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Impact of Early Versus Delayed Physiotherapy Intervention on Humerus Fracture Functional Recovery in Resource-Limited Settings

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Thesis Approval

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Dedication

This thesis is dedicated, with profound love and gratitude, to my wife and son, whose unwavering support has shaped every stage of my life. Your endless sacrifices, silent prayers, and constant belief in my potential have been the foundation upon which every achievement has been built. You have given me strength during moments of doubt, patience during moments of struggle, and encouragement whenever the path ahead seemed overwhelming.

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Asem Husien Rushdi Abdelghani

Declaration

I certify that this thesis which is submitted to the Deanship of Graduate Studies to get the degree of master in on filed Nursing Management, this is my own research and my own work and it doesn't submit to any other universities or any institutions.

Signature 

Name : Asem Husien Rushdi Abdelghani

Date: 28/12/2025

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Abstract

Background:
Humerus fractures represent a significant orthopedic challenge and may result in pain, restricted shoulder mobility, and functional disability if rehabilitation is not initiated appropriately. Although early physiotherapy is believed to enhance recovery, the optimal timing for rehabilitation initiation remains controversial, particularly in resource-limited healthcare settings such as Palestine.

Aim:
This study aimed to compare the effects of early versus delayed physiotherapy initiation on pain, edema, shoulder range of motion, and functional recovery among adults'post humerus fractures.

Methods:
A quasi-experimental study was conducted amongst 40 adults aged 18–60 years diagnosed with humerus fractures. Participants were allocated into two groups: an early intervention group (n = 20), in which physiotherapy was initiated within two weeks following orthopedic referral, and a delayed intervention group (n = 20), in which physiotherapy commenced at least after six weeks due to several delayed reasons. Both groups received standardized physiotherapy protocols adapted to fracture stage and patient tolerance. Outcome measures included pain intensity assessed using the Visual Analog Scale (VAS) and the McGill Pain Questionnaireto help patients describe and quantify their pain's quality. While for functional recovery the Upper Extremity Functional Index (UEFI) we used, shoulder range of motion measured using a goniometer, and edema evaluated through standardized circumferential limb measurements and lastly the upper limb function and disability assessed using the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire and. Assessments were performed at baseline and after an 8-week intervention period.

Results:
Improvements were observed across all outcome measures in both groups following physiotherapy. However, participants who received early physiotherapy demonstrated greater gains in shoulder range of motion and functional performance compared with those who received delayed intervention. Pain reduction occurred in both groups, with earlier initiation resulting in faster and more clinically meaningful improvement. Early intervention was also associated with lower disability levels and enhanced functional independence at follow-up.

Conclusion:
Early initiation of physiotherapy following humerus fracture is associated with superior functional recovery, improved shoulder mobility, reduced pain and edema, and decreased disability without compromising safety. These findings support the implementation of

timely rehabilitation strategies and highlight the need to improve access to early physiotherapy services in resource-limited settings.

Keywords: Humerus fracture; rehabilitation timing; pain assessment; shoulder range of motion; upper limb function; disability outcomes; Visual Analog Scale; DASH; Upper Extremity Functional Index.

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Chapter One

1.1 Background:

Humerus fractures account for 5–8% of all fractures globally and rank among the most common orthopaedic injuries. They occur across all age groups but show a bimodal distribution: peaks are observed in young adults (20–40 years), typically due to high-energy trauma (e.g., motor vehicle accidents or sports injuries), and in older adults (>60 years), commonly resulting from low-energy mechanisms such as falls—often compounded by osteoporosis **(BMJ Open, 2022; European Review of Medical and Pharmacological Sciences, 2024)**. Postmenopausal women are at heightened risk due to bone density loss and hormonal changes, whereas men are more likely to sustain fractures through occupational hazards or high-impact activities **(Task-oriented exercises, 2021).**

Anatomically, humerus fractures are categorized as proximal, mid-shaft, or distal, with proximal fractures being the most prevalent—particularly in the elderly **(Rehabilitation protocols, 2023; European Review of Medical and Pharmacological Sciences, 2024).** These injuries can cause substantial functional impairment, including pain, decreased mobility, and muscle weakness, limiting the performance of daily activities and potentially leading to prolonged disability. Immobilization, while sometimes necessary for fracture stabilization, further increases the risk of complications such as joint stiffness, muscle atrophy, and adhesive capsulitis, especially in the absence of timely, structured rehabilitation **(Task-oriented exercises, 2021).**

Physiotherapy plays a crucial role in recovery, aiming to restore range of motion (ROM), rebuild strength, and alleviate pain. Early mobilization has been associated with improved functional outcomes and reduced complication rates; however, optimal timing, intensity, and delivery of interventions remain inconsistent, contributing to variable clinical results **(BMJ Open, 2022).** This inconsistency is exacerbated in resource-limited settings such as Palestine, where access to physiotherapy is markedly unequal. Rural areas often lack adequate facilities and trained personnel, and even in urban centers, geographic and socioeconomic barriers delay or impede care

(European Review of Medical and Pharmacological Sciences, 2024; Rehabilitation Protocols, 2023). Consequently, patients face higher risks of persistent stiffness, functional decline, and long-term disability.

Evidence supports structured rehabilitation programs, including task-oriented exercises and progressive resistance training, as superior to non-structured approaches for pain control and functional independence **(BMC Musculoskeletal Disorders, 2021).** Yet, implementation is frequently hindered by limited therapist availability, financial constraints, fragmented care pathways, and insufficient patient education. Notably, fear of re-injury may deter patients from engaging in early mobilization, even when medically appropriate **(European Review of Medical and Pharmacological Sciences, 2024).**

Several recent studies have emphasized the importance of rehabilitation timing in optimizing functional outcomes following humerus fractures**. Ranieri et al. (2024)** identified that early rehabilitation, consisting mainly of pendulum and passive ROM exercises, resulted in better functional scores in the first three months of recovery, although differences in functional scores between early and late rehabilitation became minimal at longer follow-up. In surgically treated proximal humerus fractures, early controlled physiotherapy has been proven safe when stable fixation is achieved. **Zhu et al. (2022)** illustrated that commencing active rehabilitation within the first day post-operation resulted in significantly better long-term functional outcomes, such as higher Constant–Murley scores and greater shoulder range of motion, without increased risk of fixation failure.

Despite growing recognition of the benefits of early physiotherapy, significant gaps remain, particularly regarding patient-tailored protocols that account for age, fracture subtype, and comorbidities. Moreover, comparative data on the timing of intervention initiation in low-resource contexts are scarce.

Therefore, this study aims to evaluate the impact of **early** *versus* **delayed** physiotherapy initiation on pain reduction and functional recovery among adults with humerus fractures in a resource-limited setting—specifically, Palestine.

1.2 Problem Statement:

Humerus fractures, particularly proximal humerus fractures, are common orthopedic injuries that significantly impact a patient's mobility, strength, and functional abilities **(Rehabilitation Protocols, 2023).** Effective recovery requires a combination of surgical or non-surgical treatment and physiotherapy to restore function and prevent complications. However, rehabilitation for these fractures faces challenges, especially in Palestine, due to a lack of standardized protocols, variability in the timing of orthopedic referral, and initiation of physiotherapy. Furthermore, the recent war in Gaza (2023) has further complicated the accessibility and consistency of physiotherapy services in the West Bank.

Although the direct military actions are concentrated in Gaza, the spillover effects of the conflict have been deeply felt across the occupied Palestinian territories, in particular the northern part. Heightened political instability, increased military checkpoints, and restricted movement have significantly disrupted patients' ability to access or attend scheduled physiotherapy sessions. (UN OCHA, 2023).

On the other hand, a key issue in rehabilitation is determining the optimal timing for physiotherapy initiation. Early mobilization has shown promise in reducing stiffness and muscle atrophy while accelerating functional recovery. However, studies highlight potential risks such as delayed bone healing or malunion if loading occurs prematurely (European Review of Medical and Pharmacological Sciences, 2024). Conversely, delayed initiation can lead to chronic pain, reduced range of motion, and prolonged recovery, underscoring the need for evidence-based guidelines **(BMJ Open, 2022).**

Therefore, this study intends to evaluate the impact of early versus delayed physiotherapy on pain reduction, quality of pain and functional recovery among adults' post humerus fractures in a resource-limited setting such as at Northen part of west bank, Palestine.

1.3 Study Justification:

The complexity of humerus fracture recovery necessitates a multidisciplinary approach, yet evidence regarding optimal physiotherapy protocols remains inconsistent. This study addresses the critical need for personalized rehabilitation strategies based on factors such as fracture type, patient age, and comorbidities.

Additionally, the integration of physiotherapist and physician expertise in determining the timing and modalities of therapy offers a unique perspective on collaborative care, ensuring comprehensive management.

However, in Palestine, there is a lack of studies on the therapeutic use and efficacy of rehabilitation for post-traumatic humerus injuries. Therefore, it is important to study the efficacy of different time starts among adults who have traumatic humerus injuries, especially in outpatient physical therapy clinics for improving joint range of motion, reducing pain and swelling, and enhancing functional recovery outcomes in a resource-limited setting such as at Northen part of west bank, Palestine.

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1.4 Research Objectives

Research Objectives are:

1. To evaluate the effectiveness of early versus delayed physiotherapy initiation on functional recovery in humerus fracture rehabilitation.

2. To assess the impact of physiotherapy timing on pain reduction.

3. To determine the effect of physiotherapy timing on the functional abilities and level of disability of patients in resource-limited settings.

1.5 Research Hypotheses

- Early initiation of physiotherapy leads to better outcomes, such as improved range of motion (ROM) and strength, compared to delayed initiation.

- There is a significant difference in pain reduction between early and delayed physiotherapy initiation in humerus fracture rehabilitation.

- There is a significant difference in functional recovery and disability level between early and delayed physiotherapy initiation in humerus fracture rehabilitation.

1.6 Research Questions

1. Does early initiation of physiotherapy improve functional recovery compared to delayed initiation in humerus fracture rehabilitation?

2. What is the effect of early versus delayed physiotherapy initiation on pain levels in patients with humerus fractures?

3. How does the timing of physiotherapy initiation influence the functional recovery and disability level of patients in resource-limited settings?

1.7 Terminology

1. Humerus Fractures

A humerus fracture is a break in the humerus bone, categorized as proximal (near the shoulder), mid-shaft, or distal (near the elbow). These fractures are caused by trauma such as falls or vehicular accidents, and in older adults, they are often linked to osteoporosis. **(Rehabilitation protocols in proximal humerus fracture management. *ResearchGate*. 2023).**

2. Physiotherapy

Physiotherapy is a healthcare discipline that uses evidence-based therapeutic exercises, manual therapy, and education to restore movement, alleviate pain, and improve the physical function and overall well-being of individuals recovering from injuries or surgeries. **(World Confederation for Physical Therapy. "Definition of Physiotherapy." Available from**: https://world.physio.)

3. Range of Motion (ROM)

Range of Motion refers to the extent of movement around a joint or body part. ROM is a critical parameter measured during physiotherapy to assess joint flexibility and functionality. It is often categorized as passive (assisted movement) or active (movement initiated by the patient). **(O'Driscoll SW, et al. "Rehabilitation guidelines for humeral fractures."** ***Physical Therapy Research Journal.*** **2018;45(3):223-230.)**

4. Early Physiotherapy Initiation

Early physiotherapy initiation refers to starting rehabilitation exercises shortly after the acute phase of an injury, typically within the first two weeks of stabilization. This approach aims to prevent complications such as stiffness and muscle atrophy. **(Handoll HH, et al. "Interventions for treating proximal humeral fractures in adults: A systematic review."** ***Cochrane Database of Systematic Reviews.*** **2022)**

5. Adhesive Capsulitis

Adhesive capsulitis, or frozen shoulder, is characterized by progressive stiffness and pain in the shoulder joint, commonly caused by prolonged immobilization. It restricts the range of motion and can significantly hinder rehabilitation outcomes unless managed with early mobilization and targeted physiotherapy**. (Early rehabilitation and prevention of complications.** ***ResearchGate*****. 2023)**.

6. Proprioception

Proprioception is the body's ability to sense its position, movement, and spatial orientation. It plays a crucial role in balance, coordination, and joint stability. Proprioceptive exercises are often integrated into rehabilitation to restore function and prevent falls or further injury during recovery from humerus fractures. **(Continuous passive motion therapy in fracture rehabilitation.** ***BMC Geriatrics*****. 2023)**

7. Malunion

Malunion is a fracture that heals in an incorrect anatomical position, leading to deformity, impaired function, and potentially chronic pain. Malunion often necessitates further medical intervention, such as surgical correction, to restore normal alignment and function. **(The role of structured physiotherapy in preventing malunion.** ***BMJ Open*****. 2022)**

8. Rehabilitation Protocols

Rehabilitation protocols are structured plans that outline the sequence and type of therapeutic interventions to be implemented during the recovery process. These protocols are tailored to individual needs and the specifics of the injury. **(Matsen FA. "Humeral fractures and the role of physiotherapy in modern recovery."** ***Orthopaedic Clinics of North America.*** **2021;52(2):183-199)**

9. Limited resources settings

Limited-resource settings are environments where financial, infrastructural, and workforce constraints restrict access to standard healthcare services and rehabilitation resources.**(World Health Organization. (2010)**

Chapter Two

2.1 Literature Review

2.1.1 Anatomy &Physiology of the Humerus

The humerus is the largest bone in the upper limb, connecting the shoulder to the elbow. It comprises three anatomical regions:

1. Proximal Humerus: Includes the humeral head, anatomical neck, greater and lesser tubercles, and the surgical neck, where fractures are most common.

2. Shaft: Cylindrical structure that provides attachment for muscles like the deltoid and biceps brachii.

3. Distal Humerus: Forms part of the elbow joint and includes the medial and lateral epicondyles and the olecranon fossa **(Anetzberger et al., 2022)**.

The humerus plays a critical role in arm movement, serving as a lever for muscle attachment and a conduit for the brachial artery and radial nerve, which are vulnerable during fractures **(McKee et al., 2023).**

2.1.2 Common Causes of Humerus Fractures

1. **Trauma:** High-energy incidents, including road traffic accidents and significant falls, remain a common cause of humerus fractures among young and middle-aged people **(Springer, 2023)**.

2. **Falls**: In the elderly, falls from standing height account for a large number of proximal humerus fractures, often related to factors such as poor balance, reduced bone density, and frailty in these individuals **(European Review of Medical and Pharmacological**

Sciences, 2024).

3. **Sports Injuries:** Fractures frequently occur due to contact sports, extreme activities, and overuse injuries, especially among younger and more active individuals **(Rehabilitation protocols, 2023).**

4. **Pathological Fractures:** Conditions affecting bone integrity, such as osteoporosis, tumors, or infections, can result in fractures from minimal trauma. This concern is particularly significant for older adults or those with chronic health issues that impact bone strength (**BMJ Open, 2022**).

2.1.3SurgicalApproachesforHumerus Fractures

Management of humerus fractures depends on the fracture type, location, and patient factors such as age and bone health. Common surgical approaches include:

1. Proximal Humerus Fractures: Treated with open reduction and internal fixation(ORIF) using locking plates, intramedullary nailing, or shoulder arthroplasty for complex fractures. The deltopectoral approach is commonly used for proximal fractures to minimize soft tissue damage.

2. Mid-shaft fractures: Often stabilized using intramedullary nails or ORIF with plates. The posterior approach allows better access for mid-shaft fractures (**Court-Brown & McQueen, 2023**).

3. Distal Humerus Fractures: Require ORIF with dual plating for stabilization. These fractures are typically accessed via a triceps-splitting or triceps-reflecting approach (**Matsen et al., 2023**).

Despite advancements in surgical techniques, complications such as malunion, nerve injuries, and stiffness remain common, underscoring the importance of physiotherapy in the rehabilitation phase (**Zuckerman et al., 2023**).

2.1.4 Role of Physiotherapy in Rehabilitation

Physiotherapy is a cornerstone of recovery for humerus fractures, aiding pain reduction, functional restoration, and the prevention of complications like joint stiffness and muscle atrophy. Key physiotherapy roles include:

1. Acute Phase (0–6 Weeks): Focus on pain management, controlled mobilization, and minimizing stiffness through passive and active-assisted ROM exercises (**Rehabilitation protocols, 2023).**

2. Intermediate Phase(6–12Weeks): Incorporates strengthening exercises ,proprioceptive training,andprogressiveresistancetorebuildmusclestrengthandjointstability(**BMJ Open, 2022**).

3. Advanced Phase (12+ Weeks): Functional training tailored to the patient's daily activities and occupational needs, emphasizing full recovery of strength and ROM (**Springer, 2023**).

Recent studies highlight that early mobilization protocols, such as pendulum exercises and continuous passive motion (CPM) therapy, improve functional outcomes without compromising fracture healing. Collaborative decision-making between surgeons and physiotherapists regarding the timing of rehabilitation is critical for optimal results **(Task-oriented exercises, 2021) .**The role of physiotherapy in managing humerus fractures is well-documented, with studies highlighting its effectiveness in promoting recovery, minimizing complications, and restoring function. However, the optimal protocols and timing for physiotherapy remain subjects of ongoing investigation.

2.1.5 Limited Access to Specialized Physiotherapy Services

1. Financial Barriers to Care

Economic limitations significantly impact the availability and continuity of physiotherapy services in Palestine. Many patients must cover the costs of physiotherapy sessions, as these services are not always included in health insurance coverage. Forlow-income individuals ,this financial pressure often results in inadequate or incomplete rehabilitation, leading to poorer functional outcomes **individuals, this**

2. Inconsistent and Fragmented Rehabilitation Pathways

Coordination between orthopedic surgeons, primary care physicians, and physiotherapists often lacks cohesion. Many patients are released post-surgery or immobilization without receiving timely referrals for physiotherapy. This discontinuity in care delays the start of rehabilitation, ultimately diminishing its effectiveness **(Springer, 2023).**

3. **Lack of Standardized Physiotherapy Protocols**

Rehabilitation protocols for humerus fractures vary widely across health care providers, with no universally accepted guidelines. Timing, intensity, and modality choices often depend on the individual clinic than on evidence-based practices. This variability leads to inconsistent outcomes and hinders the establishment of best practices tailored to patient-specific needs **(Rehabilitation Protocols, 2023).**

2.2 Similar studies

2.2.1 Efficacy of Physiotherapy for Humerus Fractures

Physiotherapy is instrumental in restoring mobility and strength in patients with humerus fractures. **Gupte et al. (2016)** demonstrated that post-fracture physiotherapy significantly improves shoulder function, particularly when tailored to the individual's fracture type and recovery stage. Early mobilization techniques, such as passive and assisted ROM exercises, were shown to prevent joint stiffness and muscle atrophy.

