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ORIGINAL RESEARCH

An observational cross-sectional study to evaluate the epidemiology of associated injuries with distal end radius fractures

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ABSTRACT

Background: Distal end radius fractures (DERFs) are among the most common orthopaedic injuries, particularly in elderly individuals and young adults involved in high-energy trauma. **Material and Methods:** This study aims to analyse the epidemiology of associated injuries occurring concurrently with DERFs in a sample size of 300 patients. The findings highlight the incidence, risk factors, and patterns of associated injuries, contributing to improved diagnosis and management strategies. **Results:** The study was conducted in Karwar institute of medical sciences, Karwar, over two years, including both male and female patients aged 18-85 years. A structured assessment was performed, and associated injuries were classified based on anatomical location and severity. The prevalence of associated injuries was 37.3%, with ulnar styloid fractures (22.6%), scaphoid fractures (6.6%), ligamentous injuries (4%), elbow and humeral fractures (2.6%), and shoulder dislocations (1.3%) being the most common.**Conclusion:** The study concludes that associated injuries significantly impact patient outcomes and should be carefully assessed for comprehensive treatment planning.

Key words: Distal end radius fractures (DERFs), epidemiology, associated injuries, ulnar styloid fractures, scaphoid fractures, ligamentous injuries, elbow fractures, humeral fractures, shoulder dislocations, mechanism of injury

INTRODUCTION

About 15-20% of all fractures are distal end radius fractures (DERFs), making them one of the most common fractures seen in orthopaedic practice. Colles A *et al.*[1]. These fractures are caused by a variety of processes, with high-energy trauma, such as car crashes and sports injuries, being prevalent in younger people and low-energy falls being the main cause in older persons. Townsley SH *et al.*[2].The necessity for thorough epidemiological research to assess related injuries and enhance care approaches is highlighted by the rising incidence of DERFs, especially in older populations. Court-Brown CM *et al.*[3].

Even though DERFs are common, related injuries are usually disregarded, which results in less than ideal treatment results and a longer recovery time. According to studies, extra fractures or soft tissue injuries occur in around 30-40% of DERF cases, which can have a major effect on prognosis and functional recovery. Vaghela KR *et al.*[4]. Ligamentous disruptions, carpal bone fractures, ulnar styloid fractures, and proximal traumas extending to the elbow and shoulder are often linked injuries. Nellans KW *et al.*[5].

It is important to evaluate these injuries because, if neglected, they may lead to instability, persistent discomfort, and decreased wrist function. Tang JB *et al.*[6]. The need for a comprehensive and methodical assessment of all possible concurrent injuries is further highlighted by the fact that neglecting to identify and appropriately treat these related injuries can lead to long-term issues like post-traumatic arthritis, loss of wrist motion, and ongoing functional impairment.

Customising therapy strategies to maximise patient outcomes requires early detection of related injuries. Although plain radiography is still the most common diagnostic method, it is not always effective in identifying concealed and ligamentous fractures. The development of sophisticated imaging techniques like MRI and CT scans has greatly improved diagnostic accuracy by making it possible to see intricate fracture patterns and soft tissue injuries more clearly. Lopez-Jaramillo P *et al.*[7]. However, there are still gaps in the

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literature about the epidemiology, categorisation, and clinical consequences of related injuries, even though their significance is becoming more well recognised.
The purpose of this study is to examine the incidence, distribution, and consequences of these related injuries in a group of 300 DERF patients. We want to support evidence-based practices that increase diagnostic precision, direct sensible therapy choices, and ultimately improve patient outcomes by analysing the trends of related injuries. Gaining a better knowledge of these injuries can help create all-encompassing treatment plans, lower complications, and encourage functional recovery for those who are impacted.

MATERIALS AND METHODS

SOURCE OF DATA

Data were collected from the hospital's electronic medical records, radiographic databases, and clinical case files. Information was derived from patient histories, physical examinations, and imaging studies performed at the KRIMS, Karwar.

STUDY DESIGN

This is an observational, cross-sectional study designed to evaluate the epidemiology of associated injuries in patients with distal end radius fractures (DERFs). The study was conducted prospectively to ensure systematic data collection and consistency in the assessment of each case.

