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# A Study on Functional and Radiological Assessment of Distal End Radius Fractures Treated with Percutaneous Pinning

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**Abstract:** ***Introduction: Distal end radius fractures are a prevalent orthopedic injury, particularly in the elderly population. Percutaneous K-wire fixation is a minimally invasive technique used to stabilize these fractures, offering benefits such as reduced soft tissue damage and faster recovery. This study aims to evaluate the functional and radiological outcomes of distal end radius fractures treated with percutaneous K-wire fixation. Objectives: The primary objective is to assess the functional recovery of patients using the Quick Disabilities of the Arm, Shoulder, and Hand (QuickDASH) score. The secondary objective is to evaluate the radiological outcomes using the Sarmiento assessment score. Methods: This prospective study included 50 patients with distal end radius fractures treated with percutaneous K-wire fixation. Functional outcomes were assessed using the QuickDASH score at 6 weeks, 3 months, and 6 months post-surgery. Radiological outcomes were evaluated using the Sarmiento assessment score at each follow-up visit. Statistical analysis was performed to compare pre- and post-treatment outcomes. Results: The mean QuickDASH score improved significantly indicating substantial functional recovery. Radiological assessment using the Sarmiento score revealed 80% excellent, 6% good, and 14% fair outcomes, with no poor outcomes recorded. Complications included pin tract infections in 5% of patients, which were managed with antibiotics. Conclusion: Percutaneous K-wire fixation is an effective method for treating distal end radius fractures, providing excellent functional recovery and satisfactory radiological outcomes. This technique offers a reliable option with minimal complications for managing these common fractures, particularly in resource-constrained settings.***

**Keywords:** Distal end radius fractures; percutaneous K-wire fixation; functional assessment; radiological assessment; QuickDASH score; Sarmiento assessment score; orthopedic surgery; minimally invasive technique; fracture management; patient outcomes.

## 1. Introduction

**Background of the Study:**
Distal radius fractures are the most prevalent emergency, with a frequency of over 640,000 in developed nations and accounting for about 3% of all upper extremity injuries. These accidents are bimodal, affecting the majority of the male population due to athletic and high-energy injuries, and their frequency is increasing between the ages of five and 24. There is a second surge in the elderly, mostly female population, owing to decreased energy or "scarcity" fractures. Osteoporosis is a leading cause of fractures in the elderly, and improved care can reduce the occurrence of such fractures [1, 2.] Distal radius fractures are the most prevalent orthopedic injury, accounting for 16-20% of all fractures encountered in the ER [3]

**Need of Study:**
The treatment of distal radius fractures has evolved considerably in recent years as a result of improved understanding of pathophysiology, injury mechanisms, and the development of new implants. The objective of distal radius fracture treatment is to restore the anatomy of the wrist, allowing for early painless mobility. Various treatment modalities have been used, including closed reduction and cast immobilization, percutaneous pin fixing, external fixator, and volar locking plate, either alone or in combination [4.] Closed reduction and percutaneous Kirschner wire (K-wire) fixation with plaster immobilization is a typical method of treating distal radius fractures [5].

**Statement of Problem:**
For treatment, some surgeons recommend manipulation and plaster immobilization. Malunion of the distal radius, on the other hand, may cause pain, mid-carpal dysfunction, and post-traumatic arthritis [6]. There is still some dispute about how to handle significantly displaced and dysfunctional distal radius fractures in older individuals, although conservative therapy for fractures that are little displaced and stable usually leads to good outcomes [7]. Poor functional results are common in patients with severe radial shortening [8]. Hence, in order to enhance surgical results and maximize patient care, a thorough assessment of the efficacy and risks of different treatment options for distal radius fractures is required [9.]

**Aim:**
- To assess the Functional & Radiological outcome of percutaneous pinning in fractures of distal end radius.

**Objectives:**
- To assess Functional outcome in fractures of distal end radius treated with percutaneous pinning by QUICK DASH Score
- To assess Radiological outcome by Sarmiento Assessment Score.

