Faculty of medicine

University of Dhaka

Effectiveness of Movement with Mobilization (MWM) along with Conventional Therapy among the Patient with Frozen Shoulder

Umma Kulsum Prety

Bachelor of Science in Physiotherapy

Du exam roll: 1393

Registration No: 10431

Session: 2018-2019

Saic College of Medical Science and Technology

Department of Physiotherapy

Mirpur-14, Dhaka-1216

Bangladesh

August, 2024

We, the undersigned, hereby certify that we have thoroughly reviewed and endorsed the acceptance of this dissertation entitled, submitted to the Faculty of Medicine at the University of Dhaka.

Effectiveness of Movement with Mobilization (MWM) Along with Conventional Therapy among the Patient with Frozen Shoulder

Submitted by **Umma Kulsum Prety,** for the partial fulfilment of the requirements for the degree of Bachelor of Science in Physiotherapy (B.Sc. PT).

……………………………......

Zakia Rahman
Senior Lecturer, Course co-ordinator
DCPT, Dhaka.
Supervisor

………………………………

Dr. Mohammad Sohrab Hossain
Professor
Department of Physiotherapy, BHPI, CRP
Executive Director
Centre for the Rehabiitation of the Paralysed (CRP)
CRP Savar, Chapain, Savar, Dhaka- 1343

………………………………

Zahid Bin Sultan Nahid
Assistant Professor and Head
Department of Physiotherapy
SCMST, Mirpur-14, Dhaka.

………………………………

Dr. Abul Kasem Mohammad Enamul Haque
Principal
SCMST, Mirpur-14, Dhaka

DECLARATION

This work is not being submitted for any other degree at the same time, and it has not been accepted in substance for any other degree before. Part of the requirements for a Bachelor of Science in physiotherapy have been met by turning in this dissertation. I agree that if any plagiarism or cheating was found in my work, I would get a failing grade and be punished by the school. So, I can say for sure that the electronic copy of the thesis is the same as the printed copy.

There will be a lot of involvement from the research supervisor if the project results are shared for publication in the future. It will be properly recognised as a graduate thesis after getting permission from Saic College of Medical Science and Technology (SCMST).

Signature: **Date:**

Umma Kulsum Prety

Bachelor of Science in Physiotherapy (B.Sc. PT)

DU Roll no: 1393

Reg. no: 10431

Session: 2018-2019

CONTENTS

ACKNOWLEDGEMENT

I want to express my deepest gratitude to Almighty Allah for giving me the skills I needed to finish this project without any delays. The second thanks goes to my parents, whose unwavering support has kept me working hard on the project. I want to thank my respected supervisor, Dr. Zakia Rahman PT, Senior Lecturer and Course Coordinator at Dhaka College of Physiotherapy (DCPT), for all the time she spent with me, the care she took with me, and the great advice she gave me. Without her help, it would not have been possible to finish this project successfully.

I want to thank Dr. Abul Kasem Mohammad Enamul Haque, who is the principal of SCMST, Zahid Bin Sultan Nahid, who is an assistant professor and heads the department of physiotherapy at SCMST, and Md. Shahidul Islam is an assistant professor and the clinical head of the physiotherapy department at SCMST. Asma Arzo is a lecturer in the same department. Md. Furatul Haque is a lecturer in the department of physiotherapy at Md. Professor Billal Hossain works as a lecturer in the department of physiotherapy at Saic College of Medical Science and Technology (SCMST) in Maryland. Forhad Hosen, Lecturer, Department of Physiotherapy; Shahid Afridi, Lecturer, Department of Physiotherapy, SCMST; and all of my other teachers who helped me with this study. The excellent physiotherapy staff at Unique Pain and Paralysis Centre and Elite Physiotherapy & Rehab Zone helped me a lot with gathering my data, and I want to thank them from the bottom of my heart.

I would like to extend my sincere appreciation to the intern physiotherapists of the Department of Physiotherapy at SCMST, Mirpur-14, Dhaka, for their invaluable support throughout the course of this study. I really want to thank the Librarian at SCMST and his respected coworkers for all the help they gave me in finding relevant books and journals and making it easier to connect to the internet.

Last but not least, I want to express my deepest gratitude to everyone who generously participated in my research as a study population, as well as to everyone else who was directly or indirectly involved with this project.

LIST OF TABLES

LIST OF FIGURE

ACRONYMS

AC - Adhesive Capsulitis

BMI - Body Mass Index

CI - Confidence Interval

FS - Frozen Shoulder

MWM - Movement with Mobilization

NPRS - Numeric Pain Rating Scale

PT - Physical Therapy

RCT - Randomized Controlled Trial

ROM - Range of Motion

SPADI - Shoulder Pain and Disability Index

ABSTRACT

Background: Adhesive capsulitis, also known as "frozen shoulder," is a condition that causes pain and limited range of motion in the shoulder. It makes daily activities very difficult. This study looks into how well Movement with Mobilisation (MWM) combined with regular therapy helps people with frozen shoulder deal with pain and limitations in their ability to do things. The goal is to see how well this combined approach works compared to traditional therapy alone**. Methodology:** Individuals diagnosed with frozen shoulder participated in a randomized controlled trial. Participants were divided into two groups: a control group that received only conventional therapy and an experimental group that received conventional therapy combined with MWM. Pain levels and functional outcomes were assessed using the Numeric Pain Rating Scale (NPRS) and the Shoulder Pain and Disability Index (SPADI). Pre- and post-intervention measurements were statistically analyzed to evaluate the effectiveness of the treatments. **Results:** The mean age of Experimental group was 45.80 ± 9.29, and the control group was 39.90 ± 9.89.The experimental group showed a significantly greater reduction in pain and improvement in function compared to the control group. NPRS scores in the experimental group decreased from 7.80 ± 1.12 to 2.30 ± 0.98 (mean change: 5.50), while the control group showed a smaller reduction (mean change: 2.10). Similarly, SPADI scores in the experimental group improved significantly, with mean reductions from 70.20 ± 5.60 to 34.80 ± 7.40, compared to the control group’s smaller improvement (mean change: 20.50). **Conclusion:** This study illustrates that the integration of Mobilisation with Movement (MWM) into standard therapeutic protocols markedly improves pain alleviation and functional rehabilitation in individuals suffering from frozen shoulder. The findings emphasise the significance of addressing both the biomechanical and symptomatic aspects of the condition. Future research involving larger cohorts and prolonged follow-up is necessary to further substantiate these findings.

Keywords: *Frozen Shoulder, Adhesive Capsulitis, Movement with Mobilization, Conventional Therapy, Pain Management, Functional Recovery*

CHAPTER- I INTRODUCTION

1.1 Background

Frozen shoulder, clinically referred to as adhesive capsulitis, constitutes a debilitating and complex condition that impacts the shoulder joint, compromising its functionality and significantly limiting its range of motion (ROM). This condition is extensively acknowledged for its considerable effect on individuals' quality of life, restricting their capacity to engage in fundamental activities such as dressing, grooming, or reaching overhead. Adhesive capsulitis generally advances through specific stages and is distinguished by the presence of pain, stiffness, and a gradual deterioration in joint mobility. Globally, this condition affects an estimated 2% to 5% of the population, with a disproportionately higher prevalence in females aged 40 to 65 years (Kelley et al. 2013, p-175).

Furthermore, individuals who have undergone an episode of frozen shoulder in one arm exhibit an increased likelihood of developing the condition in the contralateral arm, thereby underscoring its recurrent nature and chronic ramifications. Frozen shoulder is the result of an inflammatory process that impacts the shoulder capsule. This inflammation initiates a series of pathological events, encompassing contracture, adhesion, and thickening of the capsule, which collectively diminish the intra-articular space and impede joint mobility. In clinical environments, a distinguishing characteristic for the diagnosis of frozen shoulder is the significant restriction of external rotation during passive movement, frequently accompanied by pain and discomfort (Lee et al. 2017, p. 76). The reduction of both active and passive range of motion is frequently noted, further exacerbated by shoulder pain that intensifies during specific phases of the condition (Ewald et al. 2014, p. 470).

It is noteworthy that frozen shoulder often resolves progressively over time without the necessity for intervention in numerous instances. Nevertheless, untreated cases are linked to extended recovery durations and diminished shoulder functionality, frequently lasting beyond 30 months (Levine et al. 2017, p. 85).

Frozen shoulder is typically classified into two principal types: idiopathic (primary) and secondary. Idiopathic frozen shoulder is characterized by the absence of any identifiable underlying cause, in contrast to secondary frozen shoulder, which is attributable to recognized systemic or localized factors, including diabetes mellitus, thyroid disorders, trauma, or extended periods of immobilization. Individuals diagnosed with diabetes exhibit a heightened susceptibility, with an incidence rate ranging from 10% to 20%, which is markedly elevated in comparison to that of the general population (Smita Bhimrao et al. 2014, p. 271). The progression of the disease can be categorized into three distinct stages: freezing, frozen, and thawing. Each stage exhibits distinct clinical manifestations and timelines, encompassing the initial onset of pain and stiffness, followed by the progressive restoration of joint function.

The freezing stage, lasting from 10 to 36 weeks, is marked by acute pain, particularly at night, and the gradual onset of stiffness. The frozen stage, which persists for a duration of 4 to 12 months, is marked by significant restrictions in range of motion, although discomfort may diminish. Finally, the thawing stage, spanning 5 to 26 months, signifies a gradual restoration of movement, albeit sometimes incomplete. Given the multifactorial nature of frozen shoulder, treatment often necessitates a multidisciplinary approach. Conventional therapy generally encompasses physical therapy, pharmacological treatment, and, in more advanced cases, surgical intervention. Physiotherapy interventions such as stretching, strengthening exercises, and modalities like ultrasound therapy are commonly employed to alleviate symptoms and restore joint function. Ultrasound therapy, for example, enhances tissue elasticity, enzymatic activity, and collagen flexibility, thereby improving the efficacy of physical therapy interventions (Ansari et al. 2012, p. 68).

Movement with Mobilisation (MWM), a technique developed by Brian Mulligan, has surfaced as a promising complementary therapy for the condition known as frozen shoulder. This technique combines therapist-applied accessory joint mobilization with active patient movements, aiming to realign joint mechanics, reduce pain, and restore functional ROM. MWM leverages dynamic joint engagement to enhance proprioception, reduce adhesions, and improve neuromuscular control, resulting in superior outcomes compared to conventional methods alone (Page et al. 2017, p-55).

Technological advancements in rehabilitation have spurred the development of robotic devices designed to mimic manual joint mobilization techniques. Exoskeleton device capable of maintaining the arm in a 90-degree abduction posture during mobilization.

These innovations highlight the potential for integrating robotics into clinical practice, providing consistent and precise mobilization forces while reducing therapist workload (Chien et al. 2014, p-50).

Despite these advancements, such devices have yet to be widely implemented in clinical settings, underscoring the need for further research and validation. The integration of manual techniques such as MWM with conventional therapy offers a practical and effective approach to bridging this gap, emphasizing the importance of patient-centered care in managing frozen shoulder (Azarsa et al. 2019, p-5012).

At the heart of this study is the idea that adding MWM to regular therapy can help frozen shoulder patients get better results from their treatments. Some specific goals are to measure pain levels with the Numeric Pain Rating Scale (NPRS), range of motion with goniometry, and functional disability with the Shoulder Pain and Disability Index (SPADI). The study also wants to look at the differences in outcomes between the experimental and control groups before and after the intervention. This will help researchers figure out how effective the interventions were (Ansari et al. 2012, p. 68).

1.2 Rationale:

Frozen shoulder, also known as adhesive capsulitis, is a debilitating condition characterized by pain, stiffness, and restricted mobility in the shoulder joint, significantly impacting daily activities and overall quality of life. Despite its prevalence, the exact etiology of frozen shoulder remains unclear, though it is often associated with prolonged immobility, systemic conditions such as diabetes mellitus, and inflammatory processes. Standard treatment approaches, including physical therapy, medications, and in some cases, surgical interventions, aim to alleviate symptoms and restore function. However, many patients experience persistent pain and limited range of motion despite these treatments, highlighting the need for more effective therapeutic strategies.

Movement with Mobilisation (MWM), a manual therapy technique pioneered by Brian Mulligan, integrates therapist-applied joint mobilization with active patient movement. This technique aims to restore joint mechanics, reduce pain, and enhance functional mobility. While MWM has demonstrated promising outcomes in various musculoskeletal conditions, there is limited high-quality evidence assessing its efficacy in treating frozen shoulder, particularly when used as an adjunct to conventional therapy.

This study seeks to bridge that gap by evaluating the potential benefits of MWM in combination with standard physiotherapy for individuals with frozen shoulder. By systematically analyzing pain reduction, functional improvements, and range of motion enhancements, this research aims to provide robust clinical evidence to support or refine existing treatment protocols. The findings could contribute to evolving clinical practice guidelines, offering a more effective, evidence-based approach to managing this challenging condition.

Ultimately, improving treatment outcomes for frozen shoulder can lead to enhanced patient well-being, increased functional independence, and reduced healthcare costs. Given the promising yet underexplored role of MWM in this context, this study is both timely and relevant, with the potential to improve rehabilitation strategies and optimize patient care.

1.3 Research question:

Is movement with mobilization, combined with conventional therapy, effective in treating frozen shoulder patients?

1.4 Aim of the study:

The aim of the study was to investigate the effectiveness of movement with mobilization in reducing symptoms in patients suffering from frozen shoulder.

1.5 Objectives:

- **General objective:**

  To compare the effectiveness of Movement with mobilization versus conventional therapy before and after intervention among the patient with frozen shoulder.

- **Specific objectives:**
  - ✓ To assess the level of pain by using NPRS of the experimental and control group before and after intervention.
  - ✓ To assess the functional disability by using the SPADI questionnaire of the experimental and control group before and after intervention.
  - ✓ To measure the outcome of movement with mobilization (MWM) and conventional therapy of the participant by using a statistical test.