STUDY LOCATION

The research was carried out at the KRIMS, Karwar, which serves as a regional referral centre for trauma and orthopedic injuries. The hospital's comprehensive diagnostic and treatment facilities allowed for a detailed evaluation of both primary fractures and any concomitant injuries.

STUDY DURATION

The study was conducted over a period of two years from January 2023 to December 2024. Patients were enrolled consecutively during this 24-month period to ensure a representative sample of cases presenting with DERFs.

SAMPLE SIZE

A total of 300 patients were included in the study. This sample size was determined based on prior estimates of the incidence of associated injuries in DERFs and was deemed sufficient to achieve statistical power for detecting significant correlations between clinical variables.

INCLUSION CRITERIA

- Patients aged between 18 and 85 years.
- Radiographically confirmed diagnosis of a distal end radius fracture (DERF).
- Patients presenting within the study duration at the KRIMS, Karwar.
- Availability of complete clinical and radiographic records for analysis.

EXCLUSION CRITERIA

- Patients with a prior history of wrist or distal radius fractures, which could confound the assessment of associated injuries.
- Individuals with pathological fractures resulting from neoplasms, metabolic bone diseases, or other systemic conditions.
- Cases with incomplete clinical data or inadequate radiographic imaging that precluded proper evaluation of associated injuries.

PROCEDURE AND METHODOLOGY: Upon presentation, all patients underwent a thorough clinical evaluation including a detailed history and physical examination. Standard radiographic imaging was used to confirm the diagnosis of DERF. In cases where additional injuries were suspected, advanced imaging modalities such as CT scans or MRIs were employed for further evaluation.
Data regarding demographic characteristics, the mechanism of injury, and the presence and type of associated injuries (e.g., ulnar styloid fractures, scaphoid fractures, ligamentous injuries, elbow and humeral fractures, shoulder dislocations) were recorded using a structured data collection form. Each case was reviewed independently by at least two clinicians to ensure the reliability of injury classification and severity assessment.

STATISTICAL METHODS: Clinical and demographic data were summarised using descriptive statistics. Frequencies and percentages were used to display categorical characteristics, such as the distribution of genders and the kinds of related injuries. Means and standard deviations were used to summarise continuous data, such age. Chi-square tests were used for inferential analysis to look at relationships between categorical variables (e.g., the mechanism of injury and the occurrence of concomitant injuries). Where appropriate, t-tests were employed to compare continuous variables between groups. A statistically significant p-value was defined as less than 0.05.

DATA COLLECTION: Trained research staff used pre-made data collecting forms to gather data in a methodical manner. Comprehensive data, such as patient demographics, damage causes, radiological and clinical results, and specifics of the treatment strategy, were included in the forms. For further study, all gathered data was input into a safe, electronic database.

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RESULTS

Table 1: Demographic Distribution of Patients

Parameter	Number of Cases	Percentage (%)
Male	180	60.0
Female	120	40.0
Age < 40 years	110	36.7
Age ≥ 40 years	190	63.3

The demographic distribution of patients with distal end radius fractures (DERFs) in this study highlights a predominance of male patients, accounting for 60% (n=180) of the total cases, while females comprised 40% (n=120). This aligns with the general trend observed in trauma-related fractures, where males are more frequently affected due to higher exposure to occupational and high-risk activities. Age-wise, the majority of cases (63.3%, n=190) were observed in individuals aged 40 years and above, which correlates with age-related bone density loss and increased susceptibility to fragility fractures, particularly in postmenopausal women. Conversely, younger patients under 40 years constituted 36.7% (n=110) of the study population, with injuries more commonly associated with high-energy trauma, such as sports activities or vehicular accidents. These findings reinforce the need for targeted prevention strategies in both high-risk younger populations and older individuals prone to osteoporotic fractures.