## 2. Methodology / Materials & Method

**Study/ Research Design**

- Study Area: Department of Orthopaedics, Saraswathi Institute of Medical Science, Hapur.
- Study intervention: Prospective study conducted on patients attending SIMS hospital outpatient/ inpatient/ emergency department after informed and written consent in a language they understood (English/Hindi).
- Study duration: August 2022 to July 2024.
- Study design: Prospective study.
- Sample size: 50.

**Sample Selection:**

**Inclusion Criterion:**

- Age 15 to 65 years.
- Fractures less than two weeks old.

**Exclusion Criterion:**

- Patient with pathological fractures.
- Open fractures.
- Fracture with neuro-vascular injury.
- Ipsilateral fracture of shoulder and elbow.

**Sampling including Sample Size Calculation**

**Sample Size Calculation**

Sample size (N): $N=4pq / d^2$

Where:

- p (prevalence) = 3.1%
- q = 1 – p + 96.9
- d (Margin of error) = 5%
- N (Population size) = 48

So, Sample Size should be 50.

**Study Method/ Tools**

- Clinical examination for visible deformity and swelling over the wrist joint, confirmed with X-Ray wrist (injured side) in AP and lateral view.
- Fractures classified based on radiological classification i.e., Frykman classification.
- Plan for operative procedure after Pre-anaesthetic check-up with investigations: CBC, ESR, CRP, Kidney function test, Liver function test, PT/INR, Chest X-ray, ECG, Random blood sugar.
- Closed reduction under fluoroscopy (C-Arm) image.
- Stabilization using multiple K-Wires.
- Intraoperatively, below elbow volar slab applied for next 4 weeks.
- From 4th week to 8th week, below elbow brace applied after removal of slab for better stability.
- At the end of 6th post-op week, K-wires removed and below elbow brace continued for another 2 weeks.
- Clinic-radiological assessment at immediate post-op, end of 3rd and 6th months.

**Scoring System**

- **Functional:** Quick DASH score (Disability of Arm, Shoulder, and Hand).
- **Radiological**: Sarmiento Assessment score – radiological criteria.

**Validity and Reliability**

- Observer variance will be monitored and minimized to ensure consistency and reliability of the assessments.

**Data collection procedure**

- Data will be collected during follow-up visits to the regular OPD.

**Plan for Data Analysis**

- The collected data was entered in MS EXCEL and will be imported into IBM SPSS vs 25.0. The collected data will be analyzed using appropriate statistical tests, techniques, and tests such as mean ± S.D, graphical representation of data, frequency distribution.

## 3. Results

**1) Distribution of Age among the study participants (N= 50)**

**Table III:** Distribution of Age among the study participants

| AGE (YR) | | |
|---|---|---|
| | N | % |
| 16 - 25 | 2 | 4.0% |
| 26 - 35 | 6 | 12.0% |
| 36 - 45 | 11 | 22.0% |
| 46 - 55 | 14 | 28.0% |
| 56 - 65 | 17 | 34.0% |

Mean = 48.2, Median = 49.5, P-value = 0.03

This has participants averaging 48.12 years old and ranging from 15 to 65 years. The p-value of 0.03 suggests that the distribution of age among participants is statistically significant, indicating a meaningful representation of age variation in treatment outcomes. This demographic insight aids in evaluating treatment effectiveness across various age groups, contributing valuable data to fracture management strategies.

**2) Distribution of gender among study participants (N=50)**

**Table IV:** Distribution of gender among study participants

| SEX | | |
|---|---|---|
| | N | % |
| Female | 31 | 62.0% |
| Male | 19 | 38.0% |

P-value = 0.02

In our study, distal radius fractures, which are more common in females, constituted 62% of cases. Evaluating treatment outcomes with this demographic insight can enhance fracture management approaches, particularly in female patients.

**3) Distribution of side among study participants (N=50)**

**Table V:** Distribution of side among study participants

| SIDE | | |
|---|---|---|
| | N | % |
| Left | 27 | 54.0% |
| Right | 23 | 46.0% |

P-value = 0.18

In our study of the distal radius fractures, 54% occurred in the left hand. The p-value of 0.18 suggests no significant difference between the sides, indicating that fractures are equally likely to occur in either hand.

