to the characteristics of the fracture. TBW, for example, is ideal for simple non-comminuted olecranon fractures.[4] The selection of fixation methods also considers bone quality, the expected level of stability, and the need for postoperative mobilization.[15] ,[17]

There are several limitations in this study. The retrospective nature of the research heavily relies on the completeness of patient medical records. Additionally, this study did not include an evaluation of the long-term clinical outcomes of the patients.

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study shows that elbow fracture cases in the ER at RSUP Prof. Dr. I.G.N.G. Ngoerah predominantly occur in the productive age group (15–64 years), accounting for 84.3%. The dominance of this age group reflects high physical activity, exposure to injury risks, and involvement in driving activities or occupations that have trauma risks. Based on gender, the distribution of patients is relatively balanced between males and females, with a slight male predominance (51.0%), consistent with the epidemiological pattern of musculoskeletal injuries in the productive age group.

The majority of cases were closed fractures (86.3%), indicating that most injuries arriving at the ER were not accompanied by severe soft tissue damage causing open wounds. The most common cause of fractures fell under the "unknown" category (88.2%), likely reflecting limitations in documentation during the emergency phase, although traffic accidents still appear to be a significant injury mechanism.

Based on fracture locations, intercondylar humerus fractures, olecranon fractures, and a combination of radial head fractures emerged as the most dominant injury patterns. These findings reflect the common intra-articular elbow injuries resulting from both direct and indirect trauma. In terms of management, surgery with ORIF using plate and screw (PS) was the most frequently performed procedure (80.4%), underscoring that most elbow fractures arriving at the ER require internal stabilization to achieve anatomical restoration and allow for early mobilization.

Overall, the findings of this study emphasize the importance of emergency facility preparedness, the availability of trained orthopaedic staff, and standardized elbow fracture management protocols to prevent long-term complications, such as joint stiffness and upper extremity dysfunction.

Recommendations

There is a need to optimize human resources, equipment, and service workflows in the Emergency Department, particularly during times of high patient volume, so that the handling of elbow fracture cases can be done efficiently and promptly. Increasing the competence of medical personnel, especially in applying Advanced Trauma Life Support (ATLS) principles and the early management of musculoskeletal injuries, is crucial to maintaining the quality of orthopaedic emergency services. Further research is needed to assess the long-term functional outcomes of elbow fracture patients, including evaluating the effectiveness of both operative and non-operative treatments, and their impact on work ability and the quality of life of patients in the productive age group.

ACKNOWLEDGEMNTS

The authors would like to express their sincere gratitude to RSUP Prof. Dr. I.G.N.G. Ngoerah for their permission and support in the data collection for this research. We would also like to thank Dr. Dr. Made Bramantya Karna, Sp.O.T. Subsp. T.L.B.M(K), as our supervisor, as well as all the medical and administrative staff at the Emergency Department for their invaluable information and assistance. Additionally, we would like to thank our colleagues and others who contributed their insights and feedback in the preparation of this paper. Without the support and cooperation of all parties, this research would not have been successfully carried out.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

FUNDING

The preparation of this research was self-funded.

ETHICAL APPROVAL

Ethical approval was not required for this secondary data analysis, as all data were obtained from previously published research that had already undergone ethical approval.

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