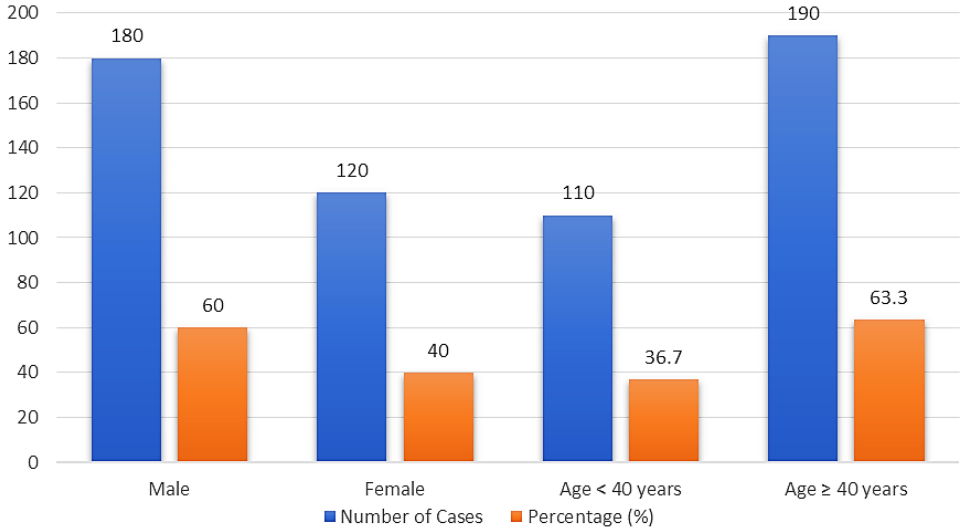

Figure 1

Table 2: Mechanisms of Injury

Mechanism of Injury	Number of Cases	Percentage (%)
Fall from height	140	46.7
Road traffic accident	100	33.3
Sports injury	30	10.0
Others	30	10.0

The mechanisms of injury leading to distal end radius fractures (DERFs) in this study indicate that falls from height were the most common cause, accounting for 46.7% (n=140) of cases. This highlights the significant role of low-energy falls, particularly among older individuals with osteoporosis, as well as high-impact falls in younger individuals. Road traffic accidents (RTAs) were the second most frequent cause, contributing to 33.3% (n=100) of cases, reflecting the high incidence of trauma-related fractures in motor vehicle collisions. Sports-related injuries accounted for 10% (n=30) of cases, predominantly affecting younger, active individuals involved in contact sports or high-impact activities. The remaining 10% (n=30) of cases were categorized under "others," which included workplace injuries and accidental falls unrelated to height. These findings emphasize the importance of fall prevention strategies in elderly populations and the need for safety measures in road traffic and sports activities to reduce the risk of DERFs.

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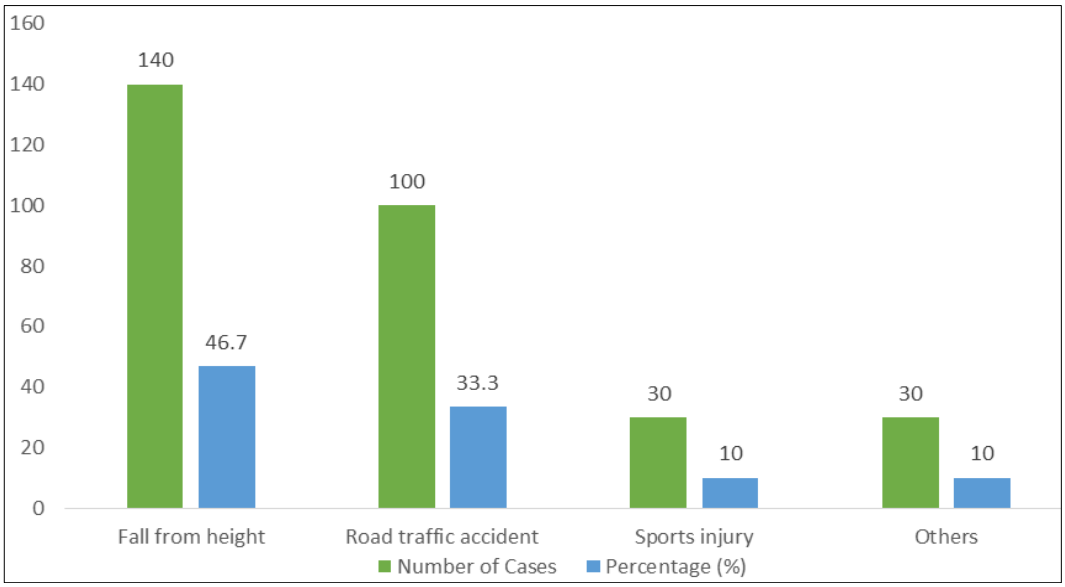