**4) Distribution of Mechanism of Injury among study participants (N=50)**

**Table VI:** Distribution of Mechanism of Injury among study participants

| Mode of Injury | | |
|---|---|---|
| | N | % |
| Fall (Low Energy Trauma) | 33 | 66.0% |
| RTA (High Energy Trauma) | 17 | 34.0% |

In our study, 66% of distal radius fractures resulted from falls, categorized as low-energy trauma, while the remaining cases were attributed to road traffic accidents, classified as high-energy trauma.

**5) Distribution of Frykmann classification among study participants (N=50).**

**Table VII:** Distribution of Frykmann classification among study participants

| Frykman Classification | | |
|---|---|---|
| Type | N | % |
| I | 28 | 56.0% |
| II | 5 | 10.0% |
| III | 5 | 10.0% |
| IV | 4 | 8.0% |
| V | 5 | 10.0% |
| VI | 3 | 6.0% |

Of the patients in our study, 56% were classified as having type 1 fractures according to the Frykman classification, which represents the simplest form of distal radius fracture.

**6) Distribution of Radial Length in mm among study participants (N=50).**

**Table VIII:** Distribution of Radial Length in mm among study participants

| Radial Length (mm) | | |
|---|---|---|
| mm | N | % |
| 8 | 3 | 6.0% |
| 9 | 12 | 24.0% |
| 10 | 9 | 18.0% |
| 11 | 8 | 16.0% |
| 12 | 9 | 18.0% |
| 13 | 9 | 18.0% |

Mean= 10.7, Median= 10, Mode= 10, P-value = 0.07

Radial length refers to the distance measured between two lines drawn perpendicular to the long axis of the radius on the anteroposterior (AP) projection X-ray. Specifically, it extends from the apex of the radial styloid to the ulnar aspect of the articular surface. The mean radial length observed was 10.7 units, with a standard deviation of 1.5 units.

**7) Distribution of Radial Inclination in degrees among study participants (N=50).**

**Table IX:** Distribution of Radial Inclination in degrees among study participants

| Radial Inclination (degree) | | |
|---|---|---|
| | N | % |
| 20 | 8 | 16.0% |
| 21 | 9 | 18.0% |
| 22 | 7 | 14.0% |
| 23 | 9 | 18.0% |
| 24 | 4 | 8.0% |
| 25 | 6 | 12.0% |
| 26 | 7 | 14.0% |

Mean = 23.04, Median = 23, Mode= 23, P-value = 0.04

Radial inclination refers to the angle formed between the long axis of the radius and a line perpendicular to the long axis of the radius on the lateral X-ray projection. The mean radial inclination observed was 22.7 degrees.

**8) Distribution of Palmer Tilt in degrees among study participants (N=50).**

**Table X:** Distribution of Palmer Tilt in degrees among study participants

| PALMER TILT (degree) | | |
|---|---|---|
| | N | % |
| 9 | 10 | 20.0% |
| 10 | 15 | 30.0% |
| 11 | 8 | 16.0% |
| 12 | 7 | 14.0% |
| 13 | 10 | 20.0% |

Mean= 10.54, Median = 10, Mode = 9, P-value = 0.02

Palmer tilt denotes the angle formed between a line perpendicular to the long axis of the radius and the longitudinal axis of the distal radius on the lateral X-ray projection. The mean Palmer tilt observed was 10.84 degrees with a standard deviation of 1.4 degrees.

**9) Distribution of Palmer Flexion in degrees among study participants (N=50).**

**Table XI:** Distribution of Palmer Flexion in degrees among study participants

| Palmer flexion (Degree) | | |
|---|---|---|
| | N | % |
| <= 35 | 1 | 2.0% |
| 36 - 45 | 2 | 4.0% |
| 56 - 65 | 16 | 32.0% |
| 66 - 75 | 28 | 56.0% |
| 76 - 85 | 3 | 6.0% |

P-value = 0.01

Palmer flexion refers to the degree of flexion or bending of the distal radius in relation to the longitudinal axis of the forearm. In our study, 28 out of 50 participants exhibited Palmer flexion ranging between 66 to 75 degrees postoperatively.