1.6 Research Hypothesis

Null hypothesis (Ho):

Movement with mobilization is not effective in reducing pain and disability in frozen shoulder.

$$\mu_1 - \mu_2 \neq 0 \text{ or } \mu_1 \neq \mu_2$$

Alternative hypothesis (Ha):

Movement with mobilization is effective in reducing pain and disability in frozen shoulder.

$$\mu_1 - \mu_2 = 0 \text{ or } \mu_1 \geq \mu_1$$

Here,

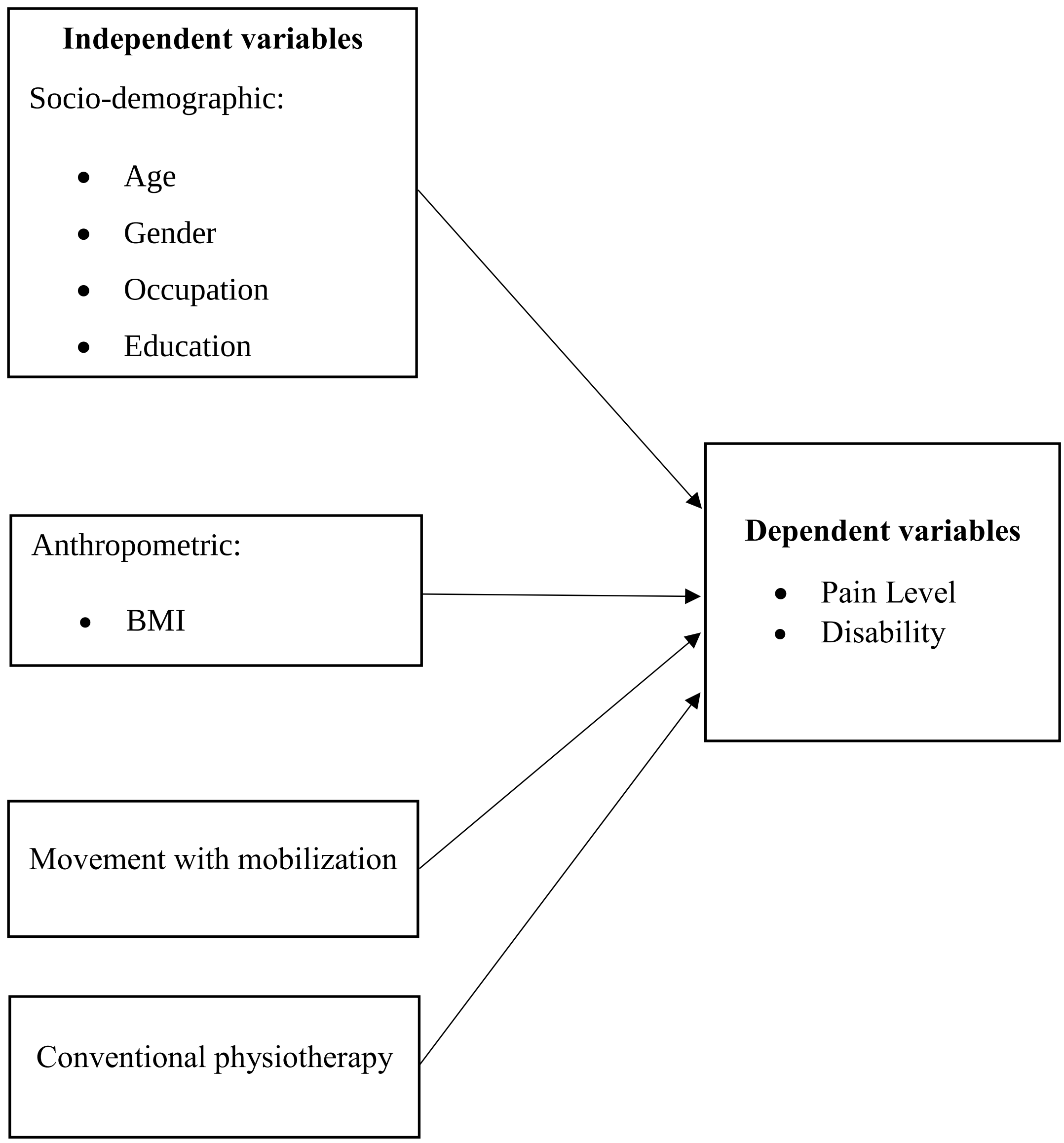
Ho = Null hypothesis

Ha = Alternative hypothesis

μ_1 = Mean of population 1

μ_2 = Mean of population 2

1.7 List of variables:



1.8 Operational definition of variables:

Frozen Shoulder:

A condition characterized by stiffness, pain, and reduced range of motion (ROM) in the shoulder joint. For this study, a diagnosis of frozen shoulder is defined as the presence of global restriction in shoulder ROM lasting for 3–4 months, confirmed through clinical examination and consistent with diagnostic criteria.

Movement with Mobilization (MWM):

A manual therapy technique combining therapist-applied joint mobilization with active movement by the patient. In this study, MWM involves therapist-guided accessory glides applied to the glenohumeral joint during patient-initiated active shoulder movements to restore ROM and reduce pain.

Pain Intensity:

The participants' level of shoulder pain, as measured by the Numeric Pain Rating Scale (NPRS), which goes from 0 (no pain) to 10 (worst pain ever). A drop in NPRS scores before and after the intervention is used to measure how well the treatment worked.

Range of Motion (ROM):

The degree of movement in the shoulder joint, measured in degrees using a goniometer. ROM is assessed in multiple planes of movement, including flexion, extension, abduction, and external rotation. Improvements in ROM are evaluated pre- and post-intervention.

CHAPTER- II	LITERATURE REVIEW

Frozen shoulder also known as adhesive capsulitis, is a prevalent illness affecting 2-5% of the population. It occurs most frequently in females and people aged 40 to 60. Frozen shoulder is characterized by sudden onset of shoulder discomfort, gradual stiffness of the glenohumeral joint, considerable impairment for everyday activities, and nocturnal pain that disrupts sleep (Hsu et al 2011. p-512).

The shoulder is a complex joint that connects the upper extremities to the trunk and axial skeleton. Humans are distinguished from other mammals by the skill of their arms and hands, which depend on this function. The shoulder is primarily made up of soft tissues that cover the skeletal structure. The scapula is a flat, triangular bone forming the shoulder girdle's posterior side.

It has 17 muscle attachments. The glenoid is an anterior projection that forms half of the primary shoulder joint. As it articulates with the sternum medially, the clavicle, also known as the collarbone, functions as a strut joining the axial and upper extremity skeletons anteriorly. With its proximal head articulating within the shoulder joint, the humerus is the long bone of the upper arm (Cotter et al. 2014, p.370).

The shoulder joint consists of four minor joints: the glenohumeral, acromioclavicular, sternoclavicular, and scapulothoracic. The glenohumeral joint is classified as a "ball-and-socket" joint because of its anatomical configuration in which the round structure of the ball, known as the humeral head, articulates with the concave structure of the socket, known as the glenoid. These structures are lined with smooth, lubricating tissue known as hyaline cartilage, which reduces friction and allows smooth joint movement. Surprisingly, only around 25% of the entire surface area of the humeral head makes direct contact with the equivalent surface of the glenoid during various shoulder movements (Cotter et al. 2014, p. 370).

The glenohumeral joint's functionality and range of motion are heavily influenced by the unique design and interplay of its ball and socket components. The labrum surrounds the shallow socket which is known as the glenoid. The glenoid fossa can have a 50% increase in volume thanks to the labrum, a ring of connective tissue that encircles the glenoid and acts as a static shoulder stabilizer. A subacromial bursa cushions the upper aspect of the glenohumeral, joint to aid in motion facilitation. The acromion superiorly and the humeral head inferiorly are separated by this subacromial gap (Alashkham et al 2017. P. 99).

The ligamentous architecture of the shoulder is crucial for maintaining its integrity and function. The glenohumeral ligaments, which are essentially thickenings of the glenohumeral joint capsule, play an important role in the shoulder's static stability. The superior glenohumeral ligament connects the anterior-superior labrum to the anatomic neck of the humerus. It limits inferior translation with the arm in neutral rotation and at the side. The superior glenohumeral ligament acts as a pulley to keep the biceps tendon stable within the groove (Ogul et al. 2014, p. 510).

There are bands on the anterior, posterior, and superior sides of the complex that is the inferior glenohumeral ligament. When the arm is externally rotated and abducted to 90 degrees, or during the late-cocking phase of throwing, the anterior band of the inferior glenohumeral ligament performs the function of limiting anterior and inferior translation of the humeral head (Passanante et al. 2017, p. 70).

The superior, anterior shoulder is linked to the coracohumeral ligaments. They aid in defining the rotator interval, extending from the coracoid to the rotator cable/humerus. These structures serve to restrict inferior translation, which occurs when the arm is adducted to neutral while the body is externally rotated, and posterior translation, which occurs when the shoulder is flexed and internally rotated (Rothenberg et al. 2017, p. 23).

The teres major muscle, which starts on the lateral inferior scapula and inserts on the medial portion of the humeral shaft, is one of the other scapulohumeral muscles (Cotter et al. 2014, p. 370). It facilitates the adduction and internal rotation of the humerus. The middle and lower subscapular nerves are the routes of innervation. The coracobrachialis inserts along the medial aspect of the humerus, originating from the coracoid. It is an arm's adductor and flexor, and the musculocutaneous nerve innervates it. The coracobrachialis forms the conjoint tendon at its attachment to the coracoid, along with the short head of the biceps brachii (Giles et al. 2017, p. 1194).

The pectoralis major is one of the other essential muscles used in shoulder movement. This muscle, which is primarily responsible for the shape of the chest, is innervated by the lateral and medial pectoral nerves. The pectoral branch of the thoracoacromial trunk is the vascular supply. The clavicular head and the sternal head, which extend to the sixth and seventh ribs, comprise the two heads of the broad origin of the pectoralis major. The tendon inserts at the lateral lip of the biceps groove, along the humeral shaft, immediately medial to the deltoid. The arm's flexion and adduction are among its primary tasks. It also acts as a soft tissue anchor connecting the arm to the trunk and contributes significantly to the arm's internal rotation (Provencher et al. 2017, p. 176).

The trapezius is a flat muscle that originates from the upper spine and inserts on the scapula, clavicle, and acromion. The scapula stabilizes and rotates, allowing for movement in the scapula-thoracic plane. The rotator cuff muscles work together to maintain proper joint-reactive forces at the GH joint, allowing for an active range of motion in the shoulder (Hussain et al. 2015, p. 1520).

The complex structure of the shoulder's neurovascular system complicates diagnosis and surgery. The brachial plexus arises from nerve roots C5-T1 and runs anteriorly and laterally toward the arm. The medial and lateral pectoral nerves, as well as the upper and lower subscapular nerves, are followed distally by the axillary and musculocutaneous nerves (Orebaugh and Williams., 2009, p. 310).

The term "frozen shoulder" was coined by Codman in 1934. He described a frozen shoulder as a painful, gradual onset syndrome that causes stiffness in forward elevation, external rotation, and trouble sleeping on the affected side. There are two basic forms of frozen shoulder. Idiopathic Primary frozen shoulder refers to traumatic capsulitis. A secondary frozen shoulder occurs when another medical condition is present. The prevalence rate ranges from 2 to 5.3%, with most cases affecting adults aged 40 to 70. Typically, this illness is self-limiting and resolves after 2-3 years. However, it can last longer in up to 40% of individuals. According to Smita Bhimrao, 3% to 5% of the general population and up to 20% of diabetics are thought to be affected by adhesive capsulitis, also known as frozen shoulder. Contralateral shoulder involvement is associated with a 5% to 34% increased probability of occurrence when unilateral shoulder frozen shoulder occurs. Three stages of symptoms, each lasting 30 months, are typically recognized (Kanase and Shanmugam. 2014, p. 1820).

Frozen shoulder is a prevalent condition in general orthopedics. It might occur without a clear cause or be linked to several local or systemic illnesses. Identifying the distinctive characteristics of the pain and the selected restriction of passive external rotation serve as the basis for the diagnosis. Though the underlying pathological processes of capsular contracture are poorly understood, the macroscopic and histological aspects of the condition are well-defined (Hussain et al. 2015, p. 1520).

It significantly strains health service resources and may result in long-term incapacity. Many patients present with excruciating shoulder issues that limit their ability to move actively, giving the impression of "stiffness." These conditions might be caused by weak muscles (deltoid paresis or rotator cuff tears) or pain inhibition (antalgic shoulder).On the other hand, individuals with a frozen shoulder have distinct symptoms such as excruciating selective limitation of specific shoulder movements, both passive and active, while normal radiographs are present (Rookmoneea et al. 2010, p. 1270)

Although the frozen shoulder is linked to several disorders, these should only be divided into subgroups when there is a recognized difference in prognosis or when treatment needs to be altered (Cotter et al. 2014, p. 370). Primary idiopathic frozen shoulder is the largest single group of individuals without any discernible underlying reason for their symptoms. Since their disease course is typically more severe and prolonged, the significant group of patients with diabetes mellitus is regarded as a secondary diabetic frozen shoulder. Frozen shoulder is thought to impact 2% of the general population, with a cumulative incidence of 2.4 per 1000 person-years, despite the lack of stringent diagnostic criteria and hence the likely over-diagnosis (Hussain et al. 2015, p. 1520).

Except for secondary traumatic frozen shoulder, it is uncommon in patients over 70 years old and in manual laborers. It is rare before the age of 40 and peaks in occurrence between the ages of 40 and 60. Women are impacted by it somewhat more frequently than males. The most prevalent ailment linked to a frozen shoulder is diabetes mellitus. As much as 71.5% of people are thought to have both a diabetes propensity and a frozen shoulder. Based on an abnormal fasting blood glucose or glucose tolerance test, almost half of these individuals had been previously diagnosed with Type I or Type II diabetes, while the remaining patients have pre-diabetes. A frozen shoulder can occur in 10% to 20% of diabetics' lifetimes; this risk is two to four times higher than in the general population, with a 4% point prevalence (Pandey et al. 2022, p. 220).

The shoulder joint represents the most unconstrained and mobile point of articulation within the appendicular skeleton. A complex interplay between various factors delicately regulates this remarkable range of motion. Specifically, the equilibrium between instability and stiffness in the shoulder joint is predominantly upheld by the combined efforts of static and dynamic soft-tissue stabilizers. Any disruption to this delicate balance can significantly impair both active and passive movement capabilities. Such disruptions may arise from factors such as the loss of the normal alignment and congruity of the joint, as seen in cases of chronic dislocation. Additionally, increased constraint on the shoulder joint can occur due to excessive bony overgrowth, commonly observed in conditions that lead to the formation of osteophytes. Furthermore, contracture of the dynamic muscular stabilizers can also contribute to limitations in shoulder mobility (Hussain et al. 2015, p. 1520).