Figure 2

Table 3: Associated Injury Types

Associated Injury Type	Number of Cases	Percentage (%)
Ulnar Styloid Fractures	68	22.6
Scaphoid Fractures	20	6.6
Ligamentous Injuries	12	4.0
Elbow & Humeral Fractures	8	2.6
Shoulder Dislocations	4	1.3

The distribution of associated injuries in patients with distal end radius fractures (DERFs) reveals that ulnar styloid fractures were the most frequently observed, accounting for 22.6% (n=68) of cases. This high incidence is expected, as the ulnar styloid often sustains injury due to its close anatomical relationship with the distal radius and its involvement in wrist stability. Scaphoid fractures were the second most common, occurring in 6.6% (n=20) of cases, which is clinically significant as undiagnosed scaphoid fractures can lead to complications such as avascular necrosis and non-union. Ligamentous injuries were noted in 4% (n=12) of cases, highlighting the need for advanced imaging in patients presenting with persistent wrist instability post-fracture. Elbow and humeral fractures were observed in 2.6% (n=8) of cases, suggesting the transmission of force proximally along the upper limb in high-energy trauma. Shoulder dislocations, though rare, were present in 1.3% (n=4) of cases, indicating severe impact injuries requiring comprehensive evaluation. These findings underscore the importance of systematically assessing for associated injuries in DERF cases to ensure proper management and prevent long-term complications.

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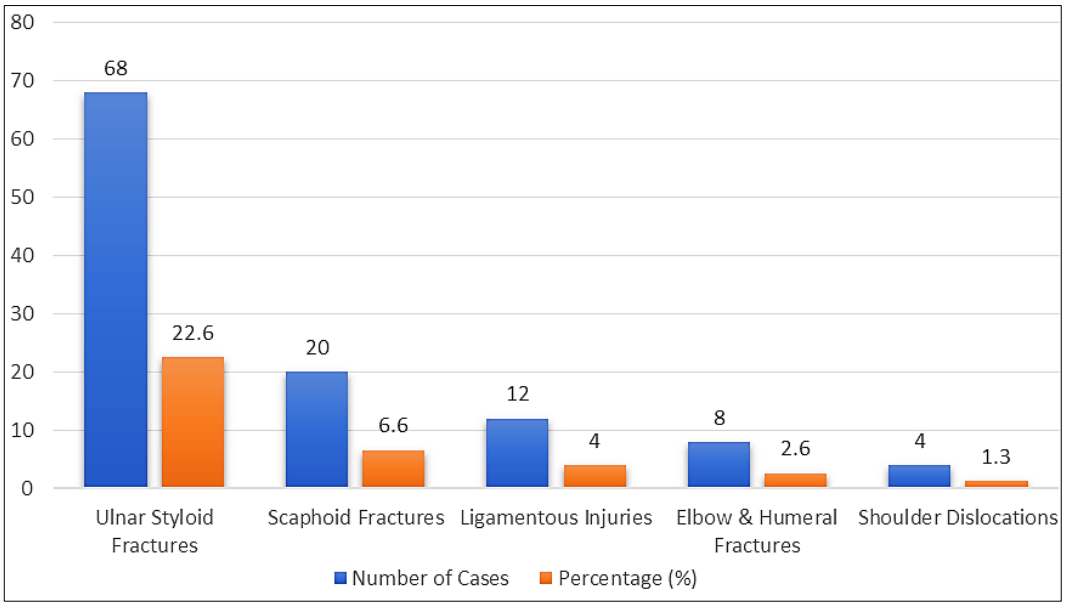