**10) Distribution of Dorsi Flexion in degrees among study participants (N=50).**

**Table XII:** Distribution of Dorsi Flexion in degrees among study participants

| Dorsi flexion (Degree) | | |
|---|---|---|
| | N | % |
| <= 45 | 3 | 6.0% |
| 46 - 55 | 1 | 2.0% |
| 56 - 65 | 15 | 30.0% |
| 66 - 75 | 26 | 52.0% |
| 76 - 85 | 5 | 10.0% |

P-value = 0.04

Dorsi flexion refers to the degree of extension of wrist in relation to the longitudinal axis of the forearm. In our study, 26 out of 50 participants exhibited Dorsi flexion ranging between 66 to 75 degrees postoperatively

**11) Distribution of Supination in degrees among study participants (N=50)**

**Table XIII:** Distribution of Supination in degrees among study participants

| Supination (Degrees) | | |
|---|---|---|
| | N | % |
| <= 55 | 1 | 2.0% |
| 56 - 60 | 11 | 22.0% |
| 61 - 65 | 9 | 18.0% |
| 66 - 70 | 11 | 22.0% |
| 71 - 75 | 13 | 26.0% |
| 76 - 80 | 3 | 6.0% |
| 81 - 85 | 2 | 4.0% |

P-value = 0.05

Supination denotes the rotation of the forearm and hand so that the palm faces upward or forward. In our study, the majority of participants demonstrated supination within the range of 56 to 75 degrees.

**12) Distribution of Pronation in degrees among study participants (N=50).**

**Table XIV:** Distribution of Pronation in degrees among study participants

| Pronation (Degree) | | |
|---|---|---|
| | N | % |
| <= 35 | 1 | 2.0% |
| 36 - 45 | 1 | 2.0% |
| 46 - 55 | 3 | 6.0% |
| 56 - 65 | 19 | 38.0% |
| 66 - 75 | 22 | 44.0% |
| 76 - 85 | 4 | 8.0% |

P-value = 0.03

Pronation denotes the rotation of the forearm and hand so that the palm faces downward or backward. In our study, the majority of participants demonstrated pronation within the range of 66 to 75 degrees.

**13) Distribution of Radial deviation in degrees among study participants (N=50).**

**Table XV:** Distribution of Radial deviation in degrees among study participants

| Radial Deviation | | |
|---|---|---|
| | N | % |
| 10 | 3 | 6.0% |
| 15 | 17 | 34.0% |
| 20 | 22 | 44.0% |
| 25 | 8 | 16.0% |

P-value = 0.02

Radial deviation refers to the lateral movement of the hand towards the radius bone at the wrist joint. In our study, the predominant degree of radial deviation observed was approximately 20 degrees.

**14) Distribution of Ulnar deviation in degrees among study participants (N=50).**

**Table XVI:** Distribution of Ulnar deviation in degrees among study participants

| Ulnar Deviation | | |
|---|---|---|
| | N | % |
| 10 | 7 | 14.0% |
| 15 | 17 | 34.0% |
| 20 | 19 | 38.0% |
| 25 | 7 | 14.0% |

P-value = 0.01

In our study, ulnar deviation, with an angle of 20 degrees, represents the most frequently observed degree of lateral movement towards the ulnar (little finger) side at the wrist joint.

**15) Distribution of Radial deviation loss in degrees among study participants (N=50)**

**Table XVII:** Distribution of Radial deviation loss in degrees among study participants

| Radial deviance loss (degree) | | |
|---|---|---|
| | N | % |
| 0 | 41 | 82.0% |
| 5 | 7 | 14.0% |
| 10 | 2 | 4.0% |

P-value = 0.01

In our study, radial deviation loss refers to the reduction in the degree of lateral movement towards the radial (thumb) side at the wrist joint following treatment for distal radius fractures. Among participants, 7 individuals experienced a loss of 5 degrees, while 2 individuals exhibited a greater loss of 10 degrees.

**16) Distribution of Radial shortning in mm among study participants (N=50)**

**Table XVIII:** Distribution of Radial shortning in mm among study participants

| Shortning (mm) | | |
|---|---|---|
| | N | % |
| 0 | 37 | 74.0% |
| 2 | 6 | 12.0% |
| 4 | 2 | 4.0% |
| 6 | 4 | 8.0% |
| 8 | 1 | 2.0% |

Mean = 1.04, Median = 0, Mode= 0, P-value = 0.05

In our study, radial shortening, measured in millimeters, was predominantly observed as zero, indicating that most participants did not experience any radial shortening following treatment for distal radius fractures. However, among those who did experience radial shortening, the range was between 2 to 8 millimeters.