Matsen et al. (2021) emphasized that incorporating progressive resistance exercises during rehabilitation significantly enhances muscle strength and functional outcomes. They noted that patients who adhered to a structured physiotherapy regimen achieved better recovery metrics, including reduced pain and improved range of motion, compared to those who relied solely on immobilization or delayed rehabilitation.

2.2.2TimingofPhysiotherapyInitiation

Recent evidence specific to proximal humerus fractures suggests the timing of physiotherapy commencement may be more important regarding early functional recovery. Yet, it has less of an impact on longer-term function. A systematic review and meta-analysis of randomized controlled trials reported that early mobilization, such as that commenced within the first week following injury, in non-surgically or surgically managed proximal humerus fractures resulted in improved short-term shoulder function with reduced pain compared with delayed mobilization after three to four weeks of immobilization, without increasing the risk of fracture displacement or complication **(Beks et al., 2025).** Similarly, **Ranieri et al. (2024)** identified that early rehabilitation, consisting mainly of pendulum and passive ROM exercises, resulted in better functional scores in the first three months of recovery, although differences in functional scores between early and late rehabilitation became minimal at longer follow-up. In surgically treated proximal humerus fractures, early controlled physiotherapy has been proven safe when stable fixation is achieved. **Zhu et al. (2022)** illustrated that commencing active rehabilitation within the first day post-operation resulted in significantly better long-term functional outcomes, such as higher Constant–Murley scores and greater shoulder range of motion, without increased risk of fixation failure.

Taking together, these findings advocate for the **early initiation** of physiotherapy in proximal humerus fractures if fracture stability allows, while the need for individualization of rehabilitation timing based on fracture characteristics, fixation method, and patient tolerance is emphasized.

2.2.3 Other Therapy Modalities

Physiotherapy protocols often include a combination of passive ROM exercises, active-assisted exercises, progressive resistance training, and functional training. **O'Driscoll et al. (2018)** compared outcomes across various modalities in patients with proximal humerus fractures and found that those who received a combination of ROM exercises and proprioceptive training experienced the greatest improvements in functional independence and quality of life.

Another study by **Zuc (2016)** evaluated the impact of proprioceptive neuromuscular facilitation (PNF) techniques on recovery. The results revealed that incorporating PNF into standard physiotherapy regimens led to faster improvements in shoulder mobility and reduced pain compared to standard resistance exercises alone.

Several recent studies have examined how patient-specific factors—such as age, comorbidity burden, physiological age, and bone health—influence physiotherapy and functional recovery after fractures. For example, in a large study of distal radius fractures (DRFs), **Preiss et al. (2023)** found that while chronological age was strongly associated with slower recovery in patients treated non-surgically(casting), physiological age markers (such as pre-injury activity level and comorbidities) were better predictors of functional outcomes after surgical treatment. **Kasi et al. (2025)** similarly showed that among elderly patients, advanced age and reduced socioeconomic status were each associated with lower likelihoods of receiving adequate physiotherapy and poorer health-related quality of life at one year.

Together, these findings support the need for individualized rehabilitation protocols that take into account physiological, age, comorbidity burden, baseline functional status, and bone health, in addition to chronological age, leading to better prognostication, more optimal physiotherapy planning, and potentially better outcomes.

2.3 Research Gap

Recent evidence has increasingly highlighted the importance of rehabilitation timing in determining early functional outcomes following humerus fractures**. Ranieri et al. (2024)** identified that early rehabilitation, consisting mainly of pendulum and passive range-of-motion (ROM) exercises, resulted in better functional scores during the first three months of recovery; however, differences between early and delayed rehabilitation became minimal at longer follow-up periods. In surgically treated proximal humerus fractures, early controlled physiotherapy is safe when stable fixation is achieved. Similarly, **Zhu et al. (2022)** demonstrated that initiating active rehabilitation within the first postoperative day resulted in significantly better long-term functional outcomes, including higher Constant–Murley scores and greater shoulder ROM, without increasing the risk of fixation failure.

Evidence from low- and limited-resource environments, where financial, geographical, and systemic barriers frequently lead to delays in treatment, is particularly rare. Therefore, there has been an evident need for a study that can investigate, in such resource-constrained environments, how timing in the initiation of physiotherapy affects recovery after a humerus fracture, providing clinically relevant data to inform practice in similar settings.

Chapter Three

Methodology

3.1 Study Design

This research adopts a quantitative, quasi-experimental design to evaluate the effectiveness of physiotherapy interventions in the rehabilitation of humerus fractures, as it focused on the timing of intervention in resource-limited settings, such as patients' homes. The study compared early physiotherapy initiation with delayed initiation to assess outcomes related to functional recovery, pain reduction, and overall disability level among patients.

3.2 Study Setting:

The study was conducted at patients' homes in the northern part of the West Bank, Palestine.

3.3 Study Population

The target population consisted of adults aged 18-60 years who had sustained a humerus fracture and were seeking physiotherapy treatment at selected hospitals or clinics.

- **Inclusion criteria:**

- Adultsaged18-60years.
- Confirmed Medical diagnosis of a humerus fracture via X-ray
- Ability to provide informed consent
- Willing to participate and commit to the rehab program.

- **Exclusion criteria:**

- Significant comorbidities that would impact rehabilitation (e.g., neurological disorders, severe cardiovascular issues)
- Patients with pathological fractures such as **osteogenic imperfecta.**
- Cognitive impairments or mental health disorders affect compliance with physiotherapy protocols.
- Non-consent or inability to participate in regular follow-ups

3.4 Data Collection

Datacollectionwasperformedusingacombinationofquantitativeandqualitativemethods:

- **Baseline Assessment:** Demographic information, fracture type and severity, and relevant medical history were collected at baseline.

- **Physiotherapy Assessment:** Physiotherapy assessment included a range of motion, muscle power, edema, and functional abilities and disabilities as following:

o **Range of Motion (ROM) , assessed through goniometric measurements**

o **Tool:** Goniometer.

o **Description:** Measures joint mobility in degrees for shoulder flexion, abduction, and external rotation

- The universal goniometer is a standard clinical tool for measuring joint range of motion. It demonstrates good to excellent intra-rater reliability (ICC = 0.90–0.98) and moderate to excellent inter-rater reliability (ICC = 0.80–0.95) for shoulder and upper-extremity joints (Kolber & Hanney, 2012). The goniometer also shows strong criterion validity when compared with radiographic and digital measurement systems (Norkin & White, 2016).

o **Edema** was assessed using standardized circumferential limb measurements, which are widely used in clinical and research settings to quantify upper extremity swelling. A non-elastic measuring tape was used to record limb circumference at predefined anatomical landmarks of the affected upper extremity. Circumferential measurement techniques have demonstrated good to excellent intra-rater reliability (ICC = 0.88–0.97) and acceptable inter-rater reliability (ICC = 0.80–0.93) for upper-limb edema assessment (Taylor et al., 2006; Williams et al., 2013). This method is considered valid for detecting changes in limb volume over time and is commonly used for monitoring edema progression and response to rehabilitation interventions (Norkin & White, 2016).

○ **Muscle power, assessed through the Oxford Scale**

The Oxford Muscle Scale is a numerical rating scale used to quantify the power or strength produced by the contraction of a muscle. The scale was originally developed by a UK government research group called the Medical Research Council (MRC), and first described in a paper titled Aids to the Investigation of Peripheral Nerve Injuries (War Memorandum No. 7), released in 1943 and reprinted as an updated version in 1976. Measurement is scored on a 0 to 5 scale, with 5 representing maximal strength. Reliability: Intraclass Correlational Coefficient (ICC) = 0.95 (0.92-0.97)

- **Outcome Measures:**

○ **Pain levels measured using the Visual Analog Scale (VAS)**

- The Visual Analog Scale (VAS) is a widely used instrument for assessing pain intensity. It demonstrates excellent test–retest reliability, with intraclass correlation coefficients (ICC) ranging from 0.94 to 0.99 in musculoskeletal populations (Bijur et al., 2001). The VAS also shows strong construct and concurrent validity, as evidenced by high correlations with other pain intensity measures such as the Numeric Rating Scale (Hawker et al., 2011). Its responsiveness to clinical change supports its use in rehabilitation research. It consists of a straight line, usually 10 cm in length, where one end represents "no pain" and the other "worst pain imaginable." Patients mark a point on the line corresponding to their pain level. (Chapman CR, et al. "The Visual Analog Scale for Pain Measurement." *Pain.* 1985;22(1):1-10.)

○ **Pain Quality**

-The McGill Pain Questionnaire (MPQ) is a tool used to assess pain qualitatively and quantitatively. It includes descriptive terms for sensory, effective, and evaluative dimensions of pain, offering insight into the patient's experience**. (Turk, D. C., & Melzack, R. "The McGill Pain Questionnaire: An Overview."** ***Pain*****. 2020).** Further**,** the Short-Form McGill Pain Questionnaire assesses both sensory and affective components of pain. It demonstrates **good to excellent internal consistency**, with Cronbach's alpha values ranging from **0.73 to 0.89**, and acceptable test–retest reliability (Melzack, 1987). The SF-MPQ has **established construct and convergent validity**, showing significant correlations with VAS and other pain intensity scales (Dworkin et al., 2005).

○ **Functional abilities assessment by using the Upper Extremity Functional Index (UEFI) by using the Arabic form.**

The Upper Extremity Functional Index shows **excellent test–retest reliability**, with ICC values reported between **0.95 and 0.98**, and **high internal consistency** (Cronbach's alpha = **0.94–0.97**) (Stratford et al., 2001; Chesworth et al., 2014). Strong **construct validity** has been demonstrated through high correlations with DASH and Quick DASH scores, supporting its use for assessing functional outcomes following upper-extremity injuries.

- **Functional performance and level of disability, evaluated using the short Arabic form of Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire**

The Quick DASH questionnaire is a reliable and valid self-reported measure of upper-extremity disability. It demonstrates **excellent internal consistency**, with Cronbach's alpha values ranging from **0.90 to 0.95**, and **high test–retest reliability** (ICC = **0.94–0.98**) (Beaton et al., 2005; Gummesson et al., 2006). The instrument has **strong construct and criterion validity**, correlating highly with the full DASH and other upper-limb functional measures.

3.5 Study Groups

To assess the effectiveness of physiotherapy in humerus fracture rehabilitation, the study included two distinct groups based on the timing of physiotherapy intervention: early vs delayed.

Group1:Early Intervention Group

- 20 Participants in this group commence physiotherapy within two weeks post-fracture after orthopedic physician referral.
- The intervention included pain management, edema reduction, and range-of-motion (ROM) exercises during the acute stage, progressing to strengthening and functional training as recovery advances.

Group2:Delayed Intervention Group

- 20 Participants in this group begin physiotherapy at least six weeks post-fracture with an orthopedic physician referral.
- Participants began physiotherapy more than six weeks ago for other reasons, such as surgeons recommending a longer initial immobilization period to protect the surgical repair. Further, any patients with personal issues, whether it was medical or financial, that prevent them from undergoing physiotherapy.
- The intervention follows a similar protocol to the early intervention group but accounts for the delayed initiation by focusing on regaining ROM and addressing stiffness or weakness resulting from the delayed start.

Both groups undergo physiotherapy protocols tailored to their recovery stage to ensure consistency and comparability.

3.6 Data Analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS, version 27). Descriptive statistics, including means, standard deviations, and percentages, were used to summarize the demographic and clinical characteristics of participants. The normality of continuous variables was assessed using the Kolmogorov–Smirnov and Shapiro–Wilk tests, which confirmed that the study data were approximately normally distributed.

For within-group comparisons (pre- and post-intervention), the paired t-test was used to evaluate changes in range of motion (ROM), muscle power, edema, pain severity, Upper Extremity Functional Index (UEFI), and Disabilities of the Arm, Shoulder, and Hand (DASH) scores. To examine between-group differences (early treatment vs. delayed treatment), the independent t-test was performed on baseline and post-test scores of the outcome measures.

In addition, the chi-square test was applied to compare categorical demographic and clinical characteristics (e.g., age groups, sex, occupation, diagnosis, comorbidities) between the two study groups, ensuring baseline equivalence.

Furthermore, a Two-Way Mixed ANOVA was conducted to assess the interaction effect between time (pre vs. post intervention) and group (early vs. delayed treatment) across all outcome measures. This analysis allowed for simultaneous examination of within-subject effects (changes over time) and between-subject effects (differences between groups). All assumptions of normality, homogeneity of variances, and sphericity were met (Shapiro–Wilk and Levene's tests, $p > .05$).

Normality tests

NormalityofthestudyvariableswasevaluatedusingKolmogorov-SmirnovandShapiro-Wilk tests. For all variables, both tests yielded non-significant results ($p > 0.05$), indicating that the data were approximately normally distributed. Pre-and post-test ROM, muscle power, edema, pain, UEFI, and DASH scores all met the normality assumption.

Although a few variables (e.g., pre-test muscle power, pre-test edema, post-test edema, post-test pain, post-test UEFI) showed borderline significance values in the Kolmogorov-Smirnov test (pslightlyabove.05), the Shapiro-Wilk results consistently supported normality(all $p>.05$).

Overall, these findings confirm that the data met the assumption of normality, supporting the use of parametric statistical analyses as seen in Table3.1(A and B).

Table 3.1(A): Normality tests

Variables	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pre-test ROM	.108	40	.200	.960	40	.165
Post-test ROM	.085	40	.200	.973	40	.446
Pre-test Muscle Power	.154	40	.053	.954	40	.102
Post-test Muscle Power	.125	40	.120	.954	40	.106
Pre-test Edema	.139	40	.051	.962	40	.191
Post-test Edema	.163	40	.052	.931	40	.062
Pre-test Pain	.085	40	.200	.978	40	.625
Post-test Pain	.143	40	.051	.967	40	.293
Pre-test UEFI	.096	40	.200	.953	40	.100
Post-test UEFI	.098	40	.200	.946	40	.054
Pre-test DASH	.066	40	.200	.978	40	.620
Post-test DASH	.061	40	.200	.976	40	.551

3.7 Ethical Considerations

Ethical approval had been obtained from the Institutional Review Board of Al-Quds University. Participants were provided with written informed consent, and data confidentiality was strictly maintained **(Appendix C).**

Chapter Four

Results and Discussion

4.1 Results

This chapter presents the results of the study, following the analysis and interpretation of the raw data on the findings of the data collected. The findings are presented according to the objective of the study and its hypothesis, which includes the way that participants were recruited in this study, the socio-demographics of the participants, and the inferential statistics.

4.1.1 Recruitment of Participants

As shown in Figure **4.1**, the flow chart below outlines the recruitment and allocation of participants throughout the study. Of 61 people screened, 57 were eligible for inclusion, whereas 4 were excluded. Of these 57, 46 consented to participate, and 11 declined—six citing financial constraints and five for no reason given. Six participants withdrew after one or two sessions during the early phase of data collection. A total sample of 40 participants who completed both pre- and post-treatment measures was determined. These were then randomly assigned to either early physiotherapy intervention (n = 20) or delayed physiotherapy intervention (n = 20).

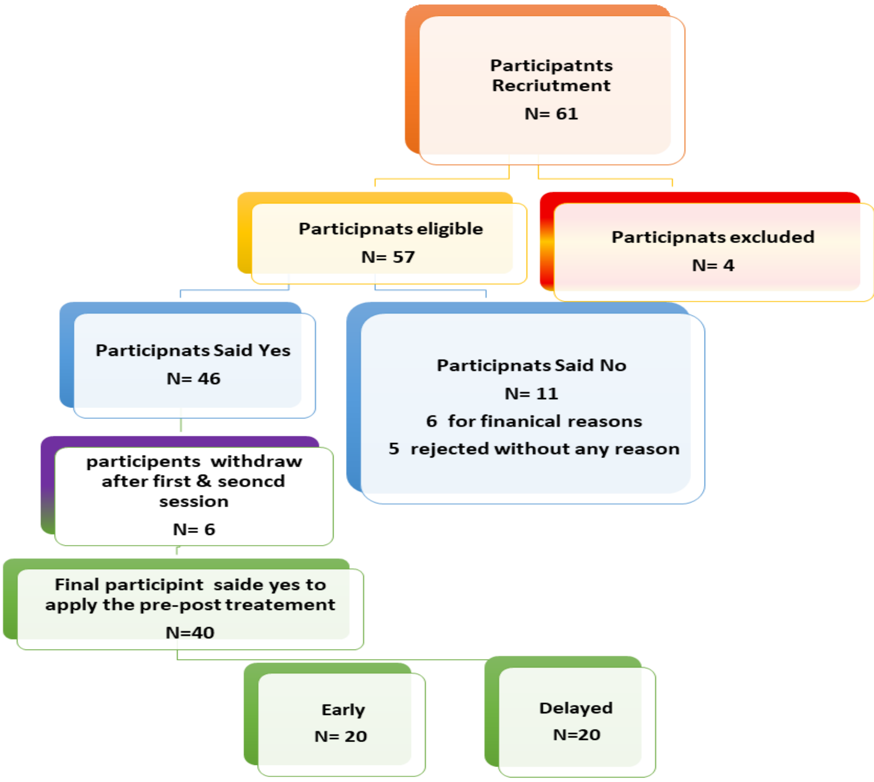

Figure 1 Recruitment Flow Chart

4.1.2 Demographic variables of the patients

The comparison of demographic and clinical characteristics between the early treatment group (n=20) and the delayed treatment group (n=20) using chi-square tests showed no statistically significant differences across all examined variables. Specifically, there were no significant differences in age distribution (p=.715), sex (p=.605), affected side (p=.341), dominant hand (p=.698), place of living (p=.344), education level(p=.691), occupation(p=.115), marital status (p=.451), smoking status (p=.514), diagnosis type (p=.579), intervention method (p=.624), or diabetes status(p=.642). These findings indicate that the two groups were comparable and well-balanced in terms of their demographic and clinical characteristics, suggesting that subsequent outcome comparisons between groups are unlikely to be confounded by baseline differences. As seen in Table 3.2.

