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EFFECTIVENESS OF QUADRICEPS MYOFASCIAL RELEASE TECHNIQUE FOR THE TREATMENT OF KNEE OSTEOARTHRITIS

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We the undersigned certify that we have carefully read and recommended to the Faculty of Medicine, University of Dhaka, for the acceptance of this dissertation entitled

EFFECTIVENESS OF QUADRICEPS MYOFASCIAL RELEASE TECHNIQUE FOR THE TREATMENT OF KNEE OSTEOARTHRITIS

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Declaration

I hereby declare that the present dissertation entitled **'Effectiveness of Quadriceps Myofascial Release Technique for the Treatment of Knee Osteoarthritis'** is an original work of my own. All source used have been cited appropriately. Any mistakes or inaccuracies are my own. I also declare that for any publication, presentation or dissemination of the study. I would be bound to take written consent from the Department of Physiotherapy, Bangladesh Health Professions Institute (BHPI).

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Contents

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Acronyms

BMI	Body Mass Index
DOMS	Delayed Onset of Muscle Soreness
ITB	Iliotibial Band
KOA	Knee Osteoarthritis
MFR	Myofascial Release
MCID	Minimum Clinical Important Difference
OA	Osteoarthritis
PF	Patellofemoral
PMR	Premotor Time
ROM	Range of Motion
RT	Reaction Time
SMR	Self Myofascial Release
TF	Tibiofemoral
TKA	Total Knee Arthroplasty
VI	Vastus Intermedius
VM	Vastus Medialis
VAS	Visual Analogue Scale
WOMAC	Western Ontario and McMaster Universities Osteoarthritis Index

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Abstract

Osteoarthritis (OA) is the leading cause of musculoskeletal pain and disability.Knee Osteoarthritis (KOA) is a heterogeneous pathology characterized by a complex and multifactorial properties**. Purpose:** The aim of the study is to explore the effectiveness of Quadriceps myofascial release technique for the treatment of knee osteoarthritis. **Objective:** To assess the effect on pain and disability of knee osteoarthritis patients after applying myofascial release to the quadriceps muscle with conventional physiotherapy in comparison with conventional physiotherapy only. **Methodology:** The study was a Quasi Experimental study design. 30 patients were allocated based on inclusion and exclusion criteria. The age range was 40 - 75 years old. They received 12 sessions of treatment for 4 weeks. Visual Analogue Scale (VAS) & WOMAC were used in the study to see the effectiveness in the pretest and posttest values of pain and disability. **Results:** Among 30 participants with knee OA in this study, 15 participants received myofascial release technique of the quadriceps muscles along with conventional treatment and 15 participants received conventional physiotherapy. Each participant of both experimental and control group score on Visual Analogue Scale (VAS) and WOMAC before and after completion of treatment were recorded. Wilcoxon Signed ranked test applied to the post-test pain score of the participants in both groups were revealed a statistically significant difference at the level of ($P< 0.05$). Following application of treatment, the study found that both the experimental group and the control group had reducing score in pain and disability in knee osteoarthritis patient. **Conclusion:** This study found that conventional physiotherapy combined with quadriceps myofascial release technique and conventional physiotherapy alone both are effective in improving pain and disability in knee osteoarthritis patients. Both methods are successful in the treatment of knee osteoarthritis.

Keywords: Osteoarthritis, Knee osteoarthritis, Myofascial Release.

CHAPTER I INTRODUCTION

1.1 Background

Osteoarthritis (OA) is the leading cause of musculoskeletal pain and disability. It is a multifactorial chronic degenerative disease including acute and/or chronic injury from normal wear and tear, senile age, obesity, and joint injury. The true pathogenesis causing OA is still unknown. OA is characterized by the degradation of articular cartilage, which results in changes in its biomechanical properties, which in turn leads to localized loss of articular cartilage, loss of joint space, osteoporosis, localized areas of synovitis, periarticular remodelling, and subchondral, even contributes to cysts (Dor & Kalichman, 2017).Osteoarthritis (OA) is a degenerative joint disorder that affects one or several diarthrodial joints, including small joints (such as those in the hand) and large joints (such as the knee and hip joints). Clinicians were unaware of OA until the late 18th century and further confusion in the nomenclature delayed its recognition as it was considered the same entity as rheumatoid arthritis (Martel-Pelletier et al., 2016).

OA is defined as a cluster of extension over distinct joint disorders with similar morphological, biological, and clinical outcomes. The resolution of OA was long focused on the changes in the articular cartilage. That concept has developed, and OA is now regarded as a disease of the entire joint, including changes in the articular cartilage, subchondral bone, ligaments, capsule, and synovial membrane, ultimately leading to joint damage (Gheno et al., 2012). Osteoarthritis has long been defined as a failure of the repair process of injured cartilage due to biomechanical and biochemical changes in the joint, in addition to the involvement of many joint tissues. Because cartilage is not vascularized, nutrients and oxygen cannot reach the chondrocytes, which are responsible for maintaining a considerable amount of extracellular matrix. As a result, the tissue starts a vicious cycle in which breakdown outnumbers extracellular matrix formation (Loeser et al., 2012).

Because articular cartilage is a neural, clinical indications do not appear until innervated tissues are affected. One reason for the late diagnosis of osteoarthritis is because of this. Whereas cartilage has long been assumed to have a part in osteoarthritis pathogenesis, new

research suggests that bone and synovial tissue also play a role, and patchy chronic synovitis is seen in the illness (Bijlsma et al., 2011)

Knee Osteoarthritis (KOA) is a heterogeneous pathology characterized by a complex and multifactorial properties. This multifactorial aetiology contributes to a wide range of changes in the symptoms and response to treatment that characterize KOA patients and presents challenges in identifying effective, personalized interventions (Dell'Isola et al., 2016). Knee OA affects the 3 compartments of the knee joint (medial, lateral, and patellofemoral joint) and it then develops slowly over 10 to 15 years, hinders with daily life activities (Lespasio et al., 2017). Approximately 25% of patients with knee osteoarthritis (KOA) has problem in performing activities of daily life due to pain, weakness, imbalance, proprioceptive sensation disorders, limited range of motion, and joint instability. Among all the restrictions that is caused by KOA, difficulty walking is the most frequent activity in daily life, and it is highly clinically relevant as it guarantees functional independence (Spinoso et al., 2019).

Identification of risk factors in early OA is essential for initiating appropriate and fast conservative treatments and preventing disease progression to levels where reconstructive surgery is the only effective treatment. Patients with early OA often report intermittent, diffuse joint pain that worsens with modest swelling following excessive stress (e.g., sports), light crepitation, and/