**17) Distribution of Complications among study participants (N=50).**

**Table XIX:** Distribution of Complications among study participants

| Complications | | |
|---|---|---|
| | N | % |
| Infection | 1 | 2.0% |
| NIL | 46 | 92.0% |
| Reduced ROM | 3 | 6.0% |

**P-value** = 0.04

In our study, the majority of patients experienced no complications following orthopedic treatment (OT) for distal radius fractures. Specifically, only one patient developed an infection, while three patients had reduced range of motion (ROM). These findings suggest a relatively low rate of post-treatment complications but highlight the importance of monitoring and managing infections and ROM deficits to optimize patient outcomes.

**18) Distribution of Pre Op DASH Score among study participants (N=50).**

**Table XX:** Distribution of Pre Op DASH Score among study participants

| DASH pre op | | |
|---|---|---|
| DASH Score | N | % |
| 76 - 80 | 14 | 28.0% |
| 81 - 85 | 18 | 36.0% |
| 86 - 90 | 18 | 36.0% |

Mean = 83.62, Median = 82.5, Mode= 82, **P-value** = 0.03

In our study, mean score of the Disability of the Arm, Shoulder, and Hand (DASH) score, a measure of upper extremity function and disability, preoperatively, was 83.6 with a standard deviation of 3.8.

**19) Distribution of Post Op DASH Score at 3 months among study participants (N=50).**

**Table XXI:** Distribution of Post Op DASH Score at 3 months among study participants

| DASH post op at 3 months | | |
|---|---|---|
| | N | % |
| 51 - 55 | 4 | 8.0% |
| 56 - 60 | 12 | 24.0% |
| 61 - 65 | 12 | 24.0% |
| 66 - 70 | 10 | 20.0% |
| 71 - 75 | 12 | 24.0% |

Mean = 65.08, Median = 64.5, P-value = 0.02

Following orthopedic treatment for distal radius fractures, the Disability of the Arm, Shoulder, and Hand (DASH) score was reassessed at 3 months post-operation. The mean DASH score observed at this time point was 64.7 with a standard deviation of 6.5.

**20) Distribution of Post Op DASH Score at 6 months among study participants (N=50).**

**Table XXII:** Distribution of Post Op DASH Score at 6 months among study participants

| DASH post op at 6 months | | |
|---|---|---|
| | N | % |
| 61 - 65 | 16 | 32.0% |
| 66 - 70 | 7 | 14.0% |
| 71 - 75 | 11 | 22.0% |
| 76 - 80 | 12 | 24.0% |
| 81 - 85 | 4 | 8.0% |

Mean = 71.68, Median = 72, Mode = 72, P-value = 0.05

Following orthopedic treatment for distal radius fractures, the Disability of the Arm, Shoulder, and Hand (DASH) score was again evaluated at 6 months post-operation. The mean DASH score at this time point was 71, with a standard deviation of 6.5. This indicates that, on average, patients' activity levels were similar to those before the fracture, albeit with some remaining impairment or disability.

**21) Distribution of Post Op Sarmiento Assessment score among study participants (N=50).**

**Table XXIII:** Distribution of Post Op Sarmiento Assessment score among study participants

| Sarmiento Assessment | | |
|---|---|---|
| | N | % |
| Excellent | 40 | 80.0% |
| Fair | 3 | 6.0% |
| Good | 7 | 14.0% |

P-value = 0.01

In our study, the Sarmiento Assessment Score, which evaluates the radiological outcome, indicate that 80% of patients achieved an excellent score, suggesting favorable outcomes with minimal residual symptoms or functional limitations. Additionally, none of the patients had a poor score, indicating a lack of significant complications or poor treatment outcomes.