Figure 3

DISCUSSION

Associated injuries significantly impact the prognosis of DERFs. The high incidence of ulnar styloid fractures aligns with previous studies, Vaghela KR *et al.*[4], emphasizing the need for simultaneous management. Ligamentous injuries, though underdiagnosed, can result in chronic instability and warrant MRI evaluation. The study also underscores that younger males involved in high-energy trauma exhibit a greater likelihood of additional injuries, corroborating prior epidemiological trends. Townsley SH *et al.*[2]Scaphoid fractures, observed in 6.6% of cases, are often difficult to detect on initial radiographs but play a critical role in wrist function and stability. Misdiagnosis or delayed management can result in avascular necrosis and long-term functional impairment. Lopez-Jaramillo P *et al.*[7] similarly, ligamentous injuries, although detected in only 4% of cases, are frequently associated with chronic wrist pain and instability, necessitating further imaging and specialized interventions. Mulders MA *et al.*[8] Furthermore, our findings suggest that elbow and humeral fractures and shoulder dislocations, though less frequent, may indicate more severe high-energy trauma. Prior studies have reported similar observations, suggesting that proximal extension of fractures warrants a broader clinical assessment to rule out occult soft tissue damage. Bachoura A *et al.*[9].

Additionally, although less common, our results imply that shoulder dislocations and elbow and humeral fractures could be signs of more serious high-energy trauma. Similar findings from earlier research indicate that proximal extension of fractures calls for a more thorough clinical evaluation in order to rule out hidden soft tissue injury. Concomitant injuries further emphasise the necessity of customised treatment plans that appropriately address both soft tissue and bone components. Goth AP *et al.* [10]Optimising functional outcomes requires rehabilitation, especially when soft tissue and ligamentous injuries are involved. In order to regain stability and function, patients with several related injuries can need a multidisciplinary approach that includes physical therapy, occupational therapy, and, in certain situations, surgery. In order to evaluate the efficacy of various treatment methods and their influence on patient-reported outcomes, such as pain, range of motion, and general quality of life, future research should concentrate on long-term follow-up. Dean E *et al.*[11]Clinicians can enhance early identification and intervention techniques by determining risk factors and patterns of related injuries. In the end, a more proactive strategy to monitoring and screening these injuries can help to improve patient recovery and lower problems in DERFs.

CONCLUSION

This study highlights the importance of recognizing associated injuries in patients with DERFs. A systematic assessment, including radiographic and clinical evaluation, is essential for optimizing treatment outcomes. Further research with larger cohorts is warranted to refine management protocols and rehabilitation strategies.

LIMITATIONS OF THE STUDY

1) **SINGLE-CENTRESTUDY WITH LIMITED GENERALIZABILITY:** The study was conducted at a single tertiary care hospital, which may limit the generalizability of the findings. Since the patient population and the clinical practices at this centre might not reflect those in other regions or healthcare settings, the results may not be universally applicable. Differences in demographics, referral patterns, and resource availability in other institutions could influence

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the incidence and management of associated injuries in distal end radius fractures.

2) **LACK OF LONG-TERM FOLLOW-UP DATA ON FUNCTIONAL OUTCOMES:** This study primarily focused on the epidemiology of associated injuries at the time of initial presentation and diagnosis. The absence of extended follow-up limits the ability to assess long-term functional outcomes, including chronic pain, wrist instability, or the development of post-traumatic arthritis. Without prolonged observation, it is challenging to fully understand the long-term impact of the associated injuries and the effectiveness of the treatment protocols implemented.
3) **POTENTIAL UNDERESTIMATION OF SOFT TISSUE INJURIES DUE TO RELIANCE ON RADIOGRAPHIC FINDINGS:**The study relied predominantly on radiographic imaging for the detection and classification of injuries. Although radiographs are effective for identifying bony injuries, they have limitations in accurately visualizing soft tissue structures. Consequently, ligamentous injuries or other soft tissue damages might have been underdiagnosed. The use of advanced imaging modalities such as MRI or CT scans, which are more sensitive for detecting soft tissue injuries, was limited, potentially leading to an underestimation of the true prevalence of these injuries in patients with distal end radius fractures.

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