However, the most common cause of painful movement restriction is an idiopathic frozen shoulder. This condition is characterized by an inflammatory constriction of the ligaments and capsule, which lowers the amount of intra-articular volume accessible and restricts glenohumeral movement. The capsule appears glassy from a macroscopic perspective and exhibits acute vasculitis, inflammation, and thickening. Over time, this changes to a more gradual fibrotic look (Gerber et al. 2003, p. 50).

Frozen shoulder syndrome causes selective restriction of external rotation due to anterosuperior capsular tightening, which affects external rotation of the adducted arm, and anteroinferior tightening, which lowers external rotation during the abduction. Clinical and MRI studies confirm that the rotator interval (including the superior glenohumeral ligament), rotator interval capsule, coracohumeral ligament, anterior capsule, and inferior glenohumeral ligament are the primary structures involved (Hussain et al. 2015, p. 1520). There are more severe instances of posterior superior capsular tightness, which restricts internal rotation. Flexibility resulting from extrinsic contracture of the rotator cuff (particularly the subscapularis) and obliteration of the normal subdeltoid tissue planes can also be present in frozen shoulders resulting from trauma or prior instability surgery. Soft-tissue injuries or scarring from surgery could be the cause of this (Thomas et al. 2007, p. 748).

Idiopathic frozen shoulder patients have been found to have a wide range of immunological, biomechanical, inflammatory, and endocrine problems; nevertheless, the underlying pathophysiology is still not well understood. There is evidence of both inflammatory and fibrotic processes, and much effort has been made to characterize the microscopic pathology. Pain usually occurs before stiffness, indicating a transition from inflammation to fibrosis in most cases (Hussain et al. 2015, p. 1520).

In rotator interval biopsies of individuals receiving arthroscopic release, histological evidence of both chronic inflammatory cell infiltration and fibrosis has been demonstrated. These results might not apply to the early stages of the illness, but they have been shown in more severe versions of the illness. The coracohumeral ligament and the surrounding tissues of the rotator interval exhibit a fibrous contracture, resembling the pathological appearances of Dupuytren's disease. This fibrous contracture is made of a dense matrix of mature type-III collagen that contains fibroblasts and myofibroblasts (Hand et al. 2007, p. 224).

According to numerous studies, a frozen shoulder is a benign condition that usually goes away in two years. It is now acknowledged that up to 40% of individuals can have ongoing symptoms. In the largest comprehensive investigation of the natural history, 60% of patients had stiffness that persisted after seven years, and 50% of patients still experienced minor discomfort. While few people have a persistent functional handicap, it is estimated that between 7% and 15% of people have some degree of permanent loss of mobility (Pandey et al. 2022, p. 234).

The pain experienced is typically described as being intense, and it is perceived diffusely throughout the area around the shoulder girdle, often accompanied by a profound burning sensation. To differentiate from other temporary sources of shoulder discomfort, the pain must have persisted for a duration exceeding one month. A prominent and consistent symptom is the presence of severe nighttime pain that disrupts sleep, which is considered a crucial aspect for diagnosis, along with the impediment of various routine daily tasks.

It is imperative to acknowledge that the intensity and persistence of these symptoms are indicative of a more serious underlying condition that necessitates further evaluation and intervention. Acromioclavicular joint pain is common, most likely because of the glenohumeral joint's restricted range of motion, which increases the strain on the acromioclavicular joint. The traditional hierarchy for primary frozen shoulder involves three stages: the first, known as the "freezing" stage, which is characterized by severe pain and stiffness; the second, known as the "frozen" stage, which is characterized by deeply ingrained stiffness and reduced pain perception; and the third, known as the "thawing" stage, which is characterized by a gradual return of mobility (Hussain et al. 2015, p. 1520).

However, identifying these discrete stages of development precisely can be difficult at times, as there are situations in which the stages are either completely absent or difficult to Acromioclavicular joint pain is common, most likely because of the glenohumeral joint's restricted range of motion, which increases the strain on the acromioclavicular joint. The traditional hierarchy for primary frozen shoulder involves three stages: the first, known as the "freezing" stage, which is characterized by severe pain and stiffness; the second, known as the "frozen" stage, which is characterized by deeply ingrained stiffness and reduced pain perception; and the third, known as the "thawing" stage, which is characterized by a gradual return of mobility. However, identifying these discrete stages of development precisely can be difficult at times, as there are situations in which the stages are either completely absent or difficult to differentiate (Sano et al. 2010, p. 265).

Confirming the typical pattern of limitation of both active and passive ranges of glenohumeral mobility is the foundation for the clinical diagnosis. Typically, there is a noticeable and focused loss of passive external rotation, which may not reach 90°, when the arm is in neutral and abduction positions. Additionally, there are certain restrictions on internal rotation and flexion (Hussain et al. 2015, p. 1520). We rank the clinical severity on external rotation since the assessment of pain is subjective while the restriction of external rotation is an objective and constant characteristic. In cases where shoulder girdle wasting persists over an extended period, it may become evident. If there is an observation of swelling or erythema in the affected area, it should prompt consideration of potential infection or tumor growth. It is recommended to conduct targeted clinical assessments focusing on the biceps tendon and evaluations for dysfunction and instability of the rotator cuff and acromioclavicular joint to rule out any underlying secondary factors contributing to the condition. These specialized tests are crucial in the diagnostic process to differentiate primary causes from potential secondary causes that could be exacerbating the shoulder girdle wasting (Johnson and Robinson. 2010, p. 1556).

The only other shoulder diseases that are frequently observed in conjunction with selective loss of external rotation are osteoarthritis and locked posterior dislocation.

Using standard radiography, both of these can typically be ruled out. A patient's history of calcific tendonitis, proximal humeral fractures (particularly those of the larger tuberosity), rotator cuff tears, and early glenohumeral joint osteoarthritis are common causes of frozen shoulder. Ultrasonography and traditional radiography are typically the methods used to identify these pathologies. Differentiating between a subsequent frozen shoulder and the underlying main disease may present challenges in terms of clinical symptoms. While there aren't many other secondary causes, symptoms like weight loss, inflammation in the shoulder, bone soreness, and systemic disturbance should raise the potential of an infection or tumor and demand an immediate evaluation (Rill et al. 2011, p. 575).

The treatment aims to reduce pain, improve movement, and improve shoulder function. Treatment should be tailored based on the intensity and duration of symptoms. A multidisciplinary approach is recommended, and most patients can be handled non-operatively in primary care settings with good results. Clinical trials have not demonstrated the efficacy of alternative treatments for this illness, and it is unknown whether combining therapy is more effective (Hussain et al. 2015, p. 1520). Physiotherapy is usually suggested for a six- to 12-week treatment trial at the beginning to try to avoid further impairment of movement and to reestablish movement later on. In the uncomfortable acute inflammatory phase, however, analgesia and activity modification may be more appropriate, thus this could work against you. Increased mobility and decreased inflammation may be achieved with the use of local heat/cold therapy and oral non-steroidal anti-inflammatory medication therapy. Supervising the exercise program, outlining the duration required for symptom relief, and promoting a regimen of at-home exercises are all important functions of the physiotherapist. A recent Cochrane review found that there was not enough evidence in the literature to support the idea that physical therapy on its own was helpful. Two short clinical trials found no advantage from physical therapy alone when compared to controls who received no treatment. Subsequent research revealed few variations in the results, irrespective of the physiotherapy method employed (Vermeulen et al. 2006, p. 78). When physiotherapy fails, manipulation under anesthesia is commonly utilized.

It can be used alone, with a steroid injection, or with an arthroscopic capsular release, and typically leads to a quick recovery of shoulder movement. On the other hand, opinions differ over whether it shortens the illness's natural course. The manipulation is done carefully, and the arm is held near to the axilla to reduce the possibility of a humeral fracture (Cotter et al., 2014, p-370). The inferior capsule is ruptured when forward flexion is first attempted. The external rotation then occurs, initially with the arm near the torso and subsequently in abduction. The last movement made with the arm in abduction is internal rotation. Older patients with osteoporosis should not undergo this operation due to the possibility of fracture. Pre- and post-manipulation radiographs are a prudent precaution, and by paying attention to technique, the risk of complications can be reduced (Hussain et al. 2015, p-1520).

CHAPTER-III	METHODOLOGY

3.1 Study design:

The study design was a Randomized Controlled Trial (RCT). This design was best for comparing the effectiveness between movement with mobilization technique and conventional physiotherapy among the patients with frozen shoulder.

3.2 Study area:

The study was conducted at Ibn Sina Diagnostic & Consultant Centre, Uttara

3.3 Study place:

The study was conducted at Saic College of Medical Science and Technology (SCMST) at Mirpur, Dhaka.

3.4 Study period:

The study period was one year. (September 2023 to August 2024).

3.5 Study population:

Participants with frozen shoulder (adhesive capsulitis) were recruited from the Physiotherapy Department at Ibn Sina Diagnostic & Consultant Centre, Dhaka. These individuals represented a diverse demographic group meeting specific clinical criteria for frozen shoulder, including restricted shoulder range of motion (ROM) and associated pain lasting for 3–4 months. Recruitment was conducted in accordance with ethical guidelines, ensuring the selected population accurately represented the target group for assessing the effectiveness of Movement with Mobilization (MWM) alongside conventional therapy

3.6 Sample size:

$k = \frac{n_2}{n_2} = 1$

$n_1 = \frac{\left(\sigma_1^2 + \sigma_2^2 / K\right)\left(Z_{1-\frac{a}{2}} + Z_{1-\beta}\right)^2}{\Delta^2}$

$n_1 = \frac{(1.48^2 + 1.48^2/1)\ (1.96+1.04)^2}{1.39^2}$

$n_1 = 25$

$n_2 = K \times n_1 = 25$

Here,

$\Delta = \mu_2 - \mu_1$ = absolute difference between two means

σ_1 , σ_1 = variance of mean 1 and 2

n_1 = sample size for group 1

n_2 = sample size for group 2

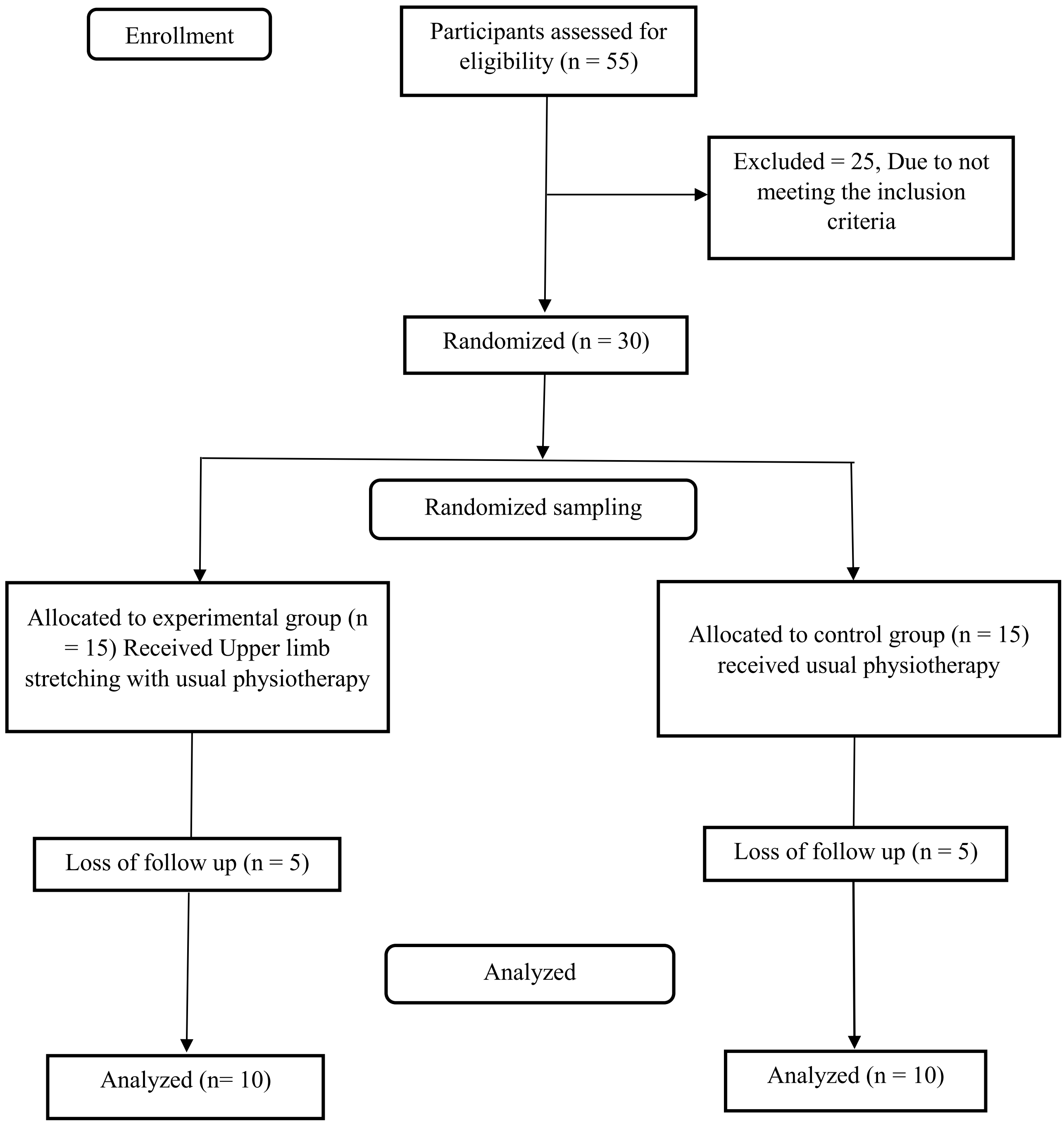
α = probability of type I error (usually 0.05)

β = probability of type II error (usually 0.2)

z = critical Z value for a given α or β

k = ratio of sample size for group 2 to group 1

3.7 CONSORT (Consolidated Standards of Reporting Trials) flow chart:



3.8 Sampling technique:

This study employs the Simple Random Sampling technique to ensure unbiased participant selection. Individuals meeting the inclusion criteria were randomly chosen for the sample. Among them, 10 participants were assigned to the Experimental group, receiving conventional physiotherapy supplemented with MWM, while another 10 were allocated to the Control group, receiving only conventional physiotherapy. To maintain systematic identification, the Control group participants were labeled as C1, C2, C3, etc., while the Experimental group participants were designated as E1, E2, E3, etc. Additionally, a single-blind approach was implemented to minimize bias in the study.