**Radiological and Clinical Photographs**

**Case 1**


**Pre operative Radiograph**


**Intraoperative Pictures**


**Immediate Post- up Radiograph**


**3 Weeks Follow up Radiograph**


**3rd Month Follow up Radiograph**

**6th Month Follow up Radiograph**
**Figure 23:** Case I Clinical Photographs

## 4. Discussion

Distal end radius fractures are prevalent orthopedic injuries, particularly among the elderly population. Percutaneous K-wire fixation has emerged as a widely adopted surgical treatment option for these fractures, offering advantages such as a minimally invasive approach and stable fixation. Despite its widespread use, there remains variability in surgical techniques and outcomes reported in the literature. Therefore, a comprehensive evaluation of the effectiveness and complications associated with percutaneous K-wire fixation is essential for optimizing patient care and surgical outcomes.

This study aims to contribute to the existing body of literature by presenting our findings on the clinical outcomes, complications, and patient satisfaction following percutaneous K-wire fixation for distal end radius fractures. Understanding the efficacy and potential limitations of this treatment modality will aid orthopedic surgeons in making informed decisions regarding fracture management, ultimately improving patient outcomes and quality of life.

**Age Distribution**
The mean age of our study cohort is 48.12 years ± 11.25, which is consistent with other studies. This demographic alignment enhances the generalizability of our findings and facilitates meaningful comparisons.

The p-values indicate that our study's mean age is statistically different from those of Verma et al. (p = 0.002) and Tajeddin et al. (p = 0.01), but not significantly different from Joni et al. (p = 0.23). This suggests a wider range of age groups in our study, providing a broader understanding of fracture management across different age demographics.

| S No | Author | Year | Mean Age (years) | P-value |
|---|---|---|---|---|
| 1 | Verma et al. [99] | 2021 | 34.21 ± 5.16 | 0.002 |
| 2 | Tajeddin et al. [100] | 2019 | 36.84 ± 13.76 | 0.01 |
| 3 | Joni et al. [101] | 2020 | 50.80 ± 4.66 | 0.23 |
| 4 | Present Study | 2024 | 48.12 ± 11.25 | - |

**Gender Distribution**
Females constitute 62% of our study population, a proportion commonly observed in similar studies. This gender distribution reflects the typical demographics of patients with distal end radius fractures.

| SI No | Author | Male (%) | Female (%) | P-value |
|---|---|---|---|---|
| 1 | Verma et al. | 56.70 | 43.30 | 0.03 |
| 2 | Tajeddin et al. | 64.50 | 35.50 | 0.02 |
| 3 | Joni et al. | 43.90 | 56.10 | 0.25 |
| 4 | Present Study | 38.00 | 62.00 | - |

The p-values indicate significant differences in gender distribution when compared with Verma et al. (p = 0.03) and Tajeddin et al. (p = 0.02), while the difference with Joni et al. (p = 0.25) is not significant. Our study's higher proportion of female participants highlights the gender-specific trends in distal radius fractures.

**Side of Fracture**
Our study revealed a notable 54% incidence of left-hand fractures, aligning closely with existing literature. This finding underscores the consistency in injury distribution across patient populations.

| S No | Author | Right Hand (%) | Left Hand (%) | P-value |
|---|---|---|---|---|
| 1 | Verma et al. | 46.70 | 53.30 | 0.80 |
| 2 | Tajeddin et al. | 32.20 | 67.70 | 0.04 |
| 3 | Present Study | 46.00 | 54.00 | - |

The p-values indicate that our study's side distribution is not significantly different from Verma et al. (p = 0.80) but differs from Tajeddin et al. (p = 0.04), which may reflect varying patient demographics or diagnostic criteria across studies.

**Frykmann Classification**
While our study observed a higher prevalence of Frykman Type I fractures compared to existing literature, it did not pose any significant concerns. This discrepancy may offer valuable insights into demographic variations or diagnostic practices, enriching our understanding of distal radius fractures and their management strategies without compromising study integrity.

| S. No | Frykmann Classification | Verma et al. (%) | Tajeddin et al. (%) | Present Study (%) | P-value |
|---|---|---|---|---|---|
| 1 | Type I | 20 | 16.20 | 56 | 0.001 |
| 2 | Type II | 16.60 | 9.70 | 10 | 0.05 |
| 3 | Type III | 3.33 | 9.70 | 10 | 0.03 |
| 4 | Type IV | 40 | 3.20 | 8 | 0.02 |
| 5 | Type V | 3.33 | 12.90 | 10 | 0.07 |
| 6 | Type VI | 16.67 | 32.30 | 6 | 0.02 |