Table4.2 (A): Demographic variables of the patients

Demographic		Early treatment group(n=20)		Delayed treatment group(n=20)		X^2	P-value
Age group (years)	20-29	2	10.0%	1	5.0%	1.359	.715
	30-39	6	30.0%	6	30.0%		
	40-49	7	35.0%	5	25.0%		
	50-59	5	25.0%	8	40.0%		
Gender	Male	17	85.0%	19	95.0%	1.111	.605
	Female	3	15.0%	1	5.0%		
Affected Side	Right	9	45.0%	13	65.0%	1.616	.341
	Left	11	55.0%	7	35.0%		
Dominant Hand	Right	18	90.0%	18	90.0%	.001	.698
	Left	2	10.0%	2	10.0%		
Place of Living	City	10	50.0%	13	65.0%	2.134	.344
	Village	7	35.0%	3	15.0%		
	Camp	3	15.0%	4	20.0%		
Education Level	Elementary	4	20.0%	3	15.0%	1.461	.691
	Secondary	4	20.0%	7	35.0%		
	Diploma	5	25.0%	3	15.0%		
	University	7	35.0%	7	35.0%		
Occupation	None	1	5.0%	7	35.0%	5.922	.115
	Office Work	10	50.0%	8	40.0%		

Table4.2 (B): Demographic variables of the patients

Demographic		Early treatment group(n=20)		Delayed treatment group(n=20)		X2	P-value
	Physically Demanding	6	30.0%	3	15.0 %		
	Others (metal Workers or farmer)	3	15.0%	2	10.0 %		
Marital Status	Single	6	30.0%	3	15.0 %	1.290	.451
	Married	14	70.0%	17	85.0 %		
Smoking	Yes	9	45.0%	6	30.0 %	.960	.514
	No	11	55.0%	14	70.0 %		
Diagnosis	Proximal Humerus	5	25.0%	7	35.0 %	1.092	.579
	Mid-shaft Humerus	7	35.0%	8	40.0%		
	Distal Humerus	8	40.0%	5	25.0%		
Intervention	Conservative	10	50.0%	10	50.0%	.001	.624
	Surgical	10	50.0%	10	50.0%		
Diabetes	Yes	5	25.0%	5	25.0%	.001	642
	No	15	75.0%	15	75.0%		

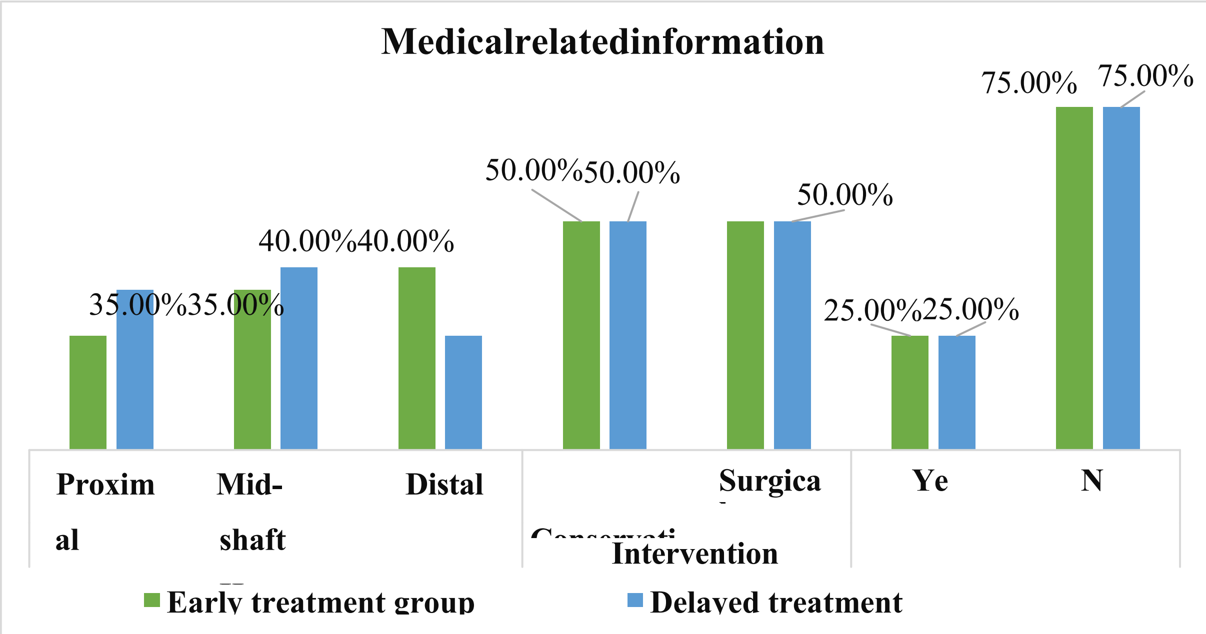

Figure2: Patient's medical-related information

Figure 2 illustrates the medical-related characteristics of participants in both the early and delayed treatment groups. The distribution of diagnosis types shows that proximal humerus fractures were slightly more common in the delayed group (35%) compared to the early group (25%), whereas mid-shaft humerus fractures were equally distributed between groups (35% each). Distal humerus fractures were reported more frequently in the early group (40%) than in the delayed group (25%). Regarding the type of intervention, both groups demonstrated an identical distribution, with 50% receiving conservative treatment and 50% undergoing surgical intervention. Similarly, diabetes prevalence was the same across groups, with 25% of participants reporting diabetes and 75% reporting no diabetes in both treatment categories. Overall, the figure indicates comparable medical profiles between the early and delayed treatment groups across diagnosis, intervention type, and diabetes status.

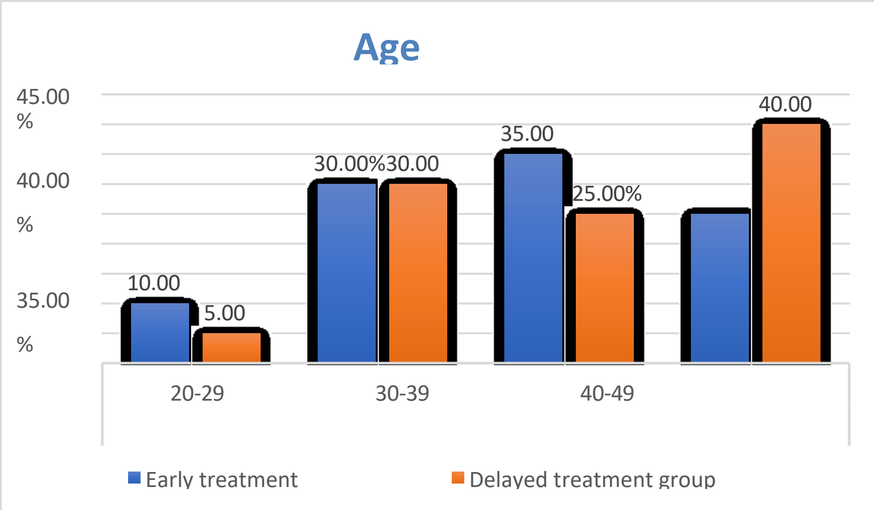

Figure3 patients age groups

Figure 3 shows the age distribution for participants in both the early treatment and delayed treatment groups. The chart indicates that most participants fall within middle age, especially within the age brackets of 40–49 and 50–59 years. Within the 40–49 age bracket, 35% of participants are within the early treatment group, while 25% are within the delayed treatment group. Similarly, the 50–59 age bracket included 25% of the early group and 40% within the delayed group. Younger participants were relatively fewer, at only 10% and 5% of participants within the age brackets of 20–29 years within the early and delayed groups, respectively. Both groups had equal numbers in the 30–39 age bracket at 30%. Overall, the distribution indicates a predominance of participants within the 30–59-year age bracket, though slightly unequal between the two treatment groups.

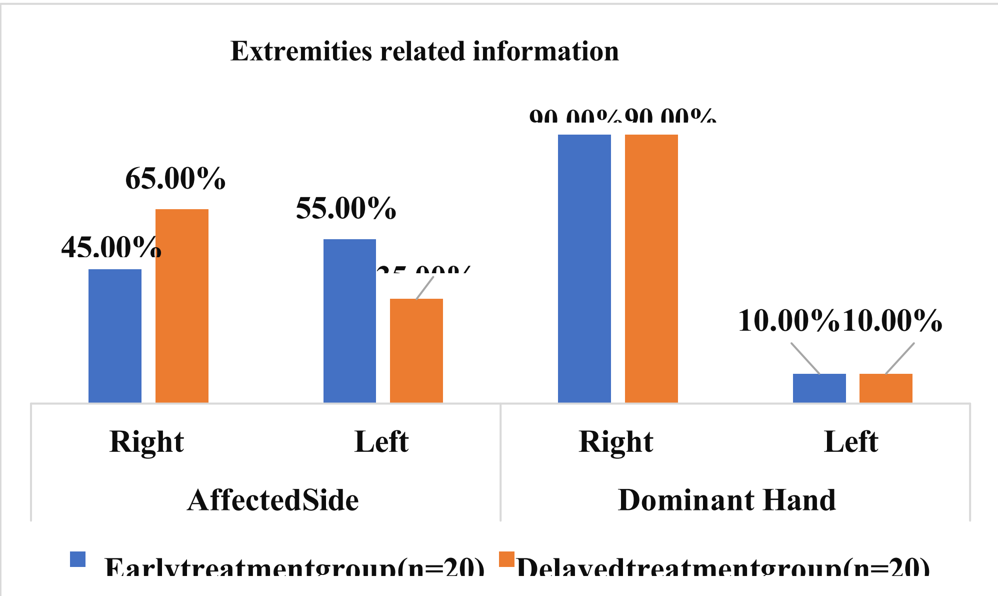

Figure 4: Patients' distribution according to affected hand and dominant hand

Figure 4 illustrates the distribution of patients across affected side and dominant hand categories for both the Early Intervention Group (n=20) and the Delayed Intervention Group (n=20). Notably, among patients in the Early Intervention Group, 65.00% had right-sided involvement compared to 45.00% in the Delayed Intervention Group, while left-sided involvement was reported in 35.00% and 55.00% of patients, respectively. In terms of dominant hand, both groups showed near-identical distributions, with 90.00% of participants in each group reporting their right hand as dominant and 10.00% reporting their left hand. This balanced representation of dominant hand between groups suggests that handedness was not a confounding variable in treatment allocation, whereas the differing proportions of affected side may warrant further investigation into potential associations with treatment timing or outcomes.

Several factors contributed to patients' delay in attending physiotherapy sessions. The most reported reason was financial constraints, which prevented some individuals from continuing or initiating therapy. Additionally, a lack of awareness about the importance of early rehabilitation and misconceptions regarding spontaneous recovery led some patients to postpone physiotherapy. A smaller proportion reported transportation difficulties ,workor family obligations, and limited availability of nearby rehabilitation centers as contributingfactors.Collectively,thesefindingshighlighttheinfluenceofsocioeconomicand logistical barriers on patients' access to timely physiotherapy intervention

4.3 Outcome Measures differences

4.3.1 Pain severity among patients

4.3.1.1. VAS scale differences

Table3. 3 presents the frequency and percentage distribution of categorical pain severity using the VAS among the early and delayed treatment groups before and after the exercise. The findings show that most participants in both groups reported severe pain before the exercise, with 75% in the early-treated group and 70% in the delayed-treated group. Following the exercise, a noticeable reduction in pain severity was observed in both groups, as severe pain completely disappeared. Moreover, the proportion of participants reporting mild pain increased substantially, reaching 65% in the early-treated group and 90% in the delayed-treated group, while moderate pain decreased in both groups. These results indicate the effectiveness of the exercise intervention in reducing pain severity regardless of treatment timing, with a slightly greater improvement observed in the delayed-treated group.

Table 4.3 Frequency and percentages of categorical pain severity using VAS among early and delayed treatment groups

		Early treated		Delayed treated	
Variables		Pre exercise n (%)	Postexercise n (%)	Pre exercise n (%)	Postexercise n (%)
Pain level	No pain	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Mild pain	0 (0%)	13 (65%)	0 (0%)	18 (90%)
	Moderate pain	5 (25%)	7 (35%)	6 (30.0%)	2 (10)
	Sever Pain	15 (75%)	0 (0%)	14 (70%)	0 (0%)

Among early-treated patients, no participants reported "no pain" before or after the intervention. Initially, the majority (75%) experienced severe pain, while2% reported moderate pain. After exercise, none reported severe pain; instead, 65% reported mild pain and 35% reported moderate pain. This demonstrates a marked improvement, with most patients shifting from severe to mild pain intensity following early rehabilitation.

Similarly, in the delayed-treated group, no patients reported no pain at any stage. Before exercise, 70% had severe pain, and 30% had moderate pain. Post-exercise, all participants reported either mild(90%)or moderate(10%)pain ,with no cases of severe pain remaining. As seen in Table 3.

In summary, both early and delayed exercise interventions were effective in reducing pain severity, as all participants improved from severe or moderate pain to predominantly mild levels after treatment .However,aslightlyhigherproportionofdelayed-treatedpatientsachievedmild pain status compared to the early-treated group (90% vs. 65%), suggesting comparable effectiveness but possibly faster pain relief in the delayed phase.

Table 4.4 Pain severity among early treated patients(n=20)

Type	Pre exercise		Post exercise		Mean difference	P-value
	Mean	SD	Mean	SD		
Pain level	7.35	1.18	2.85	1.35	4.50	<0.001*

**Sig value*

Among early-treated patients(Table3.4), the mean pain score decreased markedly from7.35±1.18 before exercise to 2.85 ± 1.35 after exercise, yielding a mean reduction of 4.50 points on the Visual Analogue Scale (VAS).

Table 4.5 Pain *severity among delayed treated patients(n=20)*

Type	Pre exercise		Post exercise		Mean difference	P-value
	Mean	SD	Mean	SD		
Pain level	7.15	1.39	2.20	1.20	4.95	<0.001*

**Sig value*

Similarly, delayed-treated patients (Table 3.5) showed a substantial decrease in mean pain level from 7.15 ± 1.39 to 2.20 ± 1.20, with a slightly larger mean reduction of 4.95 points.

In summary ,both early and delayed exercise programs were highly effective in alleviating pain intensity, with statistically significant improvements observed in both groups. Although both interventions produced comparable outcomes, the delayed-treated group demonstrated a marginally greater reduction in pain scores, indicating slightly better post-intervention pain relief.

4.3.2 MCGILL Pain Scale differences

Among early-treated patients (Table 4.6), most pain domains showed mild improvements, although only three reached statistical significance. Notably, “Heavy” pain increased slightly (mean difference=+0.50, p=.02), while “Splitting”(mean difference=—1.15,p=.002)and “Punishing–Cruel ”pain(mean difference=—1.05, p=.023)significantly decreased following exercise .Other domains, including“Throbbing,”“Shooting,”“Sharp,”“Aching,”and “Tiring–

Exhausting,” demonstrated small, non-significant changes (p > .05). The sensory component declined marginally from 18.80 ± 3.44 to 17.70 ± 3.54, while the affective domain decreased from5.70±2.90to5.50

±2.37.Overall,totalpainseverityreducedslightlyfrom24.50±5.06 to 23.20 ± 4.14 (p = .350), indicating a modest but non-significant reduction in overall pain intensity.

Table 4.6 Pain severity domains MCGILL among early treated patients(n=20)

Type	Pre exercise		Post exercise		Mean difference	P-value
	Mean	**SD**	**Mean**	**SD**		
Throbbing	1.85	1.14	2.05	0.89	0.20	.569
Shooting	1.90	1.07	1.45	1.23	-0.45	.186
Stabbing	1.55	1.23	1.50	1.00	-0.05	.891
Sharp	1.60	1.23	1.30	1.22	-0.30	.356
Cramping	1.30	1.13	1.80	1.15	0.50	.163
Gnawing	1.70	1.03	2.05	1.19	0.35	.376
Hot-Burning	2.00	1.12	1.70	1.38	-0.30	.453
Aching	1.90	0.97	1.40	1.14	-0.50	.154
Heavy	1.30	0.86	1.80	1.11	0.50	.021*
Tender	1.30	1.30	1.40	1.10	0.10	.766
Splitting	2.40	0.99	1.25	0.97	-1.15	.002*
Tiring-Exhausting	1.60	1.23	1.45	1.23	-0.15	.659
Sickening	1.10	0.79	1.35	1.27	0.25	.489
Fearful	1.00	1.12	1.75	1.02	0.75	.065
Punishing-Cruel	2.00	1.30	0.95	1.10	-1.05	.023*
Sensory	18.80	3.44	17.70	3.54	-1.10	.270
Affective	5.70	2.90	5.50	2.37	-0.20	.818
Total	24.50	5.06	23.20	4.14	-1.30	.350

In delayed-treated patients (Table4.7), none of the pain domains showed statistically significant changes after the intervention. Mean differences were small across all types of pain, with the largest reduction observed for “Stabbing” pain (–0.60, p = .163) and the largest increase in “Tiring–Exhausting” pain (+0.70, p = .149). Both sensory and affective domains exhibited negligible differences (–0.40 and +0.10, respectively), and the total pain score decreased minimally from 22.35 ± 6.38 to 22.05 ± 5.08 (p = .870).

Table4.7 Pain severity domains MCGILL among delay treated patients(n=20*)*

Type	Pre exercise		Post exercise		Mean difference	P-value
	Mean	**SD**	**Mean**	**SD**		
Throbbing	1.60	1.19	1.25	1.25	-0.35	.406
Shooting	1.45	1.05	1.40	1.31	-0.05	.881
Stabbing	1.85	1.09	1.25	1.02	-0.60	.163
Sharp	1.50	1.00	1.45	1.19	-0.05	.899
Cramping	1.50	1.24	2.10	0.91	0.60	.117
Gnawing	1.60	1.39	1.45	1.23	-0.15	.697
Hot-Burning	1.25	1.12	1.50	1.10	0.25	.449
Aching	1.35	1.27	1.55	1.19	0.20	.599
Heavy	1.90	1.12	1.65	1.04	-0.25	.460
Tender	1.55	1.15	1.45	1.10	-0.10	.716
Splitting	1.15	1.27	1.25	1.07	0.10	.810
Tiring-Exhausting	1.10	1.25	1.80	1.32	0.70	.149
Sickening	1.50	1.15	1.50	0.95	-0.00	1.000
Fearful	1.55	1.28	1.25	1.21	-0.30	.460
Punishing-Cruel	1.50	1.32	1.20	0.89	-0.30	.494
Sensory	**16.70**	**4.95**	**16.30**	**4.37**	**-0.40**	**.801**
Affective	**5.65**	**2.41**	**5.75**	**2.43**	**0.10**	**.898**
Total	**22.35**	**6.38**	**22.05**	**5.08**	**-0.30**	**.870**

In summary, while early exercise resulted in slight improvements in certain pain domains, particularly splitting and punishing–cruel pain—overall pain severity did not change significantly in either group.Thefindingssuggestthatexercisehadalimitedshort-termimpact on subjective pain perception, with a modest advantage for early intervention.

4.3.3 Range of Motion Differences among patients

Among early-treated patients (Table 4.8), pre-exercise ROM values ranged from 58.70° (shoulder internal rotation) to 82.70° (shoulder flexion). After the exercise program, all joints showed substantial gains, with post-exercise means ranging between 75.85° and 106.80°. The mean differences across all joints varied from 14.90° (wrist extension) to 24.10° (shoulder flexion), and all improvements were statistically significant ($p < 0.001$). The total ROM improved from 69.41° ± 7.80 to 87.01° ± 7.62, indicating an overall mean increase of 17.60°.

Table4.8 Range of Motion in degree among Early treated patients (n=20)

Joint	Pre exercise		Post exercise		Mean difference	P-value
	Mean	SD	Mean	SD		
1.Shoulder Flexion	82.70	24.03	106.80	25.22	24.10	<0.001*
2.Shoulder Extension	72.75	25.33	91.15	27.12	18.40	<0.001*
3.Shoulder Abduction	72.45	30.49	89.30	32.45	16.85	<0.001*
4.Shoulder Adduction	67.80	34.90	84.70	36.32	16.90	<0.001*
5.ShoulderExternal Rotation(ER)	71.40	33.46	91.25	34.93	19.85	<0.001*
6.ShoulderInternalRotation (IR)	58.70	27.23	75.85	23.95	17.15	<0.001*
7. Elbow Flexion	62.40	29.79	79.15	32.01	16.75	<0.001*
8. Elbow Extension	77.90	31.67	95.70	29.94	17.80	<0.001*
9.Forearm Supination	70.20	30.91	87.65	34.27	17.45	<0.001*
10.Forearm Pronation	66.30	30.44	83.60	32.34	17.30	<0.001*
11.WristFlexion	71.45	27.56	88.60	26.90	17.15	<0.001*
12.WristExtension	61.40	28.63	76.30	27.89	14.90	<0.001*
13.WristRadialDeviation	61.15	26.97	76.55	27.74	15.40	<0.001*
14.WristUlnar Deviation	75.15	29.55	91.60	28.47	16.45	<0.001*
Total Range of Motion	**69.41**	**7.80**	**87.01**	**7.62**	**17.60**	**<0.001***

**Sig value*

For the delayed treatment group (Table 4.9), a similar pattern was observed. Baseline (pre-exercise) ROM ranged from 55.35° (wrist extension) to 80.45° (shoulder flexion), increasing after exercise to between71.60°and 103.70° .Mean improvements across joints ranged from13.85° (wrist flexion) to 23.25° (shoulder flexion), with all differences reaching statistical significance ($p < 0.001$). The total ROM rose from 68.96° ± 8.59 to 86.47° ± 8.42, an overall gain of 17.51°.

Table4.9 Range of Motion in degrees among Delay treated patients(n=20)

Joint	Pre exercise		Post exercise		Mean difference	P-value
	Mean	SD	Mean	SD		
1.Shoulder Flexion	80.45	18.91	103.70	16.36	23.25	<0.001*
2.Shoulder Extension	73.75	34.38	92.35	30.43	18.60	<0.001*
3.Shoulder Abduction	62.80	29.76	80.25	30.29	17.45	<0.001*
4.Shoulder Adduction	64.10	30.08	79.45	29.98	15.35	<0.001*
5.ShoulderExternal Rotation(ER)	76.20	33.32	93.35	35.67	17.15	<0.001*
6.ShoulderInternalRotation (IR)	66.70	28.04	84.20	28.82	17.50	<0.001*
7.Elbow Flexion	68.65	30.37	88.70	34.08	20.05	<0.001*
8.Elbow Extension	59.20	31.18	73.45	32.52	14.25	<0.001*
9.Forearm Supination	80.15	28.03	97.65	28.27	17.50	<0.001*
10.Forearm Pronation	66.85	32.17	84.45	34.22	17.60	<0.001*
11.WristFlexion	73.10	30.94	86.95	31.52	13.85	<0.001*
12.WristExtension	55.35	29.53	71.60	31.02	16.25	<0.001*
13.WristRadialDeviation	71.65	23.00	87.60	27.23	15.95	<0.001*
14.WristUlnar Deviation	66.45	30.79	86.90	28.19	20.45	<0.001*
Total Range of Motion	**68.96**	**8.59**	**86.47**	**8.42**	**17.51**	**<0.001***

**Sig value*

In summary, both early and delayed exercise interventions produced significant and nearly equivalent improvements in joint mobility across all upper-limb joints, confirming the effectiveness of the exercises in enhancing ROM regardless of the timing of initiation.

4.3.4 Muscle Power among patients

Among early-treated patients (Table 4.10), pre-exercise muscle power scores ranged from 2.85 (wrist flexors) to 3.45(elbow flexors). Following the exercise program, scores increased across all muscle groups, with post-exercise means between 3.30and3.90.The greatest improvement was observed in the forearm pronators and wrist extensors(0.60), while the smallest was in the forearm supinators (0.40).

Theoverallmeanmusclepowerrosefrom3.02±0.25to3.51±0.35, yielding an average gain of 0.49.

Table 4.10 Muscle ***Power among early treated patients(n=20)***

Joint	Pre exercise		Post exercise		Mean difference	P-value
	Mean	SD	Mean	SD		
1.Shoulder Flexors	2.90	0.85	3.35	1.09	0.45	<0.001*
2.Shoulder Abductors	3.00	0.86	3.50	0.95	0.50	<0.001*
3.ShoulderExternalRotators	2.90	0.72	3.35	0.93	0.45	<0.001*
4.Elbow Flexors	3.45	0.83	3.90	0.97	0.45	<0.001*
5.Elbow Extensors	2.95	0.89	3.50	1.19	0.55	<0.001*
6.Forearm Pronators	3.00	0.79	3.60	0.82	0.60	<0.001*
7.Forearm Supinator's	3.10	0.79	3.50	0.89	0.40	<0.001*
8.Wrist Flexors	2.85	0.81	3.30	0.86	0.45	<0.001*
9.Wrist Extensors	3.00	0.79	3.60	0.75	0.60	<0.001*
Total Muscle Power	3.02	0.25	3.51	0.35	0.49	**<0.001***

**Sig Value*

For delayed-treated patients (Table 4.11), pre-exercise muscle power values ranged from 2.70 (shoulder flexors) to 3.50 (shoulder abductors). After exercise, the post-exercise means improved to between 3.05 and 3.90, indicating consistent progress across all joints . The largest mean gain was noted in wrist extensors (0.75), while the smallest was in wrist flexors (0.20). The total mean muscle power increased from 2.98 ± 0.26 to 3.43 ± 0.31, with an average improvement of 0.45.

Table4.11 Muscle Power among delayed-treated patients (n=20)

Joint	Pre exercise		Post exercise		Mean difference	P-value
	Mean	SD	Mean	SD		
1.ShoulderFlexors	2.70	0.80	3.35	0.99	-0.65	<0.001*
2.ShoulderAbductors	3.50	0.76	3.90	0.97	-0.40	<0.001*
3.ShoulderExternalRotators	2.75	0.79	3.40	0.82	-0.65	<0.001*
4.Elbow Flexors	3.05	0.76	3.35	0.88	-0.30	<0.001*
5.Elbow Extensors	3.10	0.79	3.40	0.99	-0.30	<0.001*
6.Forearm Pronators	2.85	0.88	3.15	1.27	-0.30	<0.001*
7.Forearm Supinator's	2.85	0.88	3.35	1.09	-0.50	<0.001*
8.WristFlexors	2.85	0.81	3.05	0.94	-0.20	<0.001*
9.WristExtensors	3.15	0.81	3.90	0.97	-0.75	<0.001*
Total Muscle Power	2.98	0.26	3.43	0.31	-0.45	**<0.001***

**Sig value*

Overall, both groups demonstrated significant enhancement in upper-limb muscle strength following rehabilitation, with the early-treated group showing slightly higher mean improvements than the delayed group ,suggesting a potential advantage of early intervention in restoring muscle power.

4.3.5 Edema measurement among patients

Among early-treated patients (Table4.12),the pre-exercisemeanmid-armcircumferencewas29.85 cm, which decreased to 24.45 cm post-exercise, reflecting a mean reduction of 5.40 cm ($p<.001$). Wrist circumference also decreased from17.05cmto15.55cm,are duction of1.50 cm($p=.008$).The overall edema measurement declined from23.45±1.48cmto20.00±1.64 cm, yielding an average reduction of 3.45 cm ($p < .001$).

Table4.12 Edema measurement among early treated patients

Joint	Pre exercise		Post exercise		Mean difference	P-value
	Mean	SD	Mean	SD		
Mid Arm	29.85	2.54	24.45	2.86	-5.40	<.001*
Wrist	17.05	1.50	15.55	1.57	-1.50	.008*
Total Edema Measurement	23.45	1.48	20.00	1.64	-3.45	<.001*

**Sig value*

For delayed-treated patients(Table4.13),the mean mid-arm circumference decreased from29.05 cm to 25.50cm (mean reduction=3.55cm,$p<.001$),and the wrist measurement declined from17.05 cm to 15.70 cm (mean reduction = 1.35 cm, $p = .014$). The total edema measurement dropped from 23.05 ± 1.65 cm to 20.60 ± 1.61 cm, resulting in a 2.45 cm decrease ($p < .001$).

Table4.13:Edema measurement among delayed-treated patients

Joint	Pre exercise		Post exercise		Mean difference	P-value
	Mean	SD	Mean	SD		
Mid Arm	29.05	3.20	25.50	3.17	3.55	<.001*
Wrist	17.05	1.54	15.70	1.84	1.35	.014*
Total Edema Measurement	23.05	1.65	20.60	1.61	2.45	<.001*

**Sig value*

In summary, both early and delayed exercise interventions significantly reduced limb swelling. However, the early-treated group achieved a greater reduction in edema compared to the delayed group, suggesting that initiating exercise earlier leads to more effective control of post-injury swelling.

4.4 Functional differences among patients

4.4.1 Upper Extremities Functional Index UEFI

Among early-treated patients (Table 4.14), most individual functional tasks demonstrated slight improvement after exercise, though only one task reached statistical significance, reaching up to a high shelf (mean difference=–1.25,p=.003). Other activities, such as reaching behind the back (p=.051)and vacuuming, sweeping, or raking(p=.115), showed noticeable but non-significant gains. The total UEFI score decreased from 41.20 ± 5.13 to 35.20 ± 5.31 (mean difference=6.00,p<.001), indicating a marked improvement in upper extremity function and reduction in disability after early exercise therapy.

Table 3.14 Functional index and disability of the arm, shoulders, and hands among early treated patients (n=20)

Type	Pre exercise		Post exercise		Mean difference	P-Value
	Mean	SD	Mean	SD		
Any of your usual work, housework, or school activities	1.85	1.46	1.95	1.54	-0.10	.825
Your usual hobbies, recreational or Sporting activities	2.40	1.57	2.10	1.07	0.30	.487
Lifting a bag of groceries to waist level	1.75	1.33	2.00	1.30	-0.25	.514
Lifting a bag of groceries above your head	1.75	1.41	1.70	1.42	0.05	.904
Grooming your hair	2.65	1.31	2.05	1.57	0.60	.181
Pushing upon your hands(e.g., from a chair)	1.70	1.26	1.85	1.39	-0.15	.778
Preparing food (e.g.,peeling,cutting, stirring)	1.90	1.37	1.60	1.27	0.30	.554
Driving	2.15	1.63	1.95	1.15	0.20	.677
Vacuuming , sweeping,or raking	2.45	1.28	1.75	1.29	0.70	.115
Dressing	2.30	1.26	2.10	1.55	0.20	.703
Doing up buttons	1.70	1.26	2.35	1.39	-0.65	.148
Using tools or appliances (e.g.,scissors, screwdriver, can opener)	2.00	1.34	2.05	1.28	-0.05	.895
Opening a jar	2.25	1.37	1.85	1.42	0.40	.423
Carrying asmall suitcasewithyouraffected limb	1.55	1.61	1.40	1.19	0.15	.751
Carryingaheavyobject(e.g.,aheavybox orchild)	2.10	1.29	1.80	1.28	0.30	.437
Washingordryingyourhair	1.70	1.56	2.25	1.59	-0.55	.334
Tyingordoing up shoelaces	1.95	1.32	1.55	1.61	0.40	.500
Reachingup toa high shelf	1.50	1.32	2.75	1.16	-1.25	.003*
Reachingbehindyourback	2.35	1.39	1.40	1.47	0.95	.051
Performingheavyhousehold chores	1.85	1.50	2.15	1.42	-0.30	.505
TotalUFEI	41.20	5.13	35.20	5.31	6.00	<.001*

**Sig value*

In delayed-treated patients (Table 4.15), most functional domains also improved after intervention, though the changes were smaller and generally not statistically significant for individual items.

The largest positive changes were seen in tying shoelaces (mean difference= –0.90, p = .055) and carrying a small suitcase (mean difference = –0.80, p = .080). The total UFEIscoreimprovedsignificantlyfrom43.15±5.14to37.65±3.42(meandifference=–5.50, p < .001), reflecting enhanced upper-limb function after delayed treatment.

Table 4.15 Functional index and disability of the arm, shoulders, and hands among delayed-treated patients (n=20)

Type	**Pre exercise**		**Post exercise**		**Mean difference**	**P-Value**
	Mean	**SD**	**Mean**	**SD**		
Any of your usual work, housework, or school activities	2.20	1.70	1.85	1.31	-0.35	.392
Your usual hobbies,recreational or Sporting activities	2.20	1.24	1.45	1.47	-0.75	.118
Lifting a bag of groceries to waist level	1.65	1.57	2.05	1.36	0.40	.397
Lifting a bag of groceries above your head	2.00	1.52	2.20	1.54	0.20	.711
Grooming your hair	2.10	1.62	2.05	1.19	-0.05	.906
Pushing up on your hands(e.g., from a chair)	1.55	1.50	1.80	1.61	0.25	.650
Preparing food(e.g.,peeling,cutting, stirring)	1.85	1.50	2.35	1.35	0.50	.353
Driving	1.85	1.53	2.20	1.36	0.35	.330
Vacuuming, sweeping,or raking	1.35	1.39	1.55	1.57	0.20	.718
Dressing	2.20	1.47	1.50	1.67	-0.70	.209
Doing up buttons	1.90	1.55	1.60	1.50	-0.30	.573
Using tools or appliances(e.g.,scissors, Screw driver,can opener)	2.20	1.44	2.00	1.52	-0.20	.677
Opening a jar	2.05	1.23	2.30	1.38	0.25	.506
Carrying a small suit case with your affected limb	2.25	1.45	1.45	1.47	-0.80	.080
Carrying a heavy object (e.g.,a heavy box orchild)	2.10	1.21	2.60	1.27	0.50	.227
Washing or drying your hair	2.45	1.47	1.90	1.45	-0.55	.334
Tying or doing up shoelaces	2.30	1.45	1.40	1.47	-0.90	.055
Reaching up to ahigh shelf	2.00	1.56	2.25	1.41	0.25	.624
Reaching behind your back	2.25	1.33	1.75	1.41	-0.50	.344
Performing heavy house hold chores	1.85	1.53	2.25	1.33	0.40	.385
Total UFEI	**43.15**	**5.14**	**37.65**	**3.42**	**-5.50**	**<.001***

**Sig value*

In summary,both early and delayed exercise interventions effectively improved arm,shoulder, and hand function, with statistically significant reductions in total disability scores.

The early-treated group demonstrated slightly greater functional improvement, particularly in reaching activities, suggesting that earlier rehabilitation may yield faster recovery of upper-limb performance.

4.4.2 Disability of the arm, shoulders and hands among patients (DASH)

Among early-treated patients (Table 4.16), pre-exercise DASH scores indicated moderate disability (59.70±8.82),which improved significantlyto47.15±9.03post-exercise ,resulting in a mean reduction of 12.55 points ($p < .001$). Although most individual tasks showed numerical improvements, these changes were not statistically significant. The greatest improvements were observed in carrying a shopping bag or briefcase (–0.65), using a knife to cut food (–0.55), and severity of tingling (mean difference = +0.80, $p = .053$). The findings suggestthatearlyrehabilitationledtomeaningfulfunctionalrecoveryandreducedupper-limb disability, even though most individual task improvements were modest.

Table4.16 Disability of the arm, shoulders and hands among early treated patients (n=20)

Type	Pre exercise		Post exercise		Mean difference	P-Value
	Mean	SD	Mean	SD		
Opening a tight or new jar	2.60	1.57	2.35	1.27	-0.25	.437
Doing heavy house hold chores(e.g., washing walls, floors)	3.30	1.34	3.90	0.97	0.60	.104
Carrying a shopping bag or brief case	3.65	1.18	3.00	1.56	-0.65	.213
Washing your back	2.50	1.43	2.55	1.39	0.05	.927
Using a knife to cut food	3.35	1.57	2.80	1.32	-0.55	.275
Recreational activities that require little effort (e.g., playing cards, knitting)	3.25	1.16	3.20	1.36	-0.05	.893
Extent of arm, shoulder or hand pain	2.85	1.39	3.15	1.39	0.30	.541
Severity of tingling(pins and needles) in your arm, shoulder,or hand	2.20	1.40	3.00	1.30	0.80	.053
Difficulty sleeping because of arm, Shoulder ,or hand pain	3.15	1.31	3.00	1.45	-0.15	.745
Limitation in social activities because of your arm, shoulder, or hand problem	2.90	1.52	3.35	1.53	0.45	.197
Difficulty performing your usual work or other daily activities	3.25	1.41	3.40	1.50	0.15	.769
Total DASH	**59.70**	**8.82**	**47.15**	**9.03**	**-12.55**	**<.001***

*Sig value

Note: A higher score indicates higher disability

For delayed-treated patients (Table4.17),a similar trend was noted. The total DASH score decreased significantly from 53.40±9.45to45.50±7.72,showingameanimprovementof7.90 points (p <.001).

Individual task scores also improved, with the most noticeable changes in carrying a shopping bag(–0.90), using a knife to cut food (–0.80),and recreational activities (–0.75). Although these improvements did not reach statistical significance (p > .05), they indicate functional recovery following delayed exercise therapy.

Table4.17 Disability of the arm ,shoulders and hands among delayed-treated patients(n=20)

Type	Pre exercise		Post exercise		Mean difference	P-Value
	Mean	SD	Mean	SD		
Opening a tight or new jar	3.50	1.40	3.10	1.25	0.40	.305
Doing heavy house hold chores(e.g.,washing walls, floors)	3.55	1.43	3.15	1.50	0.40	.214
Carrying a shopping bag or brief case	3.50	1.67	2.60	1.67	0.90	.122
Washing your back	3.30	1.22	2.85	1.35	0.45	.267
Using a knife to cut food	3.60	1.31	2.80	1.36	0.80	.104
Recreational activities that require little effort(e.g.,playing cards,knitting)	3.65	1.39	2.90	1.45	0.75	.143
Exten to farm, shoulder or hand pain	3.55	1.43	3.05	1.36	0.50	.262
Severity shoulder, or hands and needles) in your arm, shoulder,orhand	3.00	1.62	3.00	1.34	0.00	1.000
Difficulty sleeping because of arm, shoulder, or hand pain	3.00	1.17	3.45	1.50	-0.45	.330
Limitation in social activities because of your arm, shoulder, or hand problem	3.10	1.29	2.95	1.32	0.15	.651
Difficulty performing your usual work or other daily activities	2.65	1.09	2.65	1.57	0.00	1.000
TotalDASH	**53.40**	**9.45**	**45.50**	**7.72**	**7.90**	**<.001***

*Sigvalue

Note:A Higher score indicates higher disability

In summary, both early and delayed rehabilitation programs significantly reduced upper-limb disability ,as evidenced by lower total DASH scores .However, the early treated group achieved a greater improvement (12.55vs.7.90points) ,suggesting that early initiation of exercise yields more substantial gains in arm, shoulder, and hand function.

4.4.3Comparing the ROM,musclepower ,edema,painseverity,UEFI,and DASH score in terms of early and delayed treatment among patients

The comparison between early and delayed treatment groups across all functional and clinical outcome measures revealed no statistically significant differences in most parameters, indicatingthatbothinterventionswerecomparablyeffectiveinimprovingpatients’upper-limb recovery. However, the only statistically significant difference between groups was found in the pre-test DASH score (p =.036), where the early-treated group started with higher baseline disability (59.70 vs. 53.40).

However, post-test scores (47.15 vs. 45.50; p = .538) showed no significant difference, indicating that both groups achieved comparable functional recovery after intervention. As seen in Table 4.18.

Table4.18Comparing the ROM, muscle power, edema, pain severity, UEFI and DASH score in terms of early and delayed treatment among patients

Test	**Group**		**Mean**	**SD**	**t**	**P-value**
Pre-test ROM	Early treatment	20	69.41	7.80	.175	.862
	Delayed treatment	20	68.96	8.59		
Post-test ROM	Early treatment	20	87.01	7.62	.214	.832
	Delayed treatment	20	86.47	8.42		
Pre-test Muscle Power	Early treatment	20	3.02	0.25	.488	.629
	Delayed treatment	20	2.98	0.26		
Post-test Muscle Power	Early treatment	20	3.51	0.35	.803	.427
	Delayed treatment	20	3.43	0.31		
Pre-test Edema	Early treatment	20	23.45	1.48	.809	.424
	Delayed treatment	20	23.05	1.65		
Post-test Edema	Early treatment	20	20.00	1.64	-1.168	.250
	Delayed treatment	20	20.60	1.61		
Pre-test Pain	Early treatment	20	24.50	5.06	1.180	.245
	Delayed treatment	20	22.35	6.38		
Post-test Pain	Early treatment	20	23.20	4.14	.785	.437
	Delayed treatment	20	22.05	5.08		
Pre-test severity of Pain	Early treatment	20	7.35	1.18	.491	.626
	Delayed treatment	20	7.15	1.38		
Post-test severity of Pain	Early treatment	20	2.85	1.34	1.612	.115
	Delayed treatment	20	2.20	1.19		
Pre-test UEFI	Early treatment	20	41.20	5.13	-1.201	.237
	Delayed treatment	20	43.15	5.14		
Post-test UEFI	Early treatment	20	35.20	5.31	-1.735	.092
	Delayed treatment	20	37.65	3.42		
Pre-test DASH	**Early treatment**	**20**	**59.70**	**8.82**	**2.180**	**.036***
	Delayed treatment	20	53.40	9.45		
Post-test DASH	Early treatment	20	47.15	9.03	.621	.538
	Delayed treatment	20	45.50	7.72		

**Sig value*

4.4.4Relationshipbetweenageandtheoutcomemeasurement

Among the early-treated group, no correlations were observed across different measures. In addition, in the delayed-treated group, a similar pattern was evident. Correlation coefficients were non-significant. In summary, across both early and delayed rehabilitation groups, age was not a determining factor in any clinical or functional outcome. As seen in both Table 4.19 and Table 4.20.

Table4.19 Relationship between age and outcome measurement among early treated group (n=20)

Outcome measurement	Age	
	r	P-value
Pre-test ROM	.191	.419
Post-test ROM	.083	.729
Pre-test Muscle Power	-.177	.455
Post-test Muscle Power	-.122	.608
Pre-test Edema	-.046	.847
Post-test Edema	-.316	.175
Pre-test Pain	-.177	.454
Post-test Pain	.092	.699
Pre-test severity of Pain	.214	.364
Post-test severity of Pain	-.139	.559
Pre-test UEFI	.159	.502
Post-test UEFI	.308	.187
Pre-test DASH	.176	.458
Post-test DASH	-.080	.738

**Sig value*

Table20 Relationship between age and outcome measurement among delay treated group(n=20)

Outcome measurement	Age	
	r	P-value
Pre-test ROM	.050	.835
Post-test ROM	.037	.878
Pre-test Muscle Power	.070	.768
Post-test Muscle Power	.058	.807
Pre-test Edema	.082	.731
Post-test Edema	.117	.622
Pre-test Pain	.102	.670
Post-test Pain	-.223	.344
Pre-test severity of Pain	.115	.629
Post-test severity of Pain	-.351	.129
Pre-test UEFI	-.053	.826
Post-test UEFI	.095	.691
Pre-test DASH	-.103	.666
Post-test DASH	-.098	.681

4.4.5 Relation ship between pain severity and the outcome measurement

In the early-treated group, there were no statistically significant correlations between pain severityandanyoftheoutcomemeasures,indicatingimprovementsinrangeofmotion,muscle power, edema reduction, and functional recovery occurred independently of pain intensity levels before and after the intervention. As seen in Table 4.21.

Table4.21Relationship between severity of pain and outcome measurement among early treated group (n=20)

Outcome measurement	Pre-test severity of Pain		Post-test severity	
	r	P-value	R	P-value
Pre-test ROM	-.177	.455	-.319	.171
Post-test ROM	-.213	.367	-.262	.264
Pre-test Muscle Power	.040	.868	.142	.550
Post-test Muscle Power	-.038	.874	.303	.193
Pre-test Edema	-.180	.446	.062	.795
Post-test Edema	-.072	762	-.033	.891
Pre-test UEFI	.139	.560	-.428	.060
Post-test UEFI	.045	.852	-.170	.473
Pre-test DASH	.114	.632	-.121	.612
Post-test DASH	-.331	.154	.035	.883

In contrast, the delayed-treated group showed two significant relationships. Amoderate positive correlation was found between pre-test pain severity and post-test edema (r = .457, p = .043), suggesting that participants with higher initial pain tended to retain more swelling after treatment. Additionally, a moderate negative correlation was observed between post-test pain severity and pre-test edema (r = –.514, p = .020), implying that patients who began with less swelling experienced greater pain reduction after therapy. These findings suggest that in delayed rehabilitation, the relationship between pain and edema plays a more notable role in recovery outcomes. As seen in Table 4.22.

Table 4.22 Relationship between severity of pain and outcome measurement among delay treated group (n=20)

Outcome measurement	Pre-test severity of		Post-test severity of Pain	
	r	P-value	r	P-value
Pre-test ROM	-.046	.847	-.121	.613
Post-test ROM	-.060	.801	-.161	.497
Pre-test Muscle Power	-.107	.654	.030	.901
Post-test Muscle Power	-.238	.313	-.043	.857
Pre-test Edema	-.252	.284	.457	.043*
Post-test Edema	-.514	.020*	.138	.562
Pre-test UEFI	-.155	.515	-.010	.967
Post-test UEFI	-.232	.325	.335	.149
Pre-test DASH	-.007	.976	-.051	.832
Post-test DASH	.145	.542	-.066	.781

**Sig value*

4.4.6 Difference between outcome measurements (UEFI and DASH) in terms of affected side among early and delayed groups

In the early-treated group, pre- and post-intervention UEFI scores did not differ significantly between right and left sides (p =.509 and p =.579, respectively), indicating similar functional performance regardless of which limb was affected. However, a significant difference was found in the pre-test DASH score (p = .009), where participants with right-sided involvement had higher disability (mean = 65.11 ± 4.70) compared to those with left-sided involvement (mean = 55.27 ± 9.07). After treatment, this difference was no longer significant (p = .118), suggesting that rehabilitation effectively reduced side-related disparities in disability levels.

In the delayed-treated group, none of the comparisons between right and left sides reached statisticalsignificance.BothUEFIandDASHscoresbeforeandaftertreatment(p>.05)were similar, indicating comparable functional recovery regardless of the affected side. As seen in Table 4.23.

Table 4.23 Difference between outcome measurements (UEFI and DASH) in terms of affect side among early and delayed groups

Measurement	Affected side	Early Group				Delay Group			
		n	Mean	SD	P-value	n	Mean	SD	P-Value
Pre-UEFI	Right	9	40.33	6.65	.509	13	42.62	4.46	.541
	Left	11	41.91	3.65		7	44.14	6.49	
Post-UEFI	Right	9	34.44	6.13	579	13	37.46	3.26	.747
	Left	11	35.82	4.75		7	38.00	3.96	
Pre-DASH	Right	9	65.11	4.70	.009*	13	50.85	9.38	.100
	Left	11	55.27	9.07		7	58.14	8.15	
Post-DASH	Right	9	50.67	8.62	.118	13	44.23	8.02	.329
	Left	11	44.27	8.68		7	47.86	7.06	

**Sig value*

Overall, the findings suggest that limb laterality (right vs. left) did not significantly influence functional outcomes following rehabilitation in either group .Although patients with right-sided involvement initially showed greater disability in the early-treated group, post-intervention scores indicated equivalent recovery across both sides.

4.4.7Difference between outcome measurements (UEFI and DASH)in terms of Dominant hand among early and delayed groups

In the early-treated group, no statistically significant differences were found between participantswithdominant(right)andnon-dominant(left)handinvolvementforbothUEFIand DASH scores before and after treatment ($p > .05$). This indicates that functional improvement and reduction in disability were comparable regardless of whether the dominant or non-dominant hand was affected.

In contrast, the delayed-treated group showed a significant difference in post-test UEFI scores ($p = .015$), where patients with left-hand (non-dominant) involvement demonstrated higher functional scores (mean = 43.00 ± 0.00) compared to those with right-hand (dominant) involvement (mean = 37.06 ± 3.06). This suggests slightly better recovery of functional performance when the non-dominant side was affected. However, no significant differences wereobservedinDASHscoresatanystage($p>.05$),indicating that perceived disability levels were similar for both dominant and non-dominant hands. As seen in Table 4.24.

Table4.24 Difference between outcome measurement (UEFI and DASH) in terms of the dominant hand among early and delayed groups

Measurement	Affected side	Early Group				Delay Group			
		n	Mean	SD	P-value	n	Mean	SD	P-Value
Pre-UEFI	Right	18	41.33	5.40	.737	18	42.67	5.18	.216
	Left	2	40.00	0.00		2	47.50	2.12	
Post-UEFI	Right	18	34.94	5.48	.480	18	37.06	3.06	.015*
	Left	2	37.50	3.54		2	43.00	0.00	
Pre-DASH	Right	18	59.94	9.28	.385	18	53.50	9.44	.892
	Left	2	57.50	2.12		2	52.50	13.44	
Post-DASH	Right	18	46.89	9.39	.668	18	44.94	7.26	.348
	Left	2	49.50	6.36		2	50.50	13.44	

**Sig value*

In summary, dominant-hand involvement had minimal influence on rehabilitation outcomes overall. Only the delayed-treatment group showed a notable advantage in functional recovery (UEFI) for non-dominant hand injuries, while disability perception (DASH) remained unaffected in both groups.

4.5. Comparing Early and Delayed Exercise Groups Across Outcome Measures

The two-way mixed ANOVA results revealed a significant main effect of Time across all outcomemeasures($F(1,38)=146.20, p<.001, \eta^2=0.79$),indicatingthatbothearlyanddelayed exerciseinterventionsledtosubstantialimprovementsfrompre-topost-intervention.However, no significant main effect of Group or Group × Time interaction was found for any variable, suggesting that the timing of the exercise program (early vs. delayed) did not differentially affect recovery outcomes. Although the disability level was reduced. Specifically, the estimated marginal means showed that both groups achieved similar post intervention outcomes across all measures. ROM improved comparably between the early (M=78.21°,SE=1.80)and delayed(M=77.71°,SE=1.80) groups(p=.846).Muscle power(M=3.26vs.3.20, p =.494),edema(M =21.72vs.21.82,p=.771),pain(M =23.85vs.22.20,p= .179), and severity of pain (M = 5.10 vs. 4.67, p = .092) also demonstrated no statistically significant between-group differences. Likewise, functional performance measured by the Upper Extremity Functional Index (UEFI) (M = 38.20 vs. 40.40, p = .105) and disability measured by the DASH score(M=53.42vs.49.45,p=.115)showed no meaningful difference between groups. As seen in Table 4.25.

Table4.25 Two-Way Mixed ANOVA Comparing Early and Delayed Exercise Groups Across Outcome Measures

Measures	Groups	Estimated Marginal Mean(SE)	Mean Difference (Early Delayed)	p value	Interpretation
ROM	Early	78.21°(1.80)	0.50°	.846	No significant difference
	Delayed	77.71°(1.80)			
Muscle Power	Early	3.26 (0.063)	0.06	.494	No significant difference
	Delayed	3.20 (0.063)			
Edema	Early	21.72 (0.241)	-0.10	.771	No significant difference
	Delayed	21.82 (0.241)			
Pain	Early	23.85 (0.852)	1.65	.179	No significant difference
	Delayed	22.20 (0.852)			
Severity pain	Early	5.10 (0.174)	0.42	.092	No significant difference
	Delayed	4.67 (0.174)			
UEFI	Early	38.20 (0.936)	-2.20	.105	No significant difference
	Delayed	40.40 (0.936)			
DASH	Early	53.42 (1.743)	3.97	.115	No significant difference
	Delayed	49.45 (1.743)			

Note.Valuesareestimatedmarginalmeans(SE)fromatwo-waymixedANOVAwithonebetween-subjectsfactor(Group:Earlyvs.Delayed)andonewithin-subjectsfactor(Time:Prevs.Post).Allassumptionsweremet(Shapiro–Wilkand Levene's tests,p >.05).A significantmain effectofTime wasfound forallmeasures (F(1,38)=146.20,p<.001,η^2=0.79),indicatingoverallimprovementpost-intervention.

**Sig value*

Figure 5 compares the outcomes of early and delayed exercise groups across several measures, including range of motion (ROM), muscle power, edema, pain, severity of pain, the Upper Extremity Functional Index (UEFI), and the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire. Both groups show nearly identical improvements in ROM, with early and delayed groups scoring 78.21 and 77.71, respectively. Muscle power scores are almost the same at 3.26 and 3.2. For edema and pain, the early group shows slightly higher values (21.72 and 23.35) compared to the delayed group (21.82 and 22.2), suggesting marginally greater initial improvement in the early group.

Severity of pain is lower in the delayed group (4.67) versus the early group (5.1), indicating a slight advantage for the delayed group in perceived pain reduction at the measured time point. Functional outcomes favor the early group, with higher UEFI (35.2 vs. 40.4) and DASH (53.42 vs. 49.45) scores, reflecting earlier gains in upper-limb function. Overall, the chart illustrates that while early exercise may provide faster improvements in function and pain management, delayed exercise achieves comparable outcomes across most measures by the end of the study period.

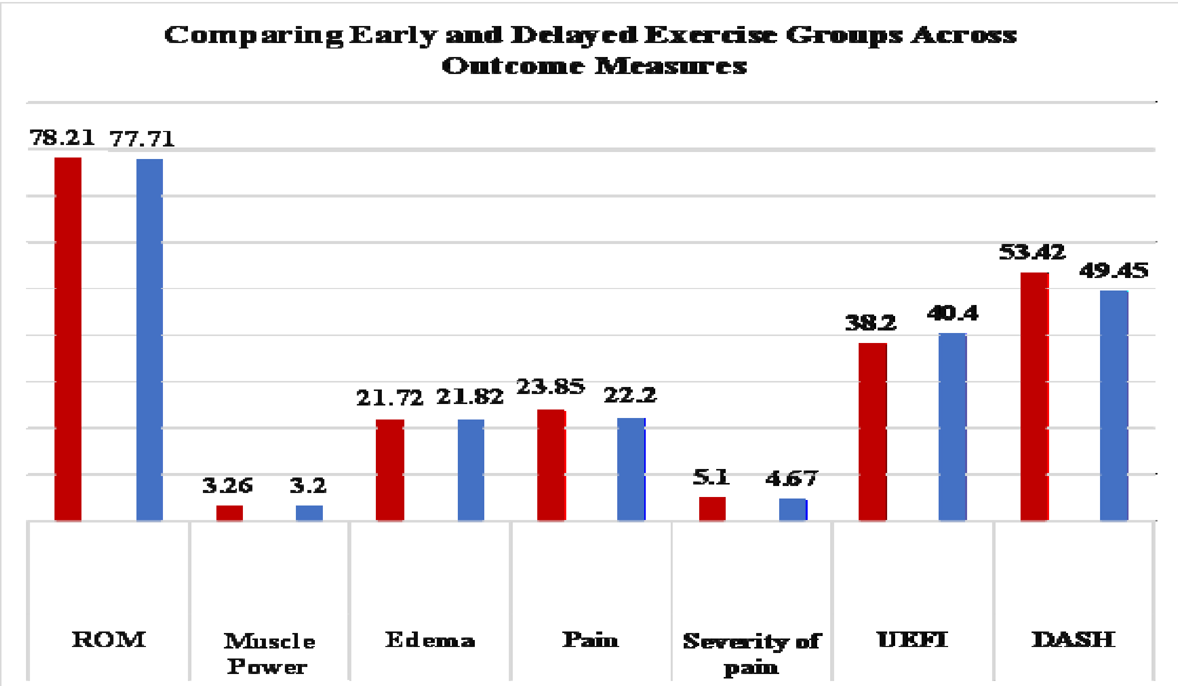

Figure 5 Comparing Early and Delayed Across Outcome Measures

In summary, both early and delayed exercise programs were equally effective in enhancing range of motion, muscle strength, edema reduction, pain relief, and upper-limb function. The significant effect of time confirms that rehabilitation produced overall functional recovery, while the non-significant group difference suggest that either Tim in approach can yield similar therapeutic outcomes.

4.2 Section Two: Discussion

Thepresentstudyaimedtoevaluatetheimpactofearlyversusdelayedphysiotherapyinitiation on pain reduction and overall functional recovery following humerus fracture in a resource-limited setting. The results revealed that both early and delayed physiotherapy interventions led to statistically significant improvements in pain(VAS),range of motion(ROM),muscle power, and upper limb function according to functional outcomes (UEFI and DASH scores).However, although no statistically significant between-group differences were observed in most outcome measures, indicating that both early and delayed physiotherapy produced comparable functional recovery, the early group demonstrated slightly greater improvement in muscle power and disability reduction. These findings provide partial support for the first hypothesis and full support for the second and third hypotheses.

4.2.1 Effect of Timing of Physiotherapy on Functional Recovery

The first hypothesis proposed that early initiation of physiotherapy would lead to better outcomes, such as improved ROM and muscle strength, compared to delayed initiation. Our findings partially supported this assumption. Both groups demonstrated significant pre–post improvements in ROM and muscle power, but between-group differences were not statistically significant. This suggests that while early rehabilitation facilitates earlier functional gains, delayed initiation once undertaken consistently can still yield comparable improvements .These results align with the findings of **Alnahdi et al. (2020)**, who reported that the timing of physiotherapy after upper-limb fractures influenced the rate, but not necessarily the extent, of functional recovery. Similarly, **Han et al. (2021)** found that early mobilization after humeral fractures improved short-term ROM ,but long-termoutcomesat12weekswerenotsignificantly different between early and delayed groups. Moreover, **Mikkelsen et al. (2022)** observed that adherence and exercise intensity were stronger predictors of recovery than initiation timing alone.

Collectively, these findings suggest that although early physiotherapy offers potential advantages in reducing stiffness and accelerating strength restoration, consistent, structured rehabilitation, regardless of timing, remains the key determinant of ultimate recovery.

4.2.2 Effect of Physiotherapy Timing on Pain Reduction

The second hypothesis stated that there would be no significant difference in pain reduction between early and delayed physiotherapy initiation. This hypothesis was supported. Both groups demonstrated significant reduction in pain intensity (VAS)after the intervention, with no meaningful differences between them. This findingisconsistent with**deOliveiraetal.(2020)**,who found that the timin gofexercise initiationafterupper-limbsurgerydidnotsignificantlyalterpaintrajectories.Likewise,**Huang et al. (2021)** reported that physiotherapy-induced pain reduction is more strongly related to tissuehealingandneuro-modulatoryadaptationsthantothespecifictimingofexerciseinitiation.

Thesimilarityinpost-interventionpainlevelsinbothgroupsinourstudysuggeststhatonce exercise begins, the analgesic mechanisms—including improved circulation, endorphin release, and desensitization—are equally activated regardless of start time.

4.2.3 Functional Recovery & Disability Level

The third hypothesis proposed no significant difference in functional recovery between early and delayed physiotherapy initiation. This hypothesis was also supported. Both groups achieved significant improvement in functional outcomes as measured by UEFI and DASH scores, indicating reduced disability and improved performance in daily activities. However, between-group comparisons were not statistically different, implying that both intervention timings were similarly effective by the end of the rehabilitation period.

Comparable findings were reported by **Liao et al. (2023)**, who showed equivalent functional outcomesatthreemonthsinearlyversusdelayedphysiotherapyfollowingupperlimbfractures, and by **Ariyoshi et al. (2019)**, who noted that long-term upper extremity function was more closely linked to thequality ofrehabilitation ratherthan theinitiation time. Additionally, **Kim et al. (2021)** emphasized that patient motivation, adherence, and home exercise compliance significantly influence functional recovery.

Furthermore, in resource-limited settings such as patients' homes, these findings are clinically relevant as access barriers such as financial limitations, travel difficulties, and delayed referral commonly postpone rehabilitation initiation. Our study results indicate that while early initiation remains ideal, delayed rehabilitation—when delivered adequately—can still achieve substantial functional recovery. This supports the feasibility and effectiveness of community-based physiotherapymodelsin low-resource environments,ashighlightedby**Asirietal.(2020)** and **Naidoo et al. (2022)**.

Regarding disability levels, the study demonstrated a significant reduction in disability across both groups, as reflected in improved DASH and UEFI scores from pre- to post-intervention. Participants showed meaningful gains in upper extremity function, reduced pain-related limitations, and greater ease in performing daily tasks. Although early initiation of physiotherapy produced slightly faster initial improvements, the final disability levels at the end of treatment were comparable between the early and delayed groups. This suggests that, while early rehabilitation may accelerate short-term progress, delayed physiotherapy—when delivered with consistent sessions and proper guidance—can still effectively restore functional independence. These findings are supported by previous research indicating that disability outcomes after upper limb injuries depend more on treatment quality, patient engagement, and adherence to home programs than on the exact timing of rehabilitation initiation.

For example, **Harris et al. (2020)** reported that structured physiotherapy programs yielded significant improvements in disability scores among individuals with upper extremity fractures, regardless of whether therapy began early or several weeks after injury. The observed improvements in the present study further reinforce the value of well-designed rehabilitation, even when initiation is delayed due to systemic, socioeconomic, or referral barriers.

4.3 Study Limitations and Future Directions

The main limitations of this study include the relatively modest sample size, which may limit generalizability. Moreover, the short follow-up duration for participant tsas we could not follow up with them for months, but it was for several weeks.

Thus, future studies should incorporate larger samples,longer-termfollow-up,andmultidimensionaloutcomestobetterunderstandhowtiming interacts with adherence, psychosocial factors, and socioeconomic context in low resource-limited settings.

Chapter Five

Conclusions and Recommendations

5.1 Conclusions

This study evaluated the influence of physiotherapy initiation timing—early versus delayed—on pain reduction ,range of motion (ROM),muscle strength ,and functional recovery following humerus fracture rehabilitation in resource-limited settings:

- The findings confirm that well-structured programs emphasizing active movement, strengthening, and patient education are highly effective in restoring upper-limb function and reducing pain after fracture, regardless of initiation timing, as both early and delayed physiotherapyinterventionsproducedsignificantimprovementsinallmeasuredoutcomes , such as pain, ROM, muscle power, functional abilities, and disability levels.

- While early commencementmighthasten the healing process, consistent delayed initiation can produce functional outcomes by the end of the program that are equivalent .Thus, the results advocate early referrals whenever possible but also reassure clinicians that delayed intervention, when structured effectively, can still deliver optimal functional gains.

- There is a central and evident role of physiotherapy in enhancing physical and functional outcomes

- The **quality, intensity, and continuity** of physiotherapy are more crucial than the exact start date, particularly in resource-limited settings where delays in accessing care are common.

- The results reinforce the need for the adaptability of physiotherapy interventions and support the development of cost-effective community-based models of care for fracture rehabilitation.

5.2 Recommendations

5.2.1 Clinical Recommendations

1. **Early referral and initiation** of physiotherapy remained visible whenever possible, as early mobilization can help prevent stiffness and accelerate recovery.

2. **Standardized rehabilitation protocols** should be implemented to ensure consistency of care across early and delayed treatment groups, emphasizing gradual progression of active ROM, strengthening, and functional training.

3. **Patient education** programs should be integrated into all physiotherapy plans to promote adherence, reduce fear of movement, and encourage home exercise continuation.

4. In **resource-limited environments**, community-based and tele-rehabilitation models should be expanded to mitigate access barriers related to cost and transportation.

5. **Pain and functional outcome assessments** (VAS, DASH, UEFI) should be routinely incorporated into clinical practice to monitor progress and tailor interventions effectively.

5.2.2 Recommendations for Policy and Health Systems

1. **Health authorities and hospitals** should establish referral pathways that prioritize early physiotherapy involvement after orthopedic stabilization.

2. **Insurance coverage and public health funding** should include post-fracture rehabilitation services to ensure continuity of care and equitable access.

3. **Training workshops** should be provided for physiotherapists to standardize managementapproachesforhumerusfracturesandtoupdateevidence-basedpractices.

5.2.3 Recommendations for Future Research

1. Conduct **long-term follow-up studies**(≥6months)to examine the sustainability of

   Functional gains achieved with early and delayed rehabilitation.

2. Investigate the **psychosocial and quality-of-life outcomes** associated with different initiation timings.

3. Explore **cost-effectiveness analysis** of early versus delayed physiotherapy to guide health-policy decisions in low-resource settings.
4. Include **larger multi-centered randomized controlled trials** to enhance the generalizability of findings.
5. Examine the role of **digital or home-based interventions** (e.g., mobile physiotherapy apps, tele-rehabilitation) to improve access and adherence among patients facing financial or logistical barriers.
6. Should include a written check-up form for patients' commitment at home program exercises to ensure the validity of the results.

5.2.4 ClinicalImplications

From a clinical stand point ,these findings high light that structured ,progressive exercise therapy is the central driver of recovery in humerus fracture rehabilitation, rather than timing alone. Early physiotherapy may accelerate the trajectory of improvement, but delayed initiation does not preclude successful outcomes if therapy is of sufficient duration and intensity.

This emphasizes the importance of ensuring continuity of care and patient adherence through education, motivation, and accessible rehabilitation services.

5.3 Summary

In summary, this thesis provides strong evidence that physiotherapy, whether initiated early or delayed, plays a pivotal role in the comprehensive rehabilitation of patients following a humerus fracture. The results demonstrated that both intervention timings produced significant within-group improvements in pain reduction, range of motion, muscle power, and upper-limb functional performance. These findings confirm that physiotherapy is a cornerstone in the restoration of upper-extremity function, supporting its continued integration into post-fracture management protocols.

Early physiotherapy initiation showed a trend toward faster improvement in muscle strength and disability reduction, suggesting that prompt mobilization may accelerate short-term recovery. Nevertheless, the absence of statistically significant differences between early and delayed groups indicates that delayed initiation, when accompanied by structured and consistent exercise programs, can achieve comparable long-term results. This outcome underscores the principle that **the quality, intensity, and adherence to rehabilitation are more influential than the exact timing of initiation**.

The findings also contribute valuable insight into the realities of clinical practice in resource-limited settings. Many patients experience delays in accessing rehabilitation due to financial constraints, transportation difficulties, or limited-service availability. The comparable effectiveness of delayed physiotherapy observed in this study provides encouraging evidence that, even when rehabilitation starts later, meaningful recovery can still be achieved through evidence-based protocol sand therapist-guidedprograms.This reinforcesthefeasibilityof community-based and home-exercise rehabilitation models, which are particularly relevant in low- and middle-income regions. Furthermore, this thesis highlights the multidimensional benefits of physiotherapy—not only in improving physical parameters such as pain and range of motion but also in enhancing patients'independence,confidence,andqualityoflife.Theintegrationofpatienteducationand functional task training likely contributed to these broad outcomes by promoting self-efficacy and adherence. These findings align with contemporary rehabilitation frameworks that emphasize patient-centered care and active participation as key determinants of successful recovery.

Collectively, the outcomes of this research provide empirical support for the development of **standardized, accessible, and scalable physiotherapy protocols** for upper-limb fracture rehabilitation.

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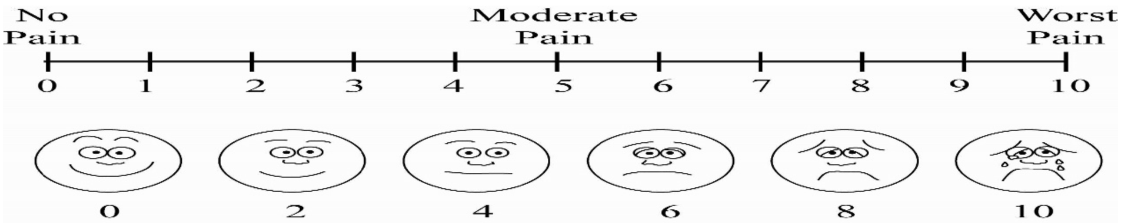
Appendix

Appendix A: Outcome Measures

1.**Pain Assessment:**

Tool :Visual Analog Scale(VAS).

- **Description:** A 10-point scale measuring pain intensity, with 0 indicating no pain and 10 representing the worst imaginable pain.



Tool: MCGILL short pain scale

SHORT-FORM McGILL PAIN QUESTIONNAIRE

RONALD MELZACK

PATIENT'S NAME: ______________________ DATE: ____________

	NONE	MILD	MODERATE	SEVERE
THROBBING	0) ____	1) ____	2) ____	3) ____
SHOOTING	0) ____	1) ____	2) ____	3) ____
STABBING	0) ____	1) ____	2) ____	3) ____
SHARP	0) ____	1) ____	2) ____	3) ____
CRAMPING	0) ____	1) ____	2) ____	3) ____
GNAWING	0) ____	1) ____	2) ____	3) ____
HOT-BURNING	0) ____	1) ____	2) ____	3) ____
ACHING	0) ____	1) ____	2) ____	3) ____
HEAVY	0) ____	1) ____	2) ____	3) ____
TENDER	0) ____	1) ____	2) ____	3) ____
SPLITTING	0) ____	1) ____	2) ____	3) ____
TIRING-EXHAUSTING	0) ____	1) ____	2) ____	3) ____
SICKENING	0) ____	1) ____	2) ____	3) ____
FEARFUL	0) ____	1) ____	2) ____	3) ____
PUNISHING-CRUEL	0) ____	1) ____	2) ____	3) ____

NO PAIN |————————————————————————| WORST POSSIBLE PAIN

P P I

0 NO PAIN ____
1 MILD ____
2 DISCOMFORTING ____
3 DISTRESSING ____
4 HORRIBLE ____
5 EXCRUCIATING ____

Fig. 1. The short-form McGill Pain Questionnaire (SF-MPQ). Descriptors 1–11 ...

2. : **Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire.**

Tool: Short-formArabicversionoftheDisabilitiesoftheArm,Shoulder,andHand (DASH) questionnaire.

Description: Aself-reportedquestionnaireassessingupperlimbfunctionalityindaily and occupational activities.

Overall DASH Score: Typically ranges from 0 to 10 in healthy adults, where 0 indicates no disability and 100 indicates maximum disability.

DASH Score Range	Interpretation
0–15	Minimal or no disability – typical of healthy populations or post-rehab success.
16–30	Mild disability – some difficulty with strenuous/occupational activities.
31–50	Moderate disability – noticeable limitations in daily and work-related tasks.
51–75	Severe disability – significant functional impairment; impacts basic ADLs.
76–100	Very severe/extreme disability – profound limitation; likely requires intervention.

إعاقات الذراع والكتف واليد (مختصر)

الرجاء أن تقيّم قدرتك على فعل النشاطات التالية خلال الأسبوع الماضي، و ذلك بوضع دائرة حول الرقم الذي يقع تحت الجواب المناسب.

	بلا صعوبة	بصعوبة خفيفة	بصعوبة متوسطة	بصعوبة شديدة	غير قادر
1. أن تفتح علبة جديدة أو مُحكمة الإغلاق.	1	2	3	4	5
2. أن تقوم بأعمال المنزل الثقيلة (مثل غسل الحيطان أو إزاحة الأثاث أو سواها من الأشياء الثقيلة).	1	2	3	4	5
3. أن تحمل كيس التسوق أو حقيبة الوثائق.	1	2	3	4	5
4. أن تغسل ظهرك.	1	2	3	4	5
5. أن تستخدم سكيناً لتقطيع الطعام.	1	2	3	4	5
6. أن تقوم بنشاطات ترفيهية تبذل فيها بعض القوة أو الدفع عبر ذراعك أو كتفك أو يدك (مثل لعب التنس أو سواها من الألعاب الأخرى).	1	2	3	4	5

	لا أبداً على الإطلاق	بشكل طفيف	بشكل متوسط	كثيراً	بشكل بالغ للغاية
7. خلال الأسبوع الماضي، هل أثرت المشكلة في ذراعك أو كتفك أو يدك بنشاطاتك الاجتماعية العادية مع عائلتك، أو أصدقائك، أو جيرانك، أو زملائك بالمهنة/النادي الاجتماعي؟ (ضع دائرة حول الرقم المناسب)	1	2	3	4	5

	غير محدود على الإطلاق	محدود بشكل طفيف	محدود بشكل متوسط	محدود جداً	غير قادر
8. خلال الأسبوع الماضي، هل أثرت المشكلة في ذراعك أو كتفك أو يدك بنشاط عملك أو أي نشاطات يومية اعتيادية أخرى؟ (ضع دائرة حول الرقم المناسب)	1	2	3	4	5

الرجاء تقدير شدة العوارض التالية التي أحسست بها خلال الأسبوع الماضي (ضع دائرة حول الرقم المناسب).

	لا يوجد	قليلاً	بشكل متوسط	بشدة	بشدة بالغة للغاية
9. وجع/ ألم/عوار في الذراع، أو الكتف، أو اليد.	1	2	3	4	5
10. وخز (مثل وخز الدبابيس و الإبر) في ذراعك، أو كتفك، أو يدك.	1	2	3	4	5

	لا صعوبة	صعوبة خفيفة	صعوبة متوسطة	صعوبة شديدة	صعوبة بالغة الشدة بحيث لا أقدر على النوم
11. خلال الأسبوع الماضي، كم كانت صعوبة نومك بسبب الوجع/ألم/عوار في ذراعك، أو كتفك، أو يدك؟ (ضع دائرة حول الرقم المناسب)	1	2	3	4	5

إعاقات الذراع والكتف واليد (مختصر): إجمالي درجات الإعاقات / الأعراض = [(مجموع عدد الاجابات) / العدد – 1] × 25 ، حيث(العدد) يساوي عدد الإجابات المكتملة.

لا يمكن حساب إجمالي الدرجات في مقياس إعاقات الذراع والكتف واليد (مختصر) إذا تجاوز عدد البنود الناقصة بنداً واحداً.

2
Arabic translation courtesy of Naser Mohammed Alotaibi, School of Occupational Therapy, Texas Woman's University, TX, USA / School of Occupational Therapy, Kuwait University, Kuwait.

إعاقات الذراع والكتف واليد (مختصر)

وحدة قياس العمل (اختياري)

الأسئلة التالية تستفسر عن تأثير مشكلة ذراعك، أو كتفك، أو يدك على مقدرتك على العمل (بما فيه القيام بالأعمال المنزلية إن كان ذلك هو دور عملك الرئيسي).
الرجاء أن تذكر ما هو عملك/ وظيفتك: ____________________
☐ أنا لا أعمل (يمكنك ترك هذا القسم).

الرجاء أن تضع دائرةً حول الرقم الأفضل وصفاً لمقدرتك الجسدية خلال الأسبوع الماضي، هل عانيتَ أية صعوبةٍ في

	لا صعوبة	صعوبة خفيفة	صعوبة متوسطة	صعوبة شديدة	غير قادر
1. أن تستخدم أسلوبك الاعتياديَ في عملك؟	1	2	3	4	5
2. أن تؤدّي عملكَ الاعتيادي، و ذلك بسبب وجع/ ألم/ عوار الذراع أو الكتف أو اليد؟	1	2	3	4	5
3. أن تؤدّي عملك بشكلٍ حسن مثلما تريد؟	1	2	3	4	5
4. أن تقضي نفس القدر من الوقت الذي تستغرقه عادةً لأداء عملك؟	1	2	3	4	5

وحدة قياس الرياضات / فنون الأداء (اختياري)

تتعلق الأسئلة التالية بتأثير مشكلة ذراعك، أو كتفك، أو يدك، على العزف على آلتك الموسيقية أو على لعب الرياضة أو كليهما.

إذا كنت تمارس أكثر من رياضة، أو تعزف على أكثر من آلة موسيقية، (أو الاثنين معاً)، فالرجاء الإجابة بالنظر إلى ذلك النشاط الذي تعتبره الأهم بالنسبة إليك.

الرجاء الإشارة إلى الرياضة أو الآلة الموسيقية الأكثر أهمية بالنسبة لك: ____________________

☐ أنا لا ألعب أي رياضة أو أعزف على أي آلة موسيقية (يمكنك ترك هذا القسم).

الرجاء أن تضع دائرةً حول الرقم الأفضل وصفاً لمقدرتك الجسدية خلال الأسبوع الماضي، هل عانيتَ أية صعوبةٍ في

	لا توجد صعوبة	صعوبة خفيفة	صعوبة متوسطة	صعوبة شديدة	غير قادر
1. أن تستخدم أسلوبك الاعتيادي في عزفك على آلتك الموسيقية أو لعبك لرياضتك؟	1	2	3	4	5
2. أن تعزف على آلتك الموسيقية، أو تلعب الرياضة التي تحبها بسبب وجع/ ألم/ عوار الذراع أو الكتف أو اليد ؟	1	2	3	4	5
3. أن تعزف على آلتك الموسيقية أو تلعب رياضتك بشكلٍ جيدٍ مثلما تحب؟	1	2	3	4	5
4. أن تقضي نفس الوقت الاعتيادي في التمرين أو في العزف على آلتك الموسيقية أو لعب رياضتك؟	1	2	3	4	5

للحصول على إجمالي درجات وحدات القياس الاختيارية: اجمع القيم الرقمية لكل جواب، و قسّمها على الرقم 4 (عدد البنود)، ثم انقص منها العدد 1، و من ثم اضرب الحاصل بالرقم 25.

<u>لا يمكن</u> حساب إجمالي درجات وحدة القياس الاختيارية إذا كانت هناك أية بنود ناقصة.

Arabic translation courtesy of Naser Mohammed Alotaibi, School of Occupational Therapy, Texas Woman's University, TX, USA / School of Occupational Therapy, Kuwait University, Kuwait.

3. Functional Recovery Index Assessment:

o Tool:UpperExtremityFunctionalIndex(UEFI)(Arabicversion)

o Description: The Upper Extremity Functional Index (UEFI) is a self-administered questionnaire that measures disability in people with upper extremity orthopedic conditions. The questionnaire lists 20 activities, and the patient gives a score to each basedonthedifficultytheyhavecompletingthatactivity.

UEFI Score (0–100)	Functional Level	Interpretation
91–100	Normal / Minimal Disability	Near-maximal function; individuals likely perform daily activities without limitation.
71–90	Mild Disability	Mild limitations in strenuous or repetitive tasks; minimal impact on ADLs.
41–70	Moderate Disability	Noticeable difficulty with routine tasks (e.g., lifting, reaching); may require adaptations.
21–40	Severe Disability	Significant functional impairment; difficulty with basic self-care and household tasks.
0–20	Extreme Disability	Profound limitations; high dependence on others for upper limb–related activities.

استبيان تقييم الوظائف العلوية للأطراف(UEFI)

المصدر : Stratford P, Binkley J, Stratford D. Development and initial validation of the upper extremity functional index. *Physiotherapy Canada*, 2001;53(4):259-67.

هذا الاستبيان يُستخدم لتقييم الإعاقة لدى الأشخاص الذين يعانون من حالات عظمية في الأطراف العلوية. يحتوي الاستبيان على قائمة بـ 20 نشاطًا يقوم المريض بتقدير مدى الصعوبة التي يواجهها في كل منها.

التعليمات:

نحن مهتمون بمعرفة ما إذا كنت تواجه أي صعوبة على الإطلاق في أداء الأنشطة المدرجة أدناه بسبب مشكلتك في الطرف العلوي. يُرجى الإجابة على كل نشاط.

الأنشطة:

اليوم، هل تواجه أو قد تواجه أي صعوبة في:

النشاط	صعوبة شديدة أو غير قادر على الأداء(0)	صعوبة كبيرة(1)	صعوبة متوسطة(2)	صعوبة قليلة(3)	بدون صعوبة(4)
.1أي من الأنشطة المعتادة في العمل أو المنزل أو المدرسة	0	1	2	3	4
.2الهوايات المعتادة أو الأنشطة الترفيهية أو الرياضية	0	1	2	3	4
.3رفع كيس بقالة إلى مستوى الخصر	0	1	2	3	4
.4رفع كيس بقالة فوق رأسك	0	1	2	3	4
.5تصفيف شعرك	0	1	2	3	4
.6الدفع بيديك (مثل من حوض الاستحمام أو الكرسي)	0	1	2	3	4
.7تحضير الطعام (مثل التقشير أو التقطيع)	0	1	2	3	4
.8القيادة	0	1	2	3	4
.9التنظيف بالمكنسة أو الكنس أو الجرف	0	1	2	3	4
.10ارتداء الملابس	0	1	2	3	4
.11غلق الأزرار	0	1	2	3	4

1

النشاط	صعوبة شديدة أو غير قادر على الأداء(0)	صعوبة كبيرة(1)	صعوبة متوسطة(2)	صعوبة قليلة(3)	بدون صعوبة(4)
.12استخدام الأدوات أو الأجهزة	0	1	2	3	4
.13فتح الأبواب	0	1	2	3	4
.14التنظيف	0	1	2	3	4
.15ربط أو شد الحذاء	0	1	2	3	4
.16النوم	0	1	2	3	4
.17غسل الملابس (مثل الغسيل أو الكي أو الطي)	0	1	2	3	4
.18فتح مرطبان	0	1	2	3	4
.19رمي كرة	0	1	2	3	4
.20حمل حقيبة صغيرة باستخدام الطرف المصاب	0	1	2	3	4

تفسير النتائج:

- يتم جمع الدرجات المقدمة لجميع الأسئلة، مع أقصى درجة ممكنة وهي 80 وأدنى درجة ممكنة وهي 0.
- تشير الدرجة المنخفضة إلى زيادة الصعوبة في الأنشطة نتيجة لمشكلة الطرف العلوي.
- **أقل مستوى للتغير القابل للكشف (ثقة 90٪): 9 نقاط.**

الناتج النهائي80 / _____ :

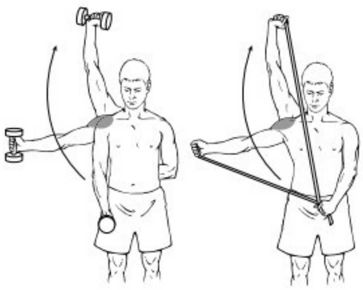
2

AppendixB:DetailedPhysiotherapyPlan

Phase	Week	Goals	Interventions
InitialPhase	1–2	Painmanagementand gentle mobilization.	- Icetherapy(3xdailyfor10–15 minutes). - Passive ROMexercises(pendulum swings). - Assistedwristandelbowflexion-extension.
MidPhase	3–4	StrengthandROMrest oration.	- Active-assistedROM(pulleysor sticks). - Isometricstrengthening(pushing againstawall). - Lightresistanceexerciseswith elastic bands.
Advanc ed Phase	5–8	Functional recovery.	- Progressive resistance training (weights or bands). - Functional exercises (lifting objects). - Task-specificactivitiestailoredto daily life.

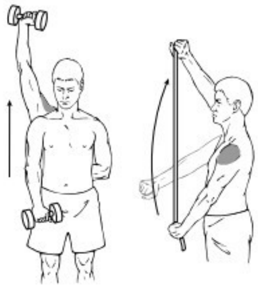
STRENGTH · Shoulder Abduction, Isometric

1. While standing, raise the _____ arm slightly away from the body as shown.
2. Place the other hand on top of your arm and push down. Do not allow your arm to move. Push as hard as you can without having any pain or moving the arm.
3. Hold this position for _____ seconds and then ***slowly*** return to the starting position.
4. Repeat exercise _____ times, _____ times per day.



STRENGTH · Shoulder Abduction

1. Stand holding a _____ lb. weight in your _____ hand and your palm facing your body as shown, or hold the rubber band/tubing as shown.
2. Slowly raise the arm up to the side and as far overhead as you can in your ***pain free*** range. If this is painful, stop and discuss this with your physician, physical therapist, or athletic trainer. *You should not progress above shoulder height unless instructed to do so by your physician, physical therapist, or athletic trainer*. If you are cleared to go above shoulder height, as you raise the arm to shoulder height begin to turn the palm toward the ceiling.
3. ***Slowly*** return to the starting position.
4. Repeat exercise _____ times, _____ times per day.



STRENGTH · Shoulder Flexion

1. Stand holding a _____ lb. weight in your _____ hand as shown, or hold the rubber band/tubing as shown.
2. Slowly raise your arm overhead as far as you can in your ***pain free*** range of motion. Do not allow your shoulder to "shrug up" while doing this exercise.
3. Keep your hand in a "*thumbs-up*" position
4. Hold this position for _____ seconds and then ***slowly*** return to the starting position.
5. Repeat exercise _____ times, _____ times per day.

RANGE OF MOTION · Flexion

1. Bend your _____ elbow as far as you can actively.
2 Try to bend it a little farther with the other hand as shown until you feel a gentle stretch.
3. Hold this position for _____ seconds and then ***slowly*** return to the starting position.
4. Repeat exercise _____ times, _____ times per day.

RANGE OF MOTION · Extension

1. Straighten your _____ elbow as far as you can actively.
2. Try to straighten it a little farther with the other hand as shown until you feel a gentle stretch.
3. Hold this position for _____ seconds and then ***slowly*** return to the starting position.
4. Repeat exercise _____ times, _____ times per day.

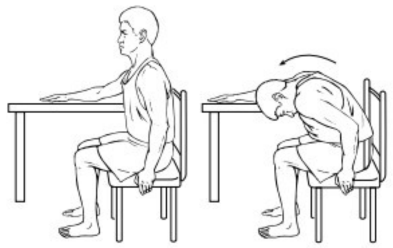
➢ **STRENGTHENING EXERCISES** · Humerus Fracture (Thrower's Fracture)

These are some of the ***initial*** exercises you may start your rehabilitation program with when cleared by your physician/surgeon to begin moving your shoulder and elbow. *Do not start these exercises until instructed to do so by your physician/surgeon!* Continue these until you see your physician, physical therapist, or athletic trainer again. Please remember:

- Strong muscles with good endurance tolerate stress better.
- Do the exercises as ***initially*** prescribed by your physician, physical therapist, or athletic trainer. Progress slowly with each exercise, gradually increasing the number of repetitions and weight used under their guidance.

STRENGTH · Shoulder Flexion, Isometric

1. While standing, raise your _____ arm straight in front of your body as shown.
2. Place the other hand on top of your arm and push down. Do not allow your arm to move. Push as hard as you can without having any pain or moving the arm.
3. Hold this position for _____ seconds and then ***slowly*** return to the starting position.
4. Repeat exercise _____ times, _____ times per day.

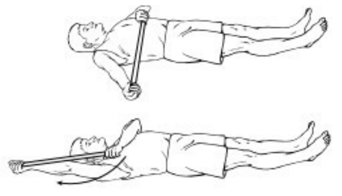


SHOULDER · Flexion

1. Sit in a chair with your _____ arm on a table as shown.
2. Lean forward, sliding your arm forward on the table until you feel a gentle stretch.
3. Return to the starting position.
4. Repeat exercise _____ times, _____ times per day. Hold each repetition 5 to 10 seconds.

SHOULDER · Flexion

1. While standing near a wall as shown, slowly "walk" your fingers up the wall until you feel a gentle stretch.
2. Repeat exercise _____ times, _____ times per day. Hold each repetition 5 to 10 seconds.



SHOULDER · Abduction

1. Lie on your back holding a stick, umbrella handle, or golf club in your hand as shown. The hand should be in the "thumbs-up" position.
2. Using the stick, slowly push your arm away from your side and as far overhead as you can without pain. Push until you feel a gentle stretch.
3. Repeat exercise _____ times, _____ times per day. Hold each repetition 5 to 10 seconds.

SHOULDER · External Rotation

1. Lie on your back or stand with your _____ arm at your side and your elbow bent to 90 degrees. Hold a stick, umbrella handle, or golf club in your hands as shown.
2. Using the stick turn/rotate your hand and forearm away from your body as shown.
3. ***Make sure you keep your upper arm and elbow next to your side.***
4. Repeat exercise _____ times, _____ times per day. Hold each repetition 5 to 10 seconds.

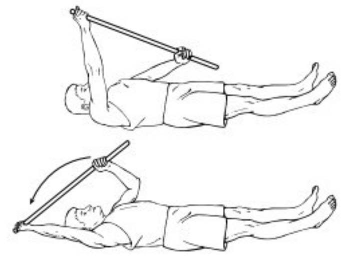
➢ **RANGE OF MOTION AND STRETCHING EXERCISES** · Humerus Fracture (Thrower's Fracture)

These are some of the ***initial*** exercises you may start your rehabilitation program with when cleared by your physician/surgeon to begin moving your shoulder and elbow. Continue these until you see your physician, physical therapist, or athletic trainer again. Please remember:

- Flexible tissue is more tolerant of the stresses placed on it during activities.
- Each stretch should be held for 20 to 30 seconds.
- A ***gentle*** stretching sensation should be felt.

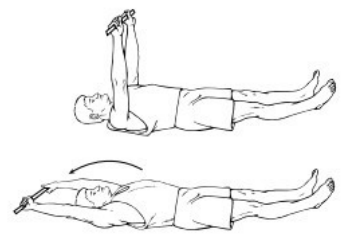
SHOULDER · Pendulum

1. Lean forward at the waist, letting your ____ arm hang freely. Support yourself by placing the opposite hand on a chair, table, or counter as shown.
2. Sway your ***whole body*** slowly forward and back. This will cause your arm to move. Let your arm hang freely. Do not tense it up.
3. Repeat the above swaying side to side and moving in circular patterns, clockwise and counterclockwise.
4. Do ____ repetitions in each direction.
5. Repeat exercise ____ times, ____ times per day.



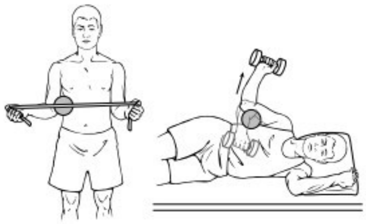
SHOULDER · Flexion

1. Lie on your back. Grasp the bottom of a stick, handle of an umbrella, or blade of a golf club in your ____ hand as shown.
2. Using the stick, raise your arm overhead as shown until you feel a gentle stretch. Lead with the thumb in a "thumbs up" position.
3. Repeat exercise ____ times, ____ times per day. Hold each repetition 5 to 10 seconds.



SHOULDER · Flexion

1. Lie on your back holding a stick in both hands, keeping your hands shoulder-width apart.
2. Raise both hands over your head until you feel a gentle stretch.
3. Repeat exercise ____ times, ____ times per day. Hold each repetition 5 to 10 seconds.

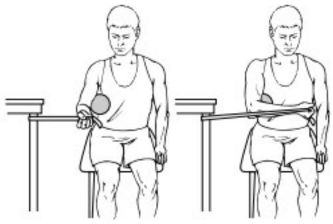


STRENGTH · Shoulder External Rotation

1. Lie on your side with your _____ arm up and the elbow bent to 90 degrees, or stand with your arms at your side and the elbows bent to 90 degrees as shown. Place a small rubber ball (4 to 6 inches in diameter) or rolled-up towel between your elbow and your side as shown.
2. Hold a _____ pound weight in your hand and turn the arm up toward the ceiling, keeping the elbow bent as shown. If using rubber band/tubing, turn the arm(s) out from your side while keeping the elbows bent.
3. Do this slowly and in control through your ***pain free*** range of motion only. If this is painful, stop and discuss this with your physician, physical therapist, or athletic trainer.
4. Hold this position for _____ seconds and then ***slowly*** return to the starting position.
5. Repeat exercise _____ times, _____ times per day.

STRENGTH · Shoulder, External Rotation, Isometric

1. Bend your _____ elbow to 90 degrees as shown, holding your arm slightly in front of your body.
2. Place your opposite hand over your wrist as shown.
3. Try to turn/rotate your arm outward, away from your body, as if it were a gate swinging open. Resist this motion with the opposite hand that is on your wrist. Do not let any motion occur.
4. Hold this position for _____ seconds.
5. Repeat exercise _____ times, _____ times per day



SHOULDER · Internal Rotation

1. Anchor the rubber band/tubing to a heavy/solid object as shown.
2. Place a small ball or towel between your elbow and body as shown in the drawing and bend your elbow to 90 degrees. Squeeze the ball gently to the side of your chest with your elbow.
3. Turn/rotate your arm in toward your body (across your chest/stomach). Do not let the ball move/fall away from the side of your chest.
4. Hold this position for _____ seconds and then ***slowly*** return to the starting position.
5. Repeat exercise _____ times, _____ times per day.

SHOULDER · Internal Rotation, Isometric

1. Bend your _____ elbow to 90 degrees as shown, holding the arm slightly in front of the body.
2. Place your opposite hand on the inside of your wrist as shown.
3. Try to turn/rotate your arm inward, toward the body, as if it were a gate swinging closed. Resist this motion with the opposite hand that is on the inside of your wrist. Do not let any motion occur.
4. Hold this position for _____ seconds.
5. Repeat exercise _____ times, _____ times per day

٤ - أدر راحة يدك نحو السقف ثم أدر يدك نحو الأرض ، حافظ على استرخاء الجزء العلوي من ذراعك بجانبك .

تمارين الكتف

٥ - قم بممارسة حركة صغيرة لكتفك لأعلى وللخلف ، وافتح صدرك وقرب لوحي كتفك بلطف معاً .

٦ - ادعم ذراعك المكسورة بذراعك السليمة . حافظ على استرخاء ذراعك العلوي ودعمه قدر الإمكان . دع ذراعك تتدلى . أرجح جسمك ، مع تأرجح ذراعك برفق للأمام والخلف ومن جانب إلى آخر .

تمارين للبدء بعد أربعة إلى ستة أسابيع من الإصابة

١ - اجلس مع وضع ذراعيك على طاولة أمامك ، ثم حرك ذراعك للأمام لتمديدها برفق . إذا وضعت منشفة على كيس قمامة ، فقد تجد الانزلاق أسهل . لا تجبر نفسك على التمديد .

٢ - أمسك ذراعك المصابة بذراعك السليمة وساعدها على رفعها وإعادتها إل الخلف . حافظ على ذراعك المصابة مسترخية ومدعومة قدر الإمكان .

تعليمات منزلية لتأهيل مرضى كسر العضد

المرحلة الأولى (من الأسبوع ١ إلى ٣ بعد التثبيت أو الجراحة): تمارين خفيفة لتحريك المفاصل القريبة بدون تحريك الكتف مباشرة

التكرار	الوصف	التمرين
١٠ مرات × ٣ يوميًا	ثني ومد الكوع والرسغ بدون حمل	تمارين الكوع Wrist & Elbow ROM
١٥ مرة × ٣ يوميًا	فتح وغلق الأصابع لتجنب التيبس	حركة الإصبع Finger Flexion & Extension
٢٠-٣٠ ثانية × ٣ مرات يوميًا	الميل للأمام وتحريك الذراع بشكل دائري خفيف	رفع الكتف بتعليق الذراع Pendulum Exercise

المرحلة الثانية (من الأسبوع ٤ إلى ٦): استعادة مدى الحركة (Active-assisted ROM ثم Passive)

التكرار	الوصف	التمرين
١٠ مرات × مرتين يوميًا	استخدم عصا أو عصا مكنسة لرفع الذراع المصابة بمساعدة الذراع الأخرى	رفع الذراع بمساعدة العصا (Flexion with stick)
١٠ مرات × مرتين يوميًا	امشي بأطراف الأصابع على الحائط حتى تصل لأعلى مدى	تمارين على الحائط (Wall Climbing)
١٠ مرات × مرتين يوميًا	امسك منشفة بكلتا اليدين خلف الظهر وحرّك لأعلى وأسفل	التمرين بالمنشفة خلف الظهر

المرحلة الثالثة (من الأسبوع ٧ إلى ١٢): تقوية العضلات تدريجيًا

التكرار	الوصف	التمرين
٣ مجموعات × ١٠ مرات	شد الشريط المطاطي في اتجاهات مختلفة (للخارج، للداخل، للأمام)	تقوية الكتف باستخدام الشريط المطاطي (Theraband)
٣ مجموعات × ١٠ مرات	استخدم دمبل خفيف (١-٢ كغم) وارفع الذراع ببطء للأمام	تمرين رفع الذراع للأمام مع وزن خفيف (Front Arm Raise)
٣ مجموعات × ١٠ مرات	تمرين تقوية خفيف للكتف والصدر	تمرين الضغط على الجدار (Wall Push-up)

ملاحظات عامة :

- استشر طبيب العظام أو أخصائي العلاج الطبيعي قبل تنفيذ أي تمرين.
- يجب التوقف فورًا عند الشعور بألم حاد أو تورم زائد.
- الالتزام بالراحة بين الجلسات والحفاظ على وضعية سليمة أثناء الجلوس أو النوم.
- يُفضل استخدام كمادات دافئة أو باردة حسب توصية الأخصائي لتخفيف الألم.

تمارين لكسر عظم العضد

تهدف المعلومات التالية إلى تحسين عملية الشفاء ومنع المشاكل الثانوية لتصلب المفاصل أثناء فترة التعافي .

يجب عليك دائماً ارتداء دعامة عظم العضد حتى أثناء ممارسة التمارين ، إلا إذا أوصى طبيبك بخلاف ذلك ،مع ذلك، ستحتاج إلى فكّ طوق الطوق والكمّة حول رقبتك ومعصمك لإكمال التمارين . يُرجى الاطلاع على النشرة الإرشادية التي تقدمها لك عيادة الكسور متعددة التخصصات لمزيد من المعلومات حول دعامتك .

يختلف عدد مرات أداء كل تمرين من شخص لآخر حسب الأعراض وفترة التعافي . نوصي ، كدليل إرشادي ، بثلاث جلسات من التمارين يومياً ، من خمس إلى عشر تكرارات لكل تمرين في الجلسة ، مع الثبات على وضعية التمدد لمدة خمس ثوانٍ تقريباً .

إذا كنت بحاجة إلى مزيد من الإرشادات حول كيفية القيام بهذه التمارين ، فهناك تسجيل فيديو على موقع الإلكتروني Addenbrooke's ضمن مقاطع فيديو لمرضى العلاج الطبيعي
Link:https://www.cuh.nhs.uk/outpatient-physiotherapy/patient-information-videos

أو اتصل بقسم العلاج الطبيعي على الرقم 21663 01223

تمارين للبدء بها على الفور

حافظ على ذراعك مدعومة على طاولة أو وسادة بحيث يكون الجزء العلوي من ذراعك / كتفيك مسترخياً .

تمارين المعصم واليد

١ - تدرب على قبضة يدك ومدّ أصابعك بانتظام . يمكنك أيضاً الضغط على كرة ناعمة او منشفة ملفوفة كتمرين لزيارة المقاومة

٢ - مد يدك بالكامل نحو الأعلى نحو السقف ونحو الأسفل نحو الأرض .

تمارين الكوع

٣ - حافظ على استرخاء ذراعك وكتفك . اثنِ ذراعك وافردها بالكامل . حافظ على هذه الوضعية لبضع ثوانٍ في كل اتجاه .

Appendix C:Ethical Approval

Al Quds University
Faculty of Health Professions
Jerusalem –Abu Dis

جامعة القدس
كلية المهن الصحية
القدس – أبو ديس

Research Ethics Subcommittee of Faculty of Health Professions
Letter of approval

March 21, 2025
Ref. No.: RESC/2025-44

Dear Applicants, (**Dr. Esra Hamdan, Mr. Asem Abdelghani**)
Program: **MSc Physiotherapy Department**

The Research Ethics subcommittee of the Faculty of Health Professions has recently reviewed your proposal entitled (**Evaluating the impact of early versus delayed physiotherapy intervention on pain & functional activity post humerus fracture**) submitted by (**Dr. Esra Hamdan**). Your proposal is deemed to meet the requirements of research ethics at Al-Quds University, but further assessment is required by the Central Research Ethics Committee of Al-Quds University. We wish you all best for the conduct of the project.

Hussein ALMasri, PhD

Hussein ALMasri

Associate Professor of Medical Imaging
Research Ethics Subcommittee Chair
Faculty of Health Professions

CC: File
CC: Committee members

Tel. Fax: 02 2791243   Email: dean@hpro.alquds.edu   **تلفاكس: 02 2791243**

Appendix D :Ethics Certificates

TRREE

Zertifikat

Certificat

Certificado

Certificate

Promouvoir les plus hauts standards éthiques dans la protection des participants à la recherche biomédicale
Promoting the highest ethical standards in the protection of biomedical research participants

Certificat de formation - Training Certificate

Ce document atteste que - this document certifies that

Asem Abdelghani

a complété avec succès - has successfully completed

Module 1 (2023) - Introduction to Research Ethics

du programme de formation TRREE en évaluation éthique de la recherche
of the TRREE training programme in research ethics evaluation

Release Date: 2025/01/21

CID : d9SuHkWYjf

Professeur Dominique Sprumont
Coordinateur TRREE Coordinator

APPROVED BY SIWF FMH ISFM

Programmes de formation continue (2 crédits)
Continuing Education Programs (2 credits)

HKU Med LKS Faculty of Medicine Clinical Trials Centre 香港大學臨床試驗中心

Ce programme est soutenu par - This program is supported by :
European and Developing Countries Clinical Trials Partnership (EDCTP) (www.edctp.org) - Swiss National Science Foundation (www.snf.ch) - Canadian Institutes of Health Research (http://www.cihr-irsc.gc.ca/e/2891.html) - Swiss Academy of Medical Science (SAMS/ASSM/SAMW) (www.samw.ch) - Commission for Research Partnerships with Developing Countries (www.kfpe.ch)

[REV : 20241120]

TRREE

Zertifikat

Certificat

Certificado

Certificate

Promouvoir les plus hauts standards éthiques dans la protection des participants à la recherche biomédicale
Promoting the highest ethical standards in the protection of biomedical research participants

Certificat de formation - Training Certificate

Ce document atteste que - this document certifies that

Asem Abdelghani

a complété avec succès - has successfully completed

Module 2 (2023) - Research Ethics Evaluation

du programme de formation TRREE en évaluation éthique de la recherche
of the TRREE training programme in research ethics evaluation

Release Date: 2025/01/21
CID : HHPkpdH3ys

Professeur Dominique Sprumont
Coordinateur TRREE Coordinator

APPROVED BY SIWF FMH ISFM
Programmes de formation continue (2 crédits)
Continuing Education Programs (2 credits)

HKU Med LKS Faculty of Medicine
Clinical Trials Centre
香港大學臨床試驗中心

Ce programme est soutenu par - This program is supported by :
European and Developing Countries Clinical Trials Partnership (EDCTP) (www.edctp.org) - Swiss National Science Foundation (www.snf.ch) - Canadian Institutes of Health Research (http://www.cihr-irsc.gc.ca/e/2891.html) - Swiss Academy of Medical Science (SAMS/ASSM/SAMW) (www.samw.ch) - Commission for Research Partnerships with Developing Countries (www.kfpe.ch)

[REV : 20241120]

Appendix E:Consent Form

نموذج الموافقة للمشاركين في البحث

عنوان الدراسة:
تأثير بدء العلاج الطبيعي المبكر مقابل المتأخر على التعافي الوظيفي لكسور العضد في البيئات محدودة الموارد

اسم الباحث الرئيسي:
عاصم عبد الغني

المشرفة:
د. إسراء حمدان

الجهة الأكاديمية:
جامعة القدس – كلية المهن الصحية

المقدمة

حضرتك مدعو/ة للمشاركة في هذه الدراسة البحثية التي تهدف إلى تقييم أثر توقيت بدء العلاج الطبيعي (المبكر مقابل المتأخر) على التعافي الحركي والوظيفي لدى المرضى المصابين بكسر في العضد. مشاركتك اختيارية بالكامل، ورفضك لن يؤثر على جودة الخدمات العلاجية المقدمة لك.

هدف الدراسة

تهدف هذه الدراسة إلى مقارنة فعالية بدء العلاج الطبيعي المبكر والمتأخر في تحسين مدى الحركة، وتقليل الألم، وزيادة القوة العضلية، وتحسين مستوى الأداء الوظيفي للطرف العلوي، مما يساعد على تحديد أفضل توقيت للعلاج في البيئات محدودة الموارد.

إجراءات المشاركة

في حال الموافقة، سيتم:

- إجراء تقييم أولي يشمل شدة الألم، المدى الحركي للمفصل، القوة العضلية، والوظيفة اليومية.
- إدراجك في إحدى مجموعتين: مجموعة العلاج المبكر أو مجموعة العلاج المتأخر، وفقًا لوضعك الصحي وتوجيه الطبيب.
- تلقي برنامج علاج طبيعي يتناسب مع حالتك الصحية.
- إجراء تقييم متابعة بعد 8 أسابيع من العلاج.

أدوات القياس المستخدمة

- **مقياس القياس البصري للألم (VAS):** لقياس شدة الألم.
- **استبيان مكغيل للألم:** لتقييم نوعية وشدة الألم.
- **مقياس DASH (Disabilities of the Arm, Shoulder and Hand):** استبيان يقيس الإعاقة في الذراع والكتف واليد وقدرتك على أداء الأنشطة اليومية.
- **مؤشر UEFI (Upper Extremity Functional Index):** أداة تقيس القدرة الوظيفية للطرف العلوي (الذراع واليد) في الحياة اليومية.
- قياس المدى الحركي باستخدام الجونيوميتر.

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- لاختبار القوة العضلية باستخدام اختبار الفحص العضلي اليدوي.(Manual Muscle Testing)

الفوائد المتوقعة

قد تستفيد من خلال: تحسين الحركة والقوة الوظيفية للطرف العلوي، وتقليل الألم، واستعادة النشاط. كما أن متابعتك خلال الدراسة ستحسن من جودة الرعاية المقدمة لك. نتائج الدراسة ستسهم في تطوير خدمات العلاج الطبيعي في فلسطين.

المخاطر المحتملة

العلاج الطبيعي آمن بشكل عام، لكن قد تشعر ببعض الألم أو الشد العضلي أو التعب المؤقت بعد الجلسات، وهي أعراض طبيعية ومؤقتة. سيتم اتخاذ كافة الإجراءات لضمان راحتك ومنع أي تفاقم.

السرية والخصوصية

جميع المعلومات التي تقدمها ستُعامل بسرية تامة، ولن يتم ذكر اسمك أو أي معلومات شخصية في أي تقرير أو نشر علمي. سيتم تخزين البيانات في ملفات مؤمّنة ولن يطّلع عليها سوى فريق البحث.

حرية الانسحاب

مشاركتك طوعية بالكامل، ويمكنك الانسحاب في أي وقت دون أي تأثير على علاجك أو الخدمات الصحية المقدمة لك.

الموافقة

أقر بأنني قرأت جميع المعلومات المتعلقة بهذه الدراسة أو تم شرحها لي بطريقة واضحة. أوافق على المشاركة في هذه الدراسة طوعًا.

اسم المشارك :...

توقيع المشارك:...

التاريخ...

اسم الباحث :عاصم عبد الغني

رقم الهاتف:0597938035

توقيع الباحث :

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تأثير التدخل المبكر مقابل التأخير في العلاج الطبيعي على تعافي كسر عظم العضد الوظيفي في البيئات ذات الموارد المحدودة

عداد الطالب : عاصم حسين رشدي عبد الغني

بإشراف : د .إسراء حمدان

الملخص

الخلفي :

تعد كسور عظمة العضد من الإصابات الشائعة في جراحة العظام، وقد تؤدي لى الألم، وتقييد حركة مفصل الكتف، وحدوث عجز وظيفي مستمر في حال عدم البدء بالتأهيل في الوقت المناسب. وعلى الرغم من شيوع التوصية بالعلاج الطبيعي المبكر لتحسين نتائج التعافي، إلا أن التوقيت الأمثل لبدء التأهيل ما يزال محل نقاش، خاصة في البيئات الصحية محدودة لموارد مثل فلسطير .

الهدف :

هدفت هذه الدراسة إلى مقارنة تأثير بدء العلاج الطبيعي المبكر مقابل المتأخر على شدة الألم، والوذمة، ومدى حركة مفصل الكتف، والتعافي الوظيفي لدى البالغين المصابين بكسور عظمة العضد .

المنهجي :

تم اجراء دراسة شبه تجريبية على 40 بالغا ت راوح أعمارهم بيز 18 60 عاما، تم تشخيص إصابتهم بكسور في عظم العضد. قُسم المشاركون إلى مجموعتين: مجموعة التدخل المبكر (ن = 20)، حيث بدأ العلاج الطبيعي في غضون أسبوعين من إحالة المريض إلى أخصائي جراحة العظام، ومجموعة التدخل المتأخر (ن = 20)، حيث بدأ العلاج الطبيعي بعد ستة أسابيع على الأقل لأسباب مختلفة. تلقت المجموعتان بروتوكولات علاج طبيعي موحدة، مكيفة مع مرحلة الكسر وقدرة المريض على التحمل. شملت مقاييس النتائج شدة الألم، التي تم تقييمها باستخدام مقياس التناظر البصري VAS) واستبيان ماكجيل للألم لمساعدة لمرضى على وصف وتحديد نوعية الألم. أما بالنسبة للتعافي الوظيفي، فقد استخدمنا مؤشر وظائف الطرف العلوي UEFI)، ومدى حركة الكتف الذي تم قياسه باستخدام مقياس الزوايا، والوذمة التي تم تقييمها من خلال قياسات محيطية موحدة للأطراف، وأخيرا،

تقييمات وظائف الطرف الع وي والإعاقة باستخدام استبيان إعاقات الذراع والكتف واليد DASH). أُجريت التقييمات عند خط الأساس وبعد فترة تدخل مدتها 8 أسابيع.

النتائج :

أظهرت النتائج تحسنا في جميع المتغيرات المقاسة لدى المجموعتين بعد العلاج الطبيعي. إلا أن مج وعة التدخل المبكر حققت تحسنا أكبر في مدى حركة الكتف والأداء الوظيفي مقارنة بمجموعة التدخل المتأخر. كما لوحظ انخفاض في شدة الألم لدى المجموعتين، مع تحسن أسرع وأكثر دلالة سريرية لدى المجموعة التي بدأت العلاج الطبيعي مبكرا. بالإضافة إلى ذلك، ارتبط التدخل المبكر بانخفاض مستويات الإعاقة وتحسن الاستقلال الوظيفي في المتابعة النهائية .

الاستنتاج :

يرتبط البدء المبكر بالعلاج الطبيعي بعد كسر عظمة العضد بتحسن وظيفي أفضل، وزيادة مدى حركة مفصل الكتف، وانخفاض الألم والوذمة، وتقليل مستوى الإعاقة دون التأثير على السلامة. تدعم هذه النتائج أهمية تطبيق برامج تأهيلية مبكرة ومنظمة، وضرورة تحسين الوصول إلى خدمات العلاج الطبيعي في البيئات الصحية محدودة الموارد .

الكلمات المفتاحية :

كسر عظمة العضد؛ توقيت التأهيل؛ تقييم الألم؛ مدى حركة الكتف؛ وظيفة الطرف العلوي؛ نواتج الإعاقة؛ مقياس التناظر البصري DASH ؛ مؤشر الوظيفة للطرف العلوي .

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