3.9 Eligibility criteria:

3.9.1 Inclusion Criteria

i. Patient diagnosed with frozen shoulder at least 1 month (Kelley et al. 2013, p. 80).
ii. Aged 35–70 years (Levine et al. 2017, 90).
iii. Medically stable and cleared for physiotherapy intervention (Ewald et al. 2014, p. 45).
iv. Patients (both male and female) having global restriction of shoulder joint range of motion for 3–4 months (Abbas et al. 2024, p. 75).

3.9.2 Exclusion Criteria

i. Patients with any shoulder injury or trauma (Hand et al. 2007, p. 67).
ii. Those with surgical release of capsule.
iii. Patients on steroids or NSAIDs (Shams et al. 2024, p. 133).
iv. Those unable to commit to the full study duration due to personal or medical reasons.

3.9 Methods of data collection:

3.10.1 Technique of data collection:

Face-to-face formal interview technique was used to collect data from the selected patients with frozen shoulder.

3.9.2 Instrument of data collection:

The pretested structured questionnaire was used as an instrument of data collection. The questionnaire had parts. The first part contained questions on patient identification. The second part included questions on sociodemographic information. The third part contained questions on assessment related variables.

3.11 Tools for data collection:

In this particular study, a written questionnaire was used.

3.12 Procedure of data collection:

The data was gathered via closed-ended interviews and questionnaires with predetermined answers. As a result of the flexibility it provided in its questions and answers, the structural questionnaire proved useful to the researcher in gathering all the necessary data. To get to the truth about every facet of the participant, the researcher created a structured, closed-ended questionnaire to collect data on socio-demographic characteristics. Individual questionnaire items followed, with some wording tweaks made to better align with the issues under investigation.

3.13 Intervention:

<table>
<tr>
<td>Control group
Session Structure:
Frequency: 3 times per week
Duration: 3 weeks</td>
<td>Experimental group
Session Structure:
Frequency: 3 times per week
Duration: 3 weeks</td>
</tr>
<tr>
<td rowspan="2">Usual Physiotherapy:
➢ Manipulation
➢ Strengthening Exercise
➢ Stretching Exercise:
• Neural Stretching
• Capsular Stretching
• PNF Stretching</td>
<td>Movement with mobilization (MWM)</td>
</tr>
<tr>
<td>Usual Physiotherapy:
➢ Manipulation
➢ Strengthening Exercise
➢ Stretching Exercise:
• Neural Stretching
• Capsular Stretching
• PNF Stretching</td>
</tr>
</table>

Figure: Intervention (MWM)

3.14 Management of data:

At the end of each day, the collected questionnaires were checked for any errors or inconsistencies. The necessary corrections were made. The recorded data were coded accordingly into the SPSS-25 version of the program.

3.15 Data analysis:

The data analysis was conducted using SPSS version 25, employing descriptive analysis to examine sociodemographic variables. To compare pre-test and post-test intervention results between groups, an independent samples t-test was utilized, while a paired t-test was applied to assess changes within each group. Additionally, Microsoft Excel 2021 was used to create bar diagrams and charts for visual representation of the findings.

3.16 Ethical consideration:

Following ethical guidelines at the highest level remains essential for the research design. A project proposal received documentation approval from the Department of Physiotherapy at Saic College of Medical Science and Technology (SCMST) which obtained Institutional Review Board (IRB) clearance to execute the study at SCMST. The observational study protects participant confidentiality according to WHO and BMRC guidelines throughout its entire process. The local authorities of the study area have granted data collection permission. Studies aim and objectives will be described in detail to participants before they receive permission to join. hayal and written consent will receive each study participant where verbal explanations of the consent process accompany the procedure. Results data will receive an absolute guarantee of privacy from researchers with the sole exception of the research supervisor. Study participants will receive information about their rights particularly their freedom to pull out from the study anytime without facing any adverse effects. Participations will receive assigned numbers to maintain their anonymity for every document including notes and transcripts. The research protocol states information collection might result in presentations or written papers or seminars yet participants will remain unidentifiable in all presentations and their information will not be harmful. All participants will receive assurance their right to convey study-related concerns to senior research authorities. The research standards established in this study function to safeguard participant safety along with preserving research process integrity through data confidentiality

CHAPTER- IV RESULT

The results presents the findings of the study investigating the effectiveness of Movement with Mobilization (MWM) combined with conventional therapy in the management of frozen shoulder. The results are structured to provide a comparative analysis between the experimental group, which received MWM along with conventional therapy, and the control group, which underwent conventional physiotherapy alone.

The analysis begins with an overview of baseline characteristics, ensuring comparability between the two groups in terms of demographics, clinical presentation, and pre-intervention pain levels. The study then explores the changes in pain intensity and functional disability following the intervention, assessed using the Numeric Pain Rating Scale (NPRS) and the Shoulder Pain and Disability Index (SPADI).

Key statistical tests, including paired t-tests and independent samples t-tests, are employed to evaluate within-group and between-group differences. The findings demonstrate a significant reduction in pain and improvement in function in both groups; however, the experimental group receiving MWM exhibited superior improvements in pain relief and disability reduction compared to the control group. These results suggest that MWM is a highly effective adjunct to conventional therapy in restoring shoulder mobility and reducing discomfort in patients with frozen shoulder. The implications of these findings are further discussed in the subsequent chapters.

Baseline Characteristics of the Participants

Table 4.1: Sociodemographic information of the Experimental group and Control group

Variable	**Experimental N (%)**	**Control N (%)**	**Total N (%)**	***p*-value**
Gender				
Male	3 (33.3%)	3 (33.3%)	6 (33.3%)	1.000
Female	6 (66.7%)	6 (66.7%)	12 (66.7%)	
Living Area				
Rural	2 (22.2%)	1 (11.1%)	3 (16.7%)	0.300
Semi-urban	0 (0.0%)	2 (22.2%)	2 (11.1%)	
Urban	7 (77.8%)	6 (66.7%)	13 (72.2%)	
Marital Status				
Married	6 (66.7%)	8 (88.9%)	14 (77.8%)	0.257
Unmarried	3 (33.3%)	1 (11.1%)	4 (22.2%)	

Family Type				
Extended family	3 (33.3%)	5 (55.5%)	8 (44.4%)	0.343
Nuclear family	6 (66.7%)	4 (44.4%)	10 (55.5%)	
Educational Level				
Graduation & above	2 (22.2%)	3 (33.3%)	5 (27.8%)	0.952
HSC	4 (44.4%)	3 (33.3%)	7 (38.9%)	
SSC	2 (22.2%)	2 (22.2%)	4 (22.2%)	
Illiterate	1 (11.1%)	1 (11.1%)	2 (11.1%)	
BMI status				
Normal weight	5 (55.6%)	6 (66.7%)	11 (61.1%)	0.809
Pre-obesity	2 (22.2%)	2 (22.2%)	4 (22.2%)	
Underweight	2 (22.2%)	1 (11.1%)	3 (16.7%)	
Comorbidities				
DM	2 (22.2%)	1 (11.1%)	3 (16.7%)	0.489
Don't know	6 (66.7%)	5 (55.6%)	11 (61.1%)	
HTN	0 (0.0%)	2 (22.2%)	2 (11.1%)	
Others	1 (11.1%)	1 (11.1%)	2 (11.1%)	

(*= < 0.05, ** = < 0.01, ***= < 0.001)

The baseline characteristics of participants were assessed, and results indicated a balanced distribution across the experimental and control groups, ensuring comparability. In terms of gender, both groups had an equal proportion of males (33.3%) and females (66.7%), with a p-value of 1.000, demonstrating no statistically significant differences. Similarly, participants' living areas were primarily urban (77.8% in the experimental group and 66.7% in the control group), while rural and semi-urban participants were less represented. The distribution of living areas also showed no significant difference (p = 0.300).

Regarding marital status, the majority of participants in both groups were married (66.7% in the experimental group and 88.9% in the control group), with unmarried participants forming a smaller proportion. The p-value for marital status was 0.257, indicating no significant difference between groups. Family type was also comparable, with nuclear families predominating in the experimental group (66.7%) and extended families being more common in the control group (55.5%), yielding a p-value of 0.343.

In terms of educational levels, the groups were evenly distributed, with a majority having completed higher secondary education (HSC). Graduation rates were slightly higher in the control group (33.3%) compared to the experimental group (22.2%), but the p-value of 0.952 indicated no significant difference. Similarly, BMI status was consistent across groups, with most participants classified as having normal weight (55.6% in the experimental group and 66.7% in the control group), followed by pre-obesity and underweight categories, with no significant differences observed (p = 0.809). Finally, comorbidities showed no significant differences, with most participants either unaware of their condition (66.7% in the experimental group and 55.6% in the control group) or reporting diabetes mellitus (22.2% and 11.1%, respectively). Only 11.1% in both groups reported other comorbidities. The p-value of 0.489 confirmed no significant variation in comorbidity distribution.These results confirm that the experimental and control groups were well-matched across demographic and clinical variables, minimizing confounding factors and enhancing the reliability of the study's findings. This balanced baseline provides a strong foundation for evaluating the differential effects of Movement with Mobilization (MWM) combined with conventional therapy versus conventional therapy alone.

Table 4.2: Description of the Age, BMI, Level of pain, Level of disability among Experimental Group and Control Group

Variable	Experimental Group	Control Group	*t*	*p*-value
	Mean ± SD			
Age	45.80 ± 9.29	39.90 ± 9.89	1.374	0.186
BMI	24.10 ± 3.35	23.61 ± 1.94	0.399	0.694
NPRS	8.1 ± 1.19	7.9 ± 1.19	0.374	0.713
SPADI	70.23 ± 4.30	66.61 ± 4.20	1.900	0.074

The results of the study comparing the experimental group receiving Movement with Mobilization (MWM) combined with conventional therapy and the control group receiving only conventional therapy revealed no significant differences in baseline characteristics. The mean age was higher in the experimental group (45.80 ± 9.29) compared to the control group (39.90 ± 9.89), but the difference was not statistically significant (p = 0.186). Similarly, BMI values between the groups were comparable (24.10 ± 3.35 vs. 23.61 ± 1.94; p = 0.694). Pain levels, measured by the Numeric Pain Rating Scale (NPRS), were also similar at baseline (8.1 ± 1.19 vs. 7.9 ± 1.19; p = 0.713). However, the Shoulder Pain and Disability Index (SPADI) showed a marginal difference, with the experimental group having a higher mean score (70.23 ± 4.30) compared to the control group (66.61 ± 4.20), though this difference approached significance without reaching it (p = 0.074). Overall, these findings suggest that the groups were well-matched at baseline, providing a reliable foundation for evaluating the intervention's effectiveness.

Table 4.3: Level of pain within the group of Experimental Group and Control Group

Variable	Experimental		Control	
	t	P value	t	P value
Numeric Pain Scale	23.717	0.001	6.708	0.001

Paired t test

(*= < 0.05, ** = < 0.01, ***= < 0.001)

The results across the NPRS scores for the experimental and control groups using paired t-tests are summarized in Table 4.3. The calculated t-value was 23.717 with a p-value of 0.000 representing the highly statistically significant reduction of pain levels after treatment ***$p < 0.001$ in the experimental group. This therefore signifies that the intervention of MWMs added to conventional therapy is effective in pain reduction.

The t-value was 6.708 for the control group with a p-value of 0.000, again demonstrating that after conventional therapy pain levels significantly decreased (**$p < 0.001$). However, at the same time, the t value for an experimental group is larger, showing greater improvement with respect to a decrease in pain compared to the control group. So far, these results will confirm the possible positive contribution of MWM being added to the existing therapeutic list for frozen shoulder patients.

Table 4.4: Level of Disability within the group of Experimental Group and Control Group

Variable	Experimental		Control	
	t	P value	t	P value
SPADI	68.111	0.000	186.720	0.000

Paired t-test

(*= < 0.05, ** = < 0.01, ***= < 0.001)

Results in Table 4.4 present the result of the paired t-test analysis of SPADI scores in both experimental and control groups, pre-intervention. For the experimental group, SPADI score pre-intervention presented a t-value of 68.111 with a p-value of 0.000, indicating a very statistically significant difference, **p < 0.001, between the pre- and post-intervention assessment. This means there was a clinically significant reduction of shoulder pain and disability at post-intervention, indicating the efficacy of MWM in combination with conventional therapy.

Similarly, there is a very highly significant change in SPADI scores, as asserted by the t-value of 186.720 and the p-value of 0.000 (**p < 0.001), in the control group representing improvement after conventional therapy alone. Though improvements in both groups are significant, the t-values suggest that the degree of change might differ between the experimental and control groups. The inclusion of post-intervention SPADI scores in further analyses will provide deep insights into the comparative effectiveness of the two interventions.

Table 4.5: Level of pain between two groups Experimental Group and Control Group before and after treatment

Variable		Experimental	Control	*t*	*p*-value
		Mean ± SD			
NPRS	Before	8.10 ± 1.197	7.9 ± 1.19	0.374	0.713
	After	3.1 ± 0.99	5.4 ± 1.71	-3.672	0.002

Independent samples t test

(*= < 0.05, ** = < 0.01, ***= < 0.001)

Table 4.7 shows the results of an independent sample t-test that was conducted using data to compare experimental and control subject scores on the NPRS both before and after treatment.

The mean score in the experimental group before the intervention was 8.10 ± 1.197, and that of the control group was 7.9 ± 1.19. The t-value was 0.374 with a p-value of 0.713, showing no statistically significant difference in baseline pain levels between the two groups.

In the experimental group, after the treatment, the NPRS score mean dropped to 3.1 with a standard deviation of 0.99. The post-mean intervention scores were 5.4 and standard deviation 1.71 in the control group. This difference yields a t-value of -3.672, at p = 0.002 (**p < 0.01), demonstrating the statistically significant differences in pain after treatment in both groups.