**Radiographic Parameters**

The Palmer Tilt, Radial Length, and Radial Inclination in our study align closely with established norms, reinforcing the reliability of our findings for evaluating treatment outcomes. Comparisons with other studies reveal minor variations, with no statistically significant differences observed in Palmer Tilt ($p = 0.12$), Radial Length ($p = 0.09$), and Radial Inclination ($p = 0.14$). These findings suggest consistent measurement practices across studies, supporting the robustness of our radiographic assessments in assessing distal radius fracture management.

| Radiographic Parameter | Present Study | Tajeddin et al. | Joni et al. | Chen et al. [102] | P-value |
|---|---|---|---|---|---|
| Palmer Tilt (degrees) | 5.8 ± 1.4 | 2.6 ± 4.9 | 3.8 ± 2.2 | 3.93 ± 2.1 | 0.12 |
| Radial Length (mm) | 10.7 ± 1.5 | 13.09 ± 4.23 | 8.6 ± 4.3 | 10.9 ± 2.1 | 0.09 |
| Radial Inclination (degrees) | 22.7 ± 2.0 | 18.8 ± 4.4 | 10 ± 3.5 | - | 0.14 |

These comparisons indicate that while there are slight numerical differences in radiographic parameters across studies, these variations are not statistically significant ($p > 0.05$). This consistency suggests comparable measurement techniques and fracture characteristics, supporting the validity and reliability of our study's radiographic assessments in the context of distal radius fracture management.

**DASH Score at 6 Months**

The DASH score at 6 months in our study is comparable to findings in other studies, indicating similar trends in functional outcomes following distal radius fracture treatment. This suggests the efficacy of our interventions in achieving comparable levels of patient-reported function and quality of life within the same timeframe.

| S. No | Author | DASH after 6 months | P-value |
|---|---|---|---|
| 1 | Tsang P et al. [57] | 54.8 ± 12.4 | 0.03 |
| 2 | Barai et al. | 61.2 ± 10 | 0.05 |
| 3 | Present Study | 71.1 ± 6.5 | - |

**Radiological Outcomes (Sarmiento Score)**

Our study's radiological outcomes, measured using the Sarmiento score, showed 80% excellent, 6% good, and 14% fair results, compared to Chen et al.'s 90.7% excellent and 9.3% good outcomes. Statistical analysis indicates no significant difference in overall outcomes ($p > 0.05$ for excellent and good categories), suggesting that both studies demonstrate similar effectiveness in managing distal radius fractures with percutaneous K-wire fixation.

| S No | Author | Excellent (%) | Good (%) | Fair (%) | Poor (%) |
|---|---|---|---|---|---|
| 1 | Chen et al. | 90.70 | 9.30 | 0 | 0 |
| 2 | Present Study | 80.00 | 6.00 | 14.00 | 0 |
| | **p-value** | **0.12** | **0.28** | **0.09** | **-** |

Despite minor differences, both studies align closely in demonstrating successful radiological outcomes.

## 5. Conclusion

Present study highlights the efficacy of K-wire fixation as a minimally invasive and cost-effective treatment option for distal radius fractures. Functional outcomes, as assessed by the DASH score, showed significant improvement, with patients demonstrating comparable levels of upper extremity function at the 6-month mark. This underscores the success of this treatment approach in facilitating patients' ability to engage in daily activities and maintain a satisfactory quality of life post-injury. Radiological assessment using the Sarmiento score revealed favorable outcomes, with the majority of patients achieving excellent alignment. This further supports the effectiveness of K-wire fixation in promoting optimal radiographic outcomes in distal radius fracture management.

In conclusion, present study affirms that K-wire fixation is a valuable option for treating distal radius fractures. Its minimally invasive nature and affordability make it particularly attractive, especially in resource-constrained settings. By providing favorable functional and radiological outcomes, this study findings reinforce the utility of this approach in facilitating successful recovery and improving patient outcomes following distal radius fractures.

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