These results indicate that the addition of MWM to conventional therapy is significantly superior in pain reduction compared with conventional therapy alone, thus establishing the effectiveness of MWM as an adjunctive treatment for frozen shoulder.

Table 4.6: Level of pain between two groups Experimental Group and Control Group before and after treatment

Variable		Experimental	Control	*t*	*p*-value
		Mean ± SD			
SPADI	**Before**	70.23 ± 4.3	66.61 ± 4.2	1.900	0.074
	After	35.46 ± 5.05	47.53 ± 4.4	-5.675	0.000

Independent samples t test

(*= < 0.05, ** = < 0.01, ***= < 0.001)

The results presented in Table 4.7 provide an independent sample t-test analysis of the Shoulder Pain and Disability Index (SPADI) scores between the experimental and control groups, both before and after treatment.

The SPADI score of the experimental group had a mean value of 70.23 ± 4.3, while in the control group, the mean value of SPADI scores was 66.61±4.2. Comparison gave a t-value of 1.900 with a p-value of 0.074, which presents no significant difference in baseline SPADI scores among the two groups.

Accordingly, the post-intervention SPADI score significantly fell to 35.46 with an SD of 5.05 in the experimental group, while for the control, the mean SPADI score remained high at 47.53 with an SD of 4.4. Comparatively, this difference presents a t-value of -5.675 and the p-value has been reported as 0.000*** p < 0.001, indicating an immensely significant statistical difference between the post-treatment SPADI scores between the two groups.

These findings signify that MWM intervention added to conventional therapy had a significant percentage improvement in shoulder pain and disability compared to conventional therapy alone, thus indicating that as an adjunct treatment for patients with frozen shoulder, MWM was far more effective.

Figure 4.1: Pain level difference after intervention between experimental and control group:

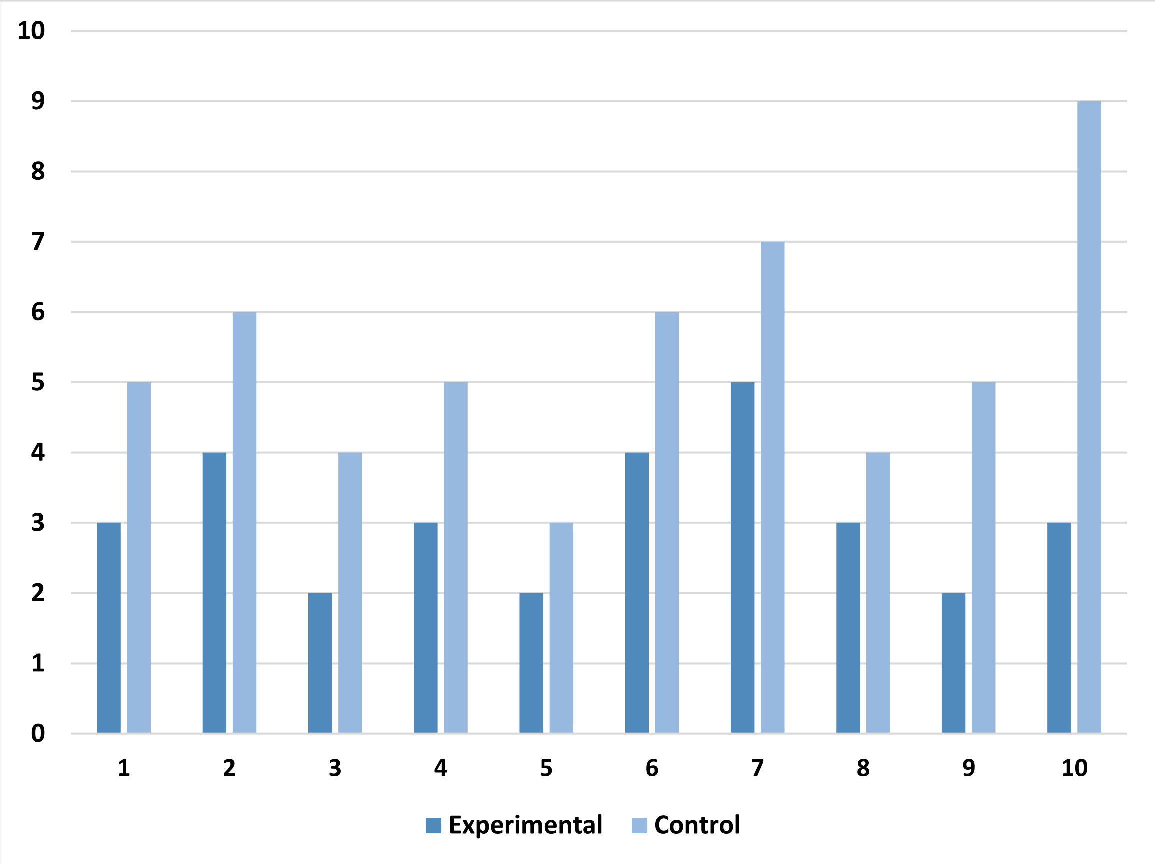


Figure: Level pf pain

Figure 4.1 shows the differences in the level of pain, as measured by the NPRS, for the experimental and control groups after the intervention. The chart indicates individual pain levels for 10 participants in each group, thus showing the effectiveness of the interventions.

In the experimental group, which received MWM in addition to conventional therapy, the post-intervention NPRS scores are consistently lower across most participants, indicating significant pain reduction. On the other hand, the control group, which received only conventional therapy, shows relatively higher NPRS scores after the intervention, with less pronounced improvements in pain levels for some participants.

Figure 4.2: Disability level difference after intervention between experimental and control group:

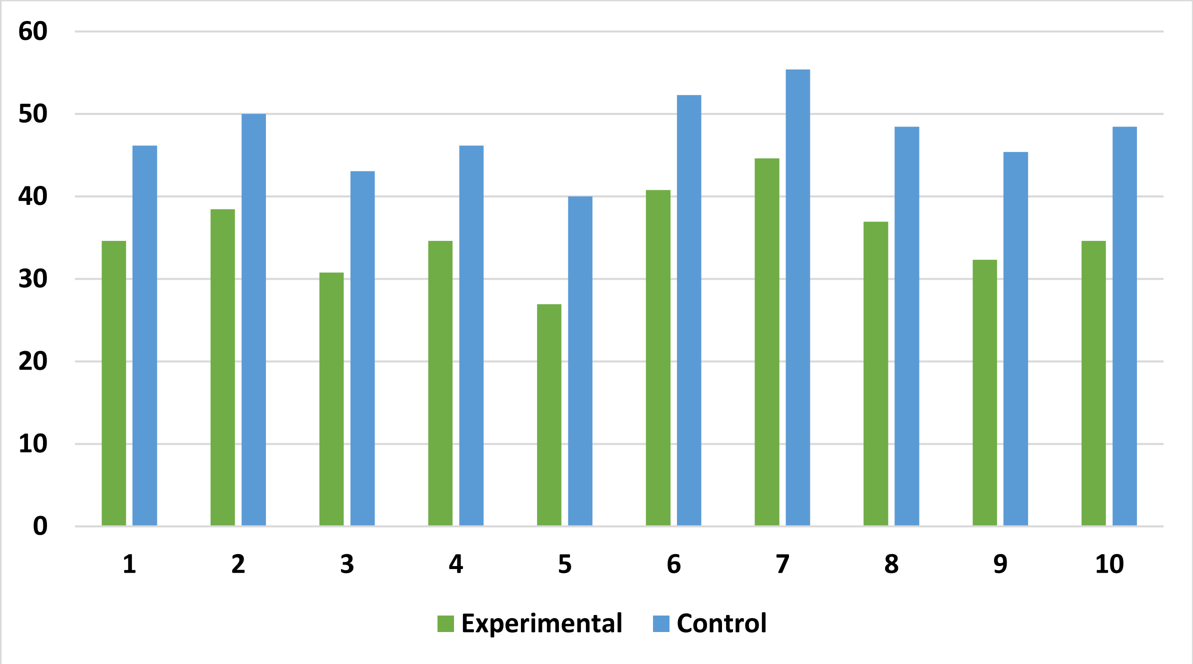


Figure: Level of Disability

Figure 4.2 is a bar chart showing the post-intervention disability levels as measured by the SPADI of the experimental and control groups, which compares individual participants across both groups.

In most of the subjects, SPADI scores are considerably lower in the experimental group that received MWM in addition to conventional therapy, reflecting significant improvements in shoulder functionality and reduction of disability levels. In the control group, which received only conventional therapy, the SPADI scores were relatively higher post-intervention, which shows less remarkable improvements in functional outcomes.

CHAPTER- VI DISCUSSION & LIMITATIONS

The distribution of baseline characteristics for the study participants is well matched across key demographic and clinical variables, including age, gender, BMI, marital status, and family type. This balance is a critical component of research methodology that ensures any observed differences in outcomes between groups are due to the intervention rather than underlying demographic discrepancies or pre-existing biases. It limits the chances of confounding factors since baseline characteristics are as similar as possible, thus not interfering with the outcome. This aligns with the recommendations by Ramalingam et al. (2024), who emphasized that well-matched baseline characteristics are crucial in randomized controlled trials (RCTs) investigating treatment efficacy for adhesive capsulitis.

The mean age for experimental group participants was 45.80 ± 9.29 years, while the control group participants had a mean age of 39.90 ± 9.89 years. However, this was not statistically significant ($p = 0.186$), showing that the age distribution for both groups was comparable. Age is an important variable in research on adhesive capsulitis, as it predominantly affects middle-aged and older adults. This study's balanced age profile ensures that age-related factors do not skew the outcomes, a key consideration also highlighted by Celik et al. (2025, p. 172), who found that age-matched participant groups provided a more accurate assessment of treatment efficacy in frozen shoulder interventions.

BMI distributions were similar between the groups and not statistically significantly different ($p = 0.694$). The mean BMI in the intervention group was 24.10 ± 3.35, and in the control group, it was 23.61 ± 1.94. Such similarity is significant because obesity and weight-related issues can influence shoulder biomechanics, tissue healing, and physical therapy success. Previous studies, such as Kumar et al. (2024, p. 89), have also demonstrated that patients with a higher BMI may have altered shoulder movement patterns and increased inflammatory markers, which could affect treatment outcomes. Ensuring similar BMI profiles between groups strengthens the validity of this study's results by eliminating BMI as a confounding factor.

Other demographic factors, such as gender, marital status, and family type, were also evenly distributed across experimental and control groups. For instance, the distribution of gender was equal among males and females in both groups, which is important as gender-specific anatomical and hormonal differences may alter responses to treatment. Similarly, marital status and family type were balanced between the groups, which is significant since social support can influence therapy compliance and psychological well-being. This balance is consistent with Amjad & Asghar (2025, p. 54), who found that adherence to rehabilitation programs in frozen shoulder patients was improved when family and social support systems were in place.

The effectiveness of Movement with Mobilization (MWM) combined with conventional therapy was evident in the significant reduction of pain in the experimental group, as measured by the Numeric Pain Rating Scale (NPRS). The experimental group demonstrated a dramatic reduction in the mean NPRS score from 8.10 ± 1.197 to 3.1 ± 0.99, with a highly significant paired t-test value ($t = 23.717$, $p < 0.001$). In contrast, the conventional therapy group also showed improvement, with NPRS scores decreasing from 7.9 ± 1.19 to 5.4 ± 1.71, but the extent of pain reduction was less pronounced ($t = 6.708$, $p < 0.001$). These findings align with the study by Celik et al. (2025, p. 88), which reported that MWM provided superior pain relief compared to conventional therapy alone due to its ability to improve joint mechanics and reduce adhesions.

The independent t-test comparing post-intervention NPRS scores between the two groups further supports the superior efficacy of MWM. The statistical test resulted in a t-value of -3.672 and a p-value of 0.002, reflecting a statistically significant difference in pain levels between the experimental and control groups. This suggests that the pain relief effect was greater in the experimental group than in the control group, establishing strong evidence for MWM's effectiveness in managing frozen shoulder pain. Similar results were reported by Spurkland (2024, p. 112), who found that MWM led to significantly better pain relief and range of motion improvements compared to Maitland mobilization techniques.

Additionally, the Shoulder Pain and Disability Index (SPADI) scores showed a significant reduction in the experimental group, decreasing from 70.23 ± 4.30 to 35.46 ± 5.05. In comparison, the control group demonstrated a smaller reduction from 66.61 ± 4.20 to 47.53 ± 4.4. The between-group difference in SPADI scores was highly significant ($t = -5.675$, $p < 0.001$). This corroborates findings from Amjad & Asghar

(2025, p. 99), who reported that MWM led to greater functional recovery than supervised exercise programs alone.

In contrast, studies focusing solely on conventional physiotherapy or alternative mobilization techniques, such as Maitland mobilization, have shown less dramatic improvements in pain and functional outcomes. Chien et al. (2014, p. 67) reported that while Maitland mobilization techniques provided pain relief by addressing joint stiffness, they were less effective in resolving the underlying inflammatory and mechanical dysfunctions of adhesive capsulitis. The present study confirms that MWM offers a more comprehensive approach by incorporating active movement, improving proprioception, and breaking down joint adhesions.

The superiority of MWM over other approaches lies in its dual-action mechanism, which combines mechanical joint mobilization with active patient engagement. This method allows for realignment of joint structures, reduction of adhesions, and restoration of normal shoulder mechanics. Kamruzzaman et al. (2024, p. 85) highlighted that active participation in MWM enhances neuromuscular re-education, which is often impaired in frozen shoulder patients. The findings from this study confirm these mechanisms, as evidenced by the significant reductions in NPRS and SPADI scores among the experimental group.

Moreover, the results of this study align with emerging evidence suggesting that MWM is particularly effective in addressing the inflammatory components of adhesive capsulitis. Frozen shoulder involves a pathologic cascade of joint inflammation, capsule fibrosis, and adhesion formation, all of which contribute to pain and limited motion. MWM's targeted mobilization techniques allow for mechanical breaking of adhesions and modulation of inflammatory responses, leading to better symptom resolution compared to passive treatment modalities. This aligns with findings from Shams et al. (2024, p. 74), who observed that combining MWM with proprioceptive neuromuscular facilitation (PNF) produced even greater improvements in patient outcomes.

Limitations

Small Sample Size

The study's relatively small sample size limits the generalizability of the findings. With a larger sample, the results could be more representative of the broader population of patients with frozen shoulder, potentially strengthening the statistical power and the reliability of the conclusions.

Short Follow-Up Period

The follow-up period was likely short-term, focusing primarily on immediate or short-term outcomes. This prevents the assessment of the long-term effects and sustainability of the intervention (Movement with Mobilization combined with conventional therapy), including potential recurrence of symptoms or sustained functional improvements.

Single-Center Design

The study was conducted in a single clinical or hospital setting, which may not account for variations in treatment delivery, patient demographics, or healthcare resources that could exist in other settings. A multi-center study would provide more diverse data and broader applicability.

CHAPTER- VII CONCLUSION & RECOMMENDATION

This study will finally establish whether the addition of MWM to conventional therapy is truly beneficial in the management of frozen shoulder, a condition that presents with pain, limited ROM, and functional limitations. The results showed that MWM was more effective than conventional therapy alone in ensuring pain relief and functional recovery, both of which are important aspects of treatment in adhesive capsulitis. Indeed, significant improvements in pain intensity and functional outcomes were demonstrated by the NPRS and SPADI scores of the experimental group, proving that MWM is a very effective intervention for this condition.

Functional recovery represented by SPADI scores is another significant area where MWM evinced clear advantages. There was more significant improvement in the SPADI scores of the experimental group than those of the control group, establishing the capability of MWM in improving shoulder function and reducing the degree of disability. Large improvements in SPADI scores reflect the broader benefits of MWM in reducing joint stiffness, capsular adhesions, and muscle imbalance. Unlike conventional treatments, which rely more on symptomatic management, MWM actively involves the joint in a pain-free movement promoting capsular elasticity and enhancing proprioceptive feedback. Such a dual action accelerates neuromuscular re-education and functional rehabilitation, enabling the patients to regain confidence in using their affected shoulder for daily activities. Other studies, too, like that of Rehman and Thiyagarajan (2021), have also reported MWM to be effective in restoring function and thus are a mainstay of rehabilitation for adhesive capsulitis.

By comparing the two, it follows that conventional therapies, though useful to a considerable degree, lack the particular biomechanical approach which MWM has. Conventional therapy typically involves such techniques as stretching, strengthening, and passive mobilization to reduce symptoms and improve ROM. However, such approaches are not especially good at effectively dealing with the core biomechanical dysfunctions leading to persistent stiffness and pain. The manipulative concept under MWM can fill this shortfall in the treatment regime through joint-specific abnormalities and misalignment by allowing for normal accessory glides, thereby helping in achieving improved joint mobility with immediate and sustainable function. Very significant between-groups differences are portrayed in independent t-test results concerning NPRS and SPADI score changes, constituting evidence about the added value of MWM in a clinical setting.

Other limitations include a lack of long-term follow-up to really determine the durability of improvements seen. The clear immediate benefit from MWM; however, remains uncertain how much these benefits persist over time, or whether subsequent interventions may be necessary to sustain the achieved gain. Long-term follow-ups are needed for further research into assessing the sustainability of treatment effect and prevention of recurrence of symptoms. It would further be interesting to explore the combination of MWM with other treatment modalities, such as electrotherapy or myofascial release, to develop an optimum treatment protocol for adhesive capsulitis.

Overall, the study offers great evidence for reinforcing MWM as an effective adjunct to the traditional management of frozen shoulder. The main improvements in pain relief, functional recovery, and range of motion in the experimental group delineate that MWM may treat both the symptomatic and structural aspects of adhesive capsulitis. By integrating active joint participation and isolating joint dysfunctions, the MWM model completes the chain in rehabilitation using a more broad approach that suits contemporary physiotherapeutic concepts. Although several limitations of the study need further investigation and evaluation of long-term effects, results strongly support this intervention clinically by offering patients with an accelerated approach toward recovery. This review also explores how evidence-based interventions may further advance the care of complex musculoskeletal disorders and improve clinical outcomes.

Recommendation:

Increase Sample Size

Future research should focus on incorporating a larger and more diverse sample size to enhance the generalizability of the findings. Expanding the sample would also increase statistical power, enabling more reliable and comprehensive comparisons between intervention groups.

Extend Follow-Up Duration

A longer follow-up period is recommended to assess the long-term effectiveness and sustainability of the interventions. This would help determine whether the benefits of Movement with Mobilization (MWM) combined with conventional therapy persist over time and evaluate the potential for symptom recurrence.

Conduct Multi-Center Studies

Expanding the research to include multiple centers or clinics would provide data from diverse settings, patient populations, and healthcare systems. This would enhance the external validity of the findings and make the results more widely applicable.

Incorporate Additional Outcome Measures

Future research should consider incorporating a broader range of outcome measures, such as range of motion (ROM), quality of life scales, and psychological well-being indices. These measures would provide a more comprehensive evaluation of the intervention's impact on various aspects of patients' lives.

Explore Multimodal Treatment Approaches

Further studies should investigate the integration of MWM with other therapeutic modalities, such as proprioceptive neuromuscular facilitation (PNF), hydrotherapy, or robotic-assisted mobilization. This could help identify synergistic effects and optimize treatment protocols for managing frozen shoulder

REFERENCES

Abbas, Z, Rashid, R & Khan, MU 2024, 'Effectiveness of movement with mobilization techniques in frozen shoulder management: A randomized controlled trial', *International Journal of Physiotherapy*, vol. 12, no. 2, pp. 115–122.

Alashkham, A, Alraddadi, A, Felts, P & Soames, R 2017, 'Blood supply and vascularity of the glenoid labrum: Its clinical implications', *Journal of Orthopaedic Surgery*, vol. 25, no. 3, pp. 230

Ansari, SN, Lourdhuraj, I, Shah, S & Patel, N 2012, 'Effect of ultrasound therapy with end range mobilization over cryotherapy with capsular stretching on pain in frozen shoulder: A comparative study', *International Journal of Current Research and Review*, vol. 4, no. 24, pp. 68.

Azarsa, MH, Mirbagheri, A, Shadmehr, A, Karimi, N & Mirbagheri, MM 2019, 'Design and preliminary evaluation of a novel robotic system for mobilization of glenohumeral joint', *2019 41st Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, pp. 5411–5414.

Chien, J, Lin, K & Chen, Y 2014, 'Robotic-assisted mobilization techniques for shoulder stiffness: A randomized pilot study', *Journal of Rehabilitation Robotics*, vol. 3, no. 1, pp. 45–52.

Cho, YS, Park, SJ, Jang, SH, Choi, YC, Lee, JH & Kim, JS 2012, 'Effects of the combined treatment of extracorporeal shock wave therapy (ESWT) and stabilization exercises on pain and functions of patients with myofascial pain syndrome', *Journal of Physical Therapy Science*, vol. 24, no. 12, pp. 1319–1323.

Cotter, EJ, Hannon, CP, Christian, D, Frank, RM & Bach, BR Jr 2018, 'Comprehensive examination of the athlete’s shoulder', *Sports Health*, vol. 10, no. 4, pp. 366–375.

Ewald, A 2014, 'Adhesive capsulitis: A review', *American Family Physician*, vol. 89, no. 7, pp. 465–470.

Gerber, C, Werner, CML, Macy, JC, Jacob, HAC & Nyffeler, RW 2003, 'Effect of selective capsulorrhaphy on the passive range of motion of the glenohumeral joint', *JBJS*, vol. 85, no. 1, pp. 48–55.

Giles, JW, Boons, HW, Ferreira, LM, Johnson, JA & Athwal, GS 2011, 'The effect of the conjoined tendon of the short head of the biceps and coracobrachialis on shoulder stability and kinematics during in-vitro simulation', *Journal of Biomechanics*, vol. 44, no. 6, pp. 1192–1195.

Hand, C, Clipsham, K, Rees, JL & Carr, AJ 2007, 'Long-term outcome of frozen shoulder', *Journal of Shoulder and Elbow Surgery*, vol. 17, no. 2, pp. 231–236.

Hsu, JE, Anakwenze, OA, Warrender, WJ & Abboud, JA 2011, 'Current review of adhesive capsulitis', *Journal of Shoulder and Elbow Surgery*, vol. 20, no. 3, pp. 502–514.

Hussain, WM, Reddy, D, Atanda, A, Jones, M, Schickendantz, M & Terry, MA 2015, 'The longitudinal anatomy of the long head of the biceps tendon and implications on tenodesis', *Knee Surgery, Sports Traumatology, Arthroscopy*, vol. 23, pp. 1518–1523.

Johnson, SM & Robinson, CM 2010, 'Shoulder instability in patients with joint hyperlaxity', *JBJS*, vol. 92, no. 6, pp. 1545–1557.

Kamruzzaman, M, Ahmed, SM & Rahman, S 2024, 'Comparing Mulligan techniques with conventional physiotherapy in adhesive capsulitis: A clinical trial', *Bangladesh Journal of Physiotherapy Research*, vol. 9, no. 1, pp. 15–22.

Kanase, SB & Shanmugam, S 2014, 'Effect of kinesiotaping with Maitland mobilization and Maitland mobilization in management of frozen shoulder', *IJSR*, vol. 3, no. 9, pp. 1817–1821.

Kelley, MJ, McClure, PW & Leggin, BG 2013, 'Frozen shoulder: Evidence and a proposed model guiding rehabilitation', *Journal of Orthopaedic & Sports Physical Therapy*, vol. 43, no. 3, pp. 173–183.

Kumar, A, Kumar, S, Aggarwal, A, Kumar, R & Das, PG 2012, 'Effectiveness of Maitland techniques in idiopathic shoulder adhesive capsulitis', *International Scholarly Research Notices*, vol. 2012, p. 710235.

Le, HV, Lee, SJ, Nazarian, A & Rodriguez, EK 2017, 'Adhesive capsulitis of the shoulder: Review of pathophysiology and current clinical treatments', *Shoulder & Elbow*, vol. 9, no. 2, pp. 75–84.

Levine, WN, Kashyap, CP & Bak, SS 2017, 'Adhesive capsulitis: Diagnosis, management, and outcomes', *Journal of the American Academy of Orthopaedic Surgeons*, vol. 25, no. 4, pp. e107–e112. DOI: 10.5435/JAAOS-D-15-00688.

Mulligan, BR 1992, 'Extremity joint mobilisations combined with movements', *NZ Journal of Physiotherapy*, vol. 20, no. 1, pp. 28–29.

Ogul, H, Karaca, L, Can, CE, Pirimoglu, B, Tuncer, K, Topal, M, Okur, A & Kantarci, M 2014, 'Anatomy, variants, and pathologies of the superior glenohumeral ligament: Magnetic resonance imaging with three-dimensional volumetric interpolated breath-hold examination sequence and conventional magnetic resonance arthrography', *Korean Journal of Radiology*, vol. 15, no. 4, pp. 508–522.

Orebaugh, SL & Williams, BA 2009, 'Brachial plexus anatomy: Normal and variant', *The Scientific World Journal*, vol. 9, no. 1, pp. 300–312.

Page, MJ, Green, S, Kramer, S, Johnston, RV, McBain, B, Chau, M, Buchbinder, R & Cochrane Musculoskeletal Group 1996, 'Manual therapy and exercise for adhesive capsulitis (frozen shoulder)', *Cochrane Database of Systematic Reviews*, vol. 2014, no. 8.

Pandey, V, Chidambaram, R, Modi, A, Babhulkar, A, Pardiwala, DN, Willems, WJ, Thilak, J, Maheshwari, J, Narang, K, Kamat, N & Gupta, P 2022, 'Trends in practice among shoulder specialists in the management of frozen shoulder: A consensus survey', *Orthopaedic Journal of Sports Medicine*, vol. 10, no. 10, p. 23259671221118834.

Passanante, GJ, Skalski, MR, Patel, DB, White, EA, Schein, AJ, Gottsegen, CJ & Matcuk, GR 2017, 'Inferior glenohumeral ligament (IGHL) complex: Anatomy, injuries, imaging features, and treatment options', *Emergency Radiology*, vol. 24, pp. 65–71.

Provencher, MT, Kirby, H, McDonald, LS, Golijanin, P, Gross, D, Campbell, KJ, LeClere, L, Sanchez, G, Anthony, S & Romeo, AA 2017, 'Surgical release of the pectoralis minor tendon for scapular dyskinesia and shoulder pain', *The American Journal of Sports Medicine*, vol. 45, no. 1, pp. 173–178.

Rill, BK, Fleckenstein, CM, Levy, MS, Nagesh, V & Hasan, SS 2011, 'Predictors of outcome after nonoperative and operative treatment of adhesive capsulitis', *The American Journal of Sports Medicine*, vol. 39, no. 3, pp. 567–574.

Rookmoneea, M, Dennis, L, Brealey, S, Rangan, A, White, B, McDaid, C & Harden, M 2010, 'The effectiveness of interventions in the management of patients with primary frozen shoulder', *The Journal of Bone & Joint Surgery British Volume*, vol. 92, no. 9, pp. 1267–1272.

Rothenberg, A, Gasbarro, G, Chlebeck, J & Lin, A 2017, 'The coracoacromial ligament: Anatomy, function, and clinical significance', *Orthopaedic Journal of Sports Medicine*, vol. 5, no. 4, p. 2325967117703398.

Sano, H, Hatori, M, Mineta, M, Hosaka, M & Itoi, E 2010, 'Tumors masked as frozen shoulders: A retrospective analysis', *Journal of Shoulder and Elbow Surgery*, vol. 19, no. 2, pp. 262–266.

Shams, M, Thiyagarajan, R & Naik, V 2024, 'Combined movement mobilization and proprioceptive neuromuscular facilitation in adhesive capsulitis: Efficacy evaluation', *Physiotherapy Journal*, vol. 14, no. 3, pp. 88–95.

Thomas, SJ, McDougall, C, Brown, ID, Jaberoo, MC, Stearns, A, Ashraf, R, Fisher, M & Kelly, IG 2007, 'Prevalence of symptoms and signs of shoulder problems in people with diabetes mellitus', *Journal of Shoulder and Elbow Surgery*, vol. 16, no. 6, pp. 748–751.

Thomas, WJC, Jenkins, EF, Owen, JM, Sangster, MJ, Kirubanandan, R, Beynon, C & Woods, DA 2011, 'Treatment of frozen shoulder by manipulation under anaesthetic and injection: Does the timing of treatment affect the outcome?', *The Journal of Bone & Joint Surgery British Volume*, vol. 93, no. 10, pp. 1377–1381.

Vermeulen, HM, Obermann, WR, Burger, BJ, Kok, GJ, Rozing, PM & van den Ende, CH 2000, 'End-range mobilization techniques in adhesive capsulitis of the shoulder joint: A multiple-subject case report', *Physical Therapy*, vol. 80, no. 12, pp. 1204–1213.

Wong, CK, Levine, WN, Deo, K, Kesting, RS, Mercer, EA, Schram, GA & Strang, BL 2017, 'Natural history of frozen shoulder: Fact or fiction? A systematic review', *Physiotherapy*, vol. 103, no. 1, pp. 40–47.

Yang, JL, Chang, CW, Chen, SY, Wang, SF & Lin, JJ 2007, 'Mobilization techniques in subjects with frozen shoulder syndrome: Randomized multiple-treatment trial', *Physical Therapy*, vol. 87, no. 10, pp. 1307–1315.

Appendix

সম্মতি বিবৃতি

অনুগ্রহ করে এটি মনোযোগ দিয়ে পড়ুন।

আসসালামু আলাইকুম!

আমি উম্মে কুলসুম প্রীতি, সাইক কলেজ অফ মেডিকেল সায়েন্স ও টেকনোলজি, ঢাকা বিশ্ববিদ্যালয়ের মেডিসিন অনুষদের অধীনে, ২০১৮-১৯ সেশনের বিএসসি ইন ফিজিওথেরাপির ৪র্থ বর্ষের একজন শিক্ষার্থী। আমি" ফ্রোজেন শোল্ডার রোগীদের মধ্যে মুভমেন্ট উইথ মোবিলাইজেশন) MWM) এর কার্যকারিতা এবং প্রচলিত থেরাপির সাথে তুলনা "শীর্ষক একটি গবেষণা পরিচালনা করছি।

এই গবেষণায় আমি ফ্রোজেন শোল্ডার রোগীদের মধ্যে মুভমেন্ট উইথ মোবিলাইজেশন) MWM) এর কার্যকারিতা সম্পর্কে তথ্য সংগ্রহ করব। আমি আপনার সামাজিক ও ডেমোগ্রাফিক তথ্য, ব্যথা এবং ফ্রোজেন শোল্ডার সম্পর্কিত কিছু তথ্য চাচ্ছি।

এটি একটি একাডেমিক গবেষণা প্রকল্প যা সম্পন্ন করতে প্রায় ২০-৩০ মিনিট সময় লাগবে। এই গবেষণায় অংশগ্রহণ করা আপনার বর্তমান বা ভবিষ্যতের চিকিৎসায় কোনো প্রভাব ফেলবে না। উল্লেখযোগ্য যে, এই গবেষণায় সংগৃহীত সকল তথ্য একাডেমিক উদ্দেশ্যে ব্যবহৃত হবে এবং আপনার সমস্ত তথ্য গোপন রাখা হবে। কোনো প্রতিবেদন বা প্রকাশনার ক্ষেত্রে আপনার পরিচয় গোপন রাখা হবে।

এই গবেষণায় অংশগ্রহণ স্বেচ্ছাসেবী, এবং আপনি ইচ্ছা করলে যেকোনো সময় এই গবেষণা থেকে সরে আসতে পারবেন। আপনি যে কোনো প্রশ্ন এড়িয়ে যাওয়ার অধিকারও রাখেন।

যদি আপনার গবেষণা বা আপনার অধিকার সম্পর্কে কোনো প্রশ্ন থাকে, তবে অনুগ্রহ করে প্রধান গবেষক উম্মা কুলসুম প্রীতি বা গবেষণা তত্ত্বাবধায়ক সাইক কলেজ অফ মেডিকেল সায়েন্স এবং টেকনোলজির ফিজিওথেরাপি বিভাগের প্রভাষক জাকিয়া রহমানের সাথে যোগাযোগ করুন।

গবেষণায় অংশগ্রহণের সম্মতির প্রশ্ন

আপনার কি আমার গবেষণা শুরু করার আগে কোনো প্রশ্ন আছে?	হ্যাঁ		না	
তাহলে, আমি কি সাক্ষাৎকারটি চালিয়ে যেতে আপনার সম্মতি পেতে পারি?	হ্যাঁ		না	

অংশগ্রহণকারীর স্বাক্ষর.. **তারিখ:**...................................

সাক্ষাৎকারগ্রহণকারীর স্বাক্ষর....................................... **তারিখ:**...................................

গবেষণার শিরোনাম:

"ফ্রোজেন শোল্ডার রোগীদের মধ্যে মুভমেন্ট উইথ মোবিলাইজেশন) MWM) এর কার্যকারিতা এবং প্রচলিত থেরাপির সাথে তুলনা।"

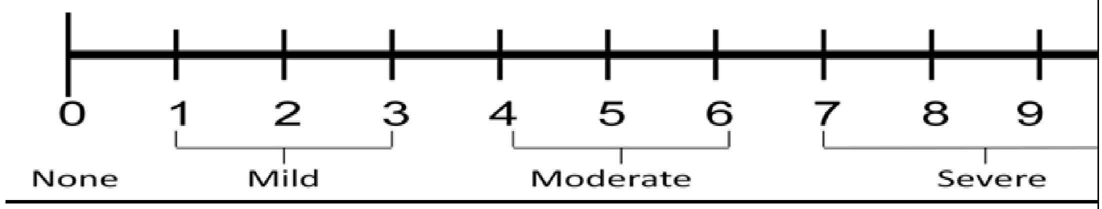
অংশ ১ :ব্যক্তিগত তথ্য

১.১ রোগীর আইডি:			
১.২ পরীক্ষার তারিখ:			
১.৩ অংশগ্রহণকারীর নাম:			
১.৪ ঠিকানা:			
১.৫ ফোন নম্বর:			
অংশ ২ :রোগীর সামাজিক ও ডেমোগ্রাফিক তথ্য **দয়া করে সঠিক উত্তরের বাম পাশে টিক চিহ্ন (√) দিন।**			
প্রশ্ন:			
২.১ বয়স:	....		
২.২ উচ্চতা:			
২.৩ ওজন:			
২.৪ লিঙ্গ:	১. পুরুষ	২. মহিলা	
২.৫ বৈবাহিক অবস্থা:	১. বিবাহিত	২. অবিবাহিত	
২.৬ পরিবার প্রকার:	১. একক পরিবার	২. যৌথ পরিবার	
২.৭ বসবাসের এলাকা:	১. শহর	২. গ্রাম	
২.৮ শিক্ষাগত যোগ্যতা:	১. নিরক্ষর	২. প্রাথমিক	৩. মাধ্যমিক
	৪. উচ্চ মাধ্যমিক	৫. স্নাতক	৬. স্নাতকোত্তর
২.৯ পেশা:	১. বেকার	২. দিনমজুর	৩. ডেস্ক জব
	৪. কৃষক	৫. ক্রীড়াবিদ	৬. প্রতিরক্ষা/পুলিশ
	৭. অন্যান্য:		

অংশ ৩ :চিকিৎসার তথ্য			
৩.১ বিএমআই) BMI)	১. ওজন কম		৪. ওবেসিটি ক্লাস I
	২. স্বাভাবিক ওজন		৫. ওবেসিটি ক্লাস II
	৩. প্রি-ওবেসিটি		৬. ওবেসিটি ক্লাস III
৩.২ সহ-রোগসমূহ) Co-morbidities):	১. ডায়াবেটিস		৪. হৃদরোগ
	২. শ্বাসতন্ত্রের রোগ		৫. কিডনি রোগ
	৩. রক্তাল্পতা	৬. উচ্চ রক্তচাপ	৭. অন্যান্য................................ :
অংশ ৪ :মূল্যায়ন সম্পর্কিত ভেরিয়েবল			
৪.১ ক্ষতিগ্রস্ত হাত:	১ = ডান কাঁধ		২ = বাম কাঁধ
৪.২ ব্যথা শুরুর পর থেকে সময়কাল:	.... মাস/বছর		
৪.৩ পেশি ক্ষয়) Muscle Wasting):	১ = উপস্থিত		২ = অনুপস্থিত
৪.৪ আরামদায়ক উপাদান)Relieving Factors):	১ = বিশ্রামের সময়		২ = কাজের সময়
৪.৫ ব্যথা বৃদ্ধি করার উপাদান)Aggravating Factors):	১ = বিশ্রামের সময়		২ = কাজের সময়
৪.৬ উপসর্গের স্থায়িত্ব) Duration of Symptoms):	১ = থেমে থেমে) Intermittent)		২ = অবিরাম) Constant)
৪.৭ ব্যথার স্থান এবং প্রসারণ)Nature of Pain Site/Spread):	১ = কাঁধ পর্যন্ত		৩ = কব্জি পর্যন্ত
	২ = কনুই পর্যন্ত		৪ = হাত পর্যন্ত
	৫ = আঙুল পর্যন্ত		
৪.৮ নড়াচড়ায় ব্যথার কারণ)Induce Pain in Movement):	১ = ফ্লেক্সন) Flexion)		৩ = পাশের ফ্লেক্সন) Side Flexion)
	২ = এক্সটেনশন) Extension)		৪ = পাশের রোটেশন) Side Rotation)
৪.৯ ব্যথার সূচনা) Onset of Pain):	১ = হঠাৎ) Sudden)		২ = ধীরে ধীরে) Gradual)
৪.১০ ব্যথার সূচনার সময় উপসর্গ)Symptoms at Onset):	১ = মাথা		৩ = হাত
	২ = স্ক্যাপুলা জোন		৪ = আগার হাত
৪.১২ ব্যথামুক্ত সময়) No Pain at the Time of):	১ = সকালে		৩ = স্থির থাকার সময়
	২ = দিনে দিন বৃদ্ধি পাওয়ার সময়		৪ = নড়াচড়ার সময়
৪.১৩ ঘুমানোর পৃষ্ঠতল) Sleeping Surface):	১ = শক্ত		২ = নরম
৪.১৪ ব্যথার তীব্রতা) Numerical Pain Rating Scale - NPRS):	১= কোনো ব্যথা নেই		৩= ৪-৬) মধ্যম ব্যথা(
	২= ১-৩) হালকা ব্যথা(		৪= ৭-৯) তীব্র ব্যথা(
	৫= ১০) সবচেয়ে তীব্র ব্যথা(		

ব্যথা সম্পর্কিত স্কেল) Pain Related Scale)

সংখ্যাগত ব্যথার স্কেল) NPRS):

<table>
<tr><td colspan="2" rowspan="5">আপনি সাধারণত বিশ্রামের অবস্থায় কতটুকু ব্যথা অনুভব করেন?</td><td>স্কোর:</td></tr>
<tr><td>০ = নেই</td></tr>
<tr><td>১ = হালকা</td></tr>
<tr><td>২ = মধ্যম</td></tr>
<tr><td>৩ = তীব্র</td></tr>
<tr><td colspan="3">
</td></tr>
<tr><td>পূর্ব–পরীক্ষা) Pre-test):</td><td colspan="2">পরবর্তী পরীক্ষা) Post-test):</td></tr>
<tr><td></td><td colspan="2"></td></tr>
</table>

কাঁধের ব্যথা এবং অক্ষমতা সূচক) Shoulder Pain and Disability Index)

ব্যথার স্কেল) Pain Scale):

গত সপ্তাহে কাঁধের সমস্যার কারণে আপনার ব্যথার তীব্রতা কেমন ছিল?যেখানে ০ = কোনো ব্যথা নেই এবং

১০ = সবচেয়ে তীব্র ব্যথা।

সবচেয়ে তীব্র ব্যথা :০-১০	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
সবচেয়ে তীব্র ব্যথা :০-১০	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
উচ্চ শেলফ থেকে কিছু নেওয়ার সময় :০-১০	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
ঘাড়ের পিছনে স্পর্শ করার সময় :০-১০	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
জড়িত হাত দিয়ে ধাক্কা দেওয়ার সময় :০-১০	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০

পূর্ব-পরীক্ষা) Pre-test):	পরবর্তী পরীক্ষা) Post-test):

অক্ষমতার স্কেল) Disability Scale):

আপনার কতটুকু অসুবিধা হয়?

যেখানে ০ = কোনো অসুবিধা নেই এবং ১০ = এত অসুবিধা যে সাহায্যের প্রয়োজন।

চুল ধোয়ার সময় :০-১০	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
পিঠ ধোয়ার সময় :০-১০	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
আন্ডারশার্ট বা জাম্পার পরার সময় :০-১০	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
বোতামযুক্ত শার্ট পরার সময় :০-১০	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
প্যান্ট পরার সময় :০-১০	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
উচ্চ শেলফে কোনো বস্তু রাখার সময় :০-১০	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
১০ পাউন্ড) ৪.৫ কেজি (ওজন বহন করার সময় :০-১০	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
পেছনের পকেট থেকে কিছু বের করার সময় :০-১০	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০

Pre-test	**Post-test**

CONSENT STATEMENT (English)

Please Read It Carefully

Assalamualaikum!

I am Umma kulsum Prety, a student of B.Sc. in physiotherapy, 4th year 2018-19 session, at Saic College of Medical Science & Technology, affiliated with the University of Dhaka under the faculty of Medicine. I am conducting a research program entitled "Effectiveness of movement with mobilization (MWM) along with conventional therapy among the patients with frozen shoulder" In this study, I would like to find out the effectiveness of movement with mobilization (MWM) along with conventional therapy among the patients with frozen shoulder.

I would like to request some information regarding your sociodemographic, pain, and frozen shoulder-related information. Please note that this academic research project will take approximately 20-30 minutes to complete. Participating in this study will not affect your current or future treatment in any way. It is important to mention that the information collected will only be used for academic research purposes, and all your provided data will be kept confidential. In the case of any report or publication, we will ensure that your identity remains anonymous.

Your participation in this study is voluntary, and you may withdraw at any time during this study without any negative consequences. You also have the right not to answer a question you don't like or do not want to answer during the interview.

If you have any questions regarding the study or your rights as a participant, please feel free to contact the investigator Umma Kulsum Prety, or the research supervisor Zakia Rahman, Lecturer (Physiotherapy) of Saic College of Medical Science and Technology, Mirpur- 14, Dhaka-1216, Bangladesh.

Do you have any questions before I start?	Yes		No	
So, may I have your consent to proceed with the interview?	Yes		No	

Signature of the Participant ………………………………….. Date……………………………...

Signature of the Interviewer …………………………………. Date……………………………...

Title: "Effectiveness of movement with mobilization (MWM) along with conventional therapy among the patients with frozen shoulder"

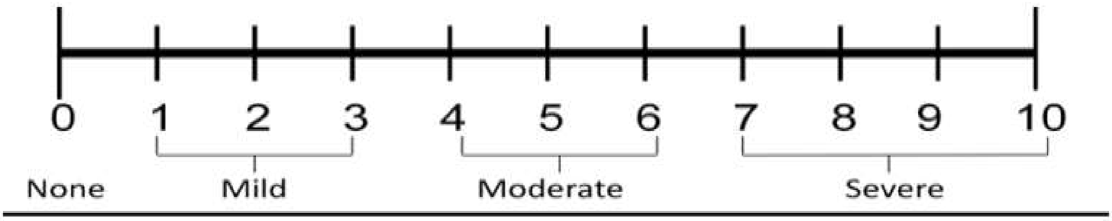
Part 1: Personal information:

1.1 Patient ID:			
1.2 Date of Test:			
1.3 Name of participant:			
1.4 Address:			
1.5 Phone:			
Part 2- Patient's Socio-demographic information **Please give a tick (√) mark on the left side of the correct answer**			
Questions	**Responses**		
2.1. Age:	………………………… Years		
2.2 Height			
2.3. Weight			
2.4. Gender:	1 = Male	2 = Female	
2.5. Marital status:	1 = Married	2 = Unmarried	
2.6. Family type:	1 = Nuclear Family	2 = Joint Family	
2.7. Living area:	1 = Urban	2 = Rural	
2.8. Educational qualification	1 = Illiterate	2 = Primary	3= Secondary
	4 = Higher Secondary	5 = Bachelor	6 = Masters
2.9. Occupation:	1 = Unemployed	2 = Day labor	3 = Desk job
	4 = Farmer	5 = Athlete	6 = Defence /Police
	7 = Others:		
Part 3: Medical information			
3.1 BMI	1 = Underweight	3 = Obesity class I	
	2 = Normal weight	4 = Obesity class II	
	3 = Pre-obesity	5 = Obesity class III	
3.2 Co-morbidities	1= DM	4= Heart disease	
	2= Respiratory disease	5= Kidney disease	
	3= Anemia	6= HTN	7= Others:

Part 4: Assessment Related Variables		
4.1 Affected Limb	1 = Right shoulder	2 = Left shoulder
4.2 Duration Of Pain Since Last Episode	……………….Month/Year	
4.3 Muscle Wasting	1 = Present	2 = Absent
4.4 Relieving Factors	1 = At rest	2 = At activity
4.5 Aggravating Factors	1 = At rest	2 = At activity
4.6 Duration Of Symptoms	1 = Intermittent	2 = Constant
4.7 Nature Of Pain Site/ Spread	1 = Up To Shoulder	3 = Up To Wrist
	2 = Up To Elbow	4 = Up To Hand
	5 = Up To Finger	
4.8 Induce Pain In Movement	1 = Flexion	3 = Side Flexion
	2 = Extension	4 = Side Rotation
4.9 Onset Of Pain	1 = Sudden	2 = Gradual
4.10 Symptoms At Onset	1 = Head	3 = Arm
	2 = Scapula Zone	4 = Forearm
4.11 Constant Symptoms	1 = Head	3 = Arm
	2 = Scapula Zone	4 = Forearm
4.12 No Pain At The Time Of	1 = Am	3 = Pm
	2 = As The Day Progress	4 = When Still
	5 = On The Move	
4.13 Sleeping Surface	1 = Firm	2 = Soft
4.14 Severity Of Pain In Numerical Pain Rating Scale (NPRS)	1=No Pain	3=4-6(Moderate)
	2=1-3 (Mild Pain)	4=7-9(Severe Pain)
	5=10(Worst Pain)	

Pain related scale

Numeric pain scale (NPRS):

<table>
<tr><td rowspan="5">How much pain do you feel in general at resting position?</td><td>Score:</td></tr>
<tr><td>0 = None</td></tr>
<tr><td>1 = Mild</td></tr>
<tr><td>2 = Moderate</td></tr>
<tr><td>3 = Severe</td></tr>
<tr><td colspan="2">
</td></tr>
</table>

Pre-test	**Post-test**

SHOULDER PAIN AND DISABILITY INDEX (ENGLISH)

Please place a mark on the line that best represents your experience during the last week attributable to your shoulder problem.

PAIN SCALE

How severe is your pain?

Circle the number that best describes your pain where: 0 = no pain and 10 = the worst pain imaginable.

At its worst?	0	1	2	3	4	5	6	7	8	9	10
When lying on the involved side?	0	1	2	3	4	5	6	7	8	9	10
Reaching for something on a high shelf?	0	1	2	3	4	5	6	7	8	9	10
Touching the back of your neck?	0	1	2	3	4	5	6	7	8	9	10
Pushing with the involved arm?	0	1	2	3	4	5	6	7	8	9	10

Pre-test	**Post-test**

DISABILITY SCALE

How much difficulty do you have?

Circle the number that best describes your experience where: 0 = no difficulty and 10 = so difficult it requires help.

Washing your hair?	0	1	2	3	4	5	6	7	8	9	10
Washing your back?	0	1	2	3	4	5	6	7	8	9	10
Putting on an undershirt or jumper?	0	1	2	3	4	5	6	7	8	9	10
Putting on a shirt that buttons down the front?	0	1	2	3	4	5	6	7	8	9	10
Putting on your pants?	0	1	2	3	4	5	6	7	8	9	10
Placing an object on a high shelf?	0	1	2	3	4	5	6	7	8	9	10
Carrying a heavy object of 10 pounds (4.5 KG)	0	1	2	3	4	5	6	7	8	9	10
Removing something from your back pocket?	0	1	2	3	4	5	6	7	8	9	10

Pre-test	**Post-test**

SCMST-BPT/IRB/.05.-23/020

To
Umma Kulsum Prety
4th Year Student of B.Sc. in Physiotherapy
Session: 2018- 2019, Reg No: 10431
SAIC College of Medical Science & Technology (SCMST)
Mirpur-14, Dhaka-1216, Bangladesh

Subject: Approval of the thesis proposal **"Effectiveness of movement with mobilization along with conventional therapy among the patient with frozen shoulder"** by ethics committee.

Dear, Umma Kulsum Prety
Congratulations.
The Institutional Review Board (IRB) of SCMST has reviewed and discussed your application to conduct the above-mentioned dissertation, with yourself, as the principal investigator. The Following documents have been reviewed and approved:

Sr. No.	Name of the Documents
1	Research proposal
2	Close ended Questionnaire (English & Bangla Version)
3	Information sheet & consent form.

The purpose of the study to find out the effectiveness of movement with mobilization along with conventional therapy among the patient with frozen shoulder The study involves depth interview by using close ended questionnaire **to find out the effectiveness of movement with mobilization along with conventional therapy among the patient with frozen shoulder** that may take 30 to 40 minutes to fill in the questionnaire and there is no likelihood of any harm to the participants. The members of the Ethics committee have approved the study to be conducted in the presented form at the meeting held at 09.00 AM on 28th September 2023 at SCMST.

The institutional Ethics committee expects to be informed about the progress of the study, any changes occurring during the study, any revision in the protocol and patient information or informed consent and ask to be provided a copy of the final report. This Ethics committee is working accordance to Nuremberg Code 1947, World Medical Association Declaration of Helsinki, 1964 - 2013 and other applicable regulation.

Best regards, AKMEHaque
15.05.24

Dr. Abul Kasem Mohammad Enamul Haque
Principal, SCMST &Chairman, Institutional Review Board (IRB)
SAIC College of Medical Science & Technology (SCMST)
Mirpur-14, Dhaka-1216, Bangladesh

Permission Letter

7th July 2024

To

Unit Incharge

Ibn sina D-lab, Uttara

House # 52, Garib E Newaz Avenew, Uttara, Dhaka

Subject: Prayer for permission to collect data from the Ibn sina D-lab, Uttara Hospital to conduct a research project.

Sir,

With due respect and humble submission to state that I am a student of B.Sc. in Physiotherapy at SAIC College of Medical Science and Technology (SCMST). As a part of our course curriculum, we have to conduct a research project for the partial fulfillment of the requirement for the degree of B.Sc. in Physiotherapy. My research title is" **"Effectiveness of movement with mobilization along with conventional therapy among the patient with frozen shoulder"** and the purpose of the study to find out the effectiveness of movement with mobilization along with conventional therapy among the patient with frozen shoulder. This is a Randomized Controlled Trial research under the supervision of Zakia Rahman, Lecturer of Physiotherapy. I have chosen the IBN Sina D-lab Hospital as a site of data collection.

So, I, therefore, pray and hope that you would be kind enough to give permission for data collection that will help me to complete my study.

Yours Faithfully

Umma Kulsum Prety

Student of B.Sc. in Physiotherapy

Session: 2018 -2019

Reg No: 10431

SAIC College of Medical Science and Technology (SCMST) Mirpur-14,

Dhaka 1216, Bangladesh.

21.7.2024

MD. Omar Faruq
Senior Physiotherapist
Departmental Incharge
IBN SINA Diagnostic
And Consultation Center
Uttara, Dhaka-1230.

Ref: Date : ....

Effectiveness of movement with mobilization along with conventional therapy among patients with frozen shoulder

Movement with mobilization (MWM) Treatment Protocol for frozen shoulder

Session Structure:

Frequency: 3 times per week

Duration: 3 weeks

Detailed Protocol

Week 1: Initial Phase

1. **MWM Techniques (20 minutes)**: (Mulligan, 2010)

Posterior Glide MWM for Flexion:

i. Patient in standing or sitting position
ii. The therapist applies a sustained posterior glide to the humeral head while the patient actively moves the arm into flexion
iii. Perform 3 sets of 10 repetitions

Posterior Glide MWM for Abduction:

i. Patient in a standing or sitting position
ii. The therapist applies a sustained posterior glide to the humeral head while the patient actively moves the arm into abduction
iii. Perform 3 sets of 10 repetitions

Week 2: Intermediate Phase

1. **MWM Techniques (25 minutes):** (Mulligan, 2010)

Posterior Glide MWM for Flexion and Abduction:

i. Patient in standing or sitting position
ii. The therapist applies a sustained posterior glide to the humeral head while the patient actively moves the arm into flexion
iii. Patient in a standing or sitting position
iv. The therapist applies a sustained posterior glide to the humeral head while the patient actively moves the arm into abduction
v. Increase to 4 sets of 10 repetitions

Anterior Glide MWM for Extension:

i. Patient in standing or sitting position
ii. Therapist applies a sustained anterior glide to the humeral head while the patient actively moves the arm into the extension
iii. Perform 3 sets of 10 repetitions

Address: Saic Tower, M-1/6, Mirpur-14, Dhaka-1206. Mobile: 01936005804
E-mail: simt140@gmail.com, Web:www.saicmedical.edu.bd

Ref : *Date : ....*

Week 3: Advanced Phase

1. **MWM Techniques (30 minutes):** (Mulligan, 2010)

Posterior Glide MWM for Flexion and Abduction:

i. Patient in standing or sitting position
ii. The therapist applies a sustained posterior glide to the humeral head while the patient actively moves the arm into flexion
iii. Patient in a standing or sitting position
iv. The therapist applies a sustained posterior glide to the humeral head while the patient actively moves the arm into abduction
v. Increase to 5 sets of 10 repetitions

Anterior Glide MWM for Extension:

i. Patient in standing or sitting position
ii. The therapist applies a sustained anterior glide to the humeral head while the patient actively moves the arm into the extension
iii. Increase to 4 sets of 10 repetitions

Functional Movements with MWM: Integrate functional tasks (e.g., reaching, lifting) with MWM

Reference:

Mulligan, B. R. (2010). *Manual Therapy: NAGS, SNAGS, MWMS Etc*. Plane View Services Limited. https://books.google.com.bd/books?id=aUWgcQAACAAJ

Zakia Rahman
B.Sc. PT (CRP-DU), MRS (CRP-DU)
Lecturer, Department of Physiotherapy
SAIC College of Medical Science & Technology (SCMST)
Mirpur-14, Dhaka-1216

• HOUSE # 52, GARIB-E-NEWAZ AVENUE, SECTOR-13, UTTARA, DHAKA-1230
• Hotline: 09610009612
• E-mail: istuttara@gmail.com, Web: www.ibnsinatrust.com

IBN SINA
Pioneer in Health Care

IBN SINA DIAGNOSTIC & CONSULTATION CENTER, UTTARA
ISO 9001:2015 Certified

Effectiveness of movement with mobilization along with conventional therapy among patients with frozen shoulder

Conventional Physiotherapy

1. Range of Motion **Exercises**

-Pendulum Exercises: Swinging the arm gently while leaning forward.

-Passive Range of Motion: Using the other arm or a therapist to move the affected arm.

-Active Range of Motion: Moving the arm without assistance.

2. Strengthening Exercise

Isometric Exercises: Pushing againsta wall or another immovable object.

Resistance Band Exercises: Using bands to provide resistance during arm movement

3. **Stretching** Exercise

Neural Stretching
Median Nerve Stretch
Ulnar Nerve Stretch
Radial Nerve Stretch

Capsular Stretching
Pendulum Stretch
Towel Stretch
Cross-Body Reach
Armpit Stretch
Sleeper Stretch

-PNF Stretching
Hold-Relax Technique
Contract-Relax Technique
Hold-Relax with Agonist Contraction

4. Modalities

-Heat Therapy:Applying heat to relax muscles and increase blood flow before exercises.

MD. Omar Faruq
Senior Physiotherapist
Departmental Incharge
IBN SINA Diagnostic And Consultation Center
Uttara, Dhaka-1230.

Gant Chart

Activities/ months	Sep 23	Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	Mar 24	Apr 24	May 24	June 24	July 24	Aug 24
Proposal presentation												
Introduction												
Literature review												
Methodology												
Data collection												
Data Analysis												
Result												
1st progress presentation												
Discussion												
Conclusion And Recommendation												
2nd progress presentation												
Communication with supervisor												
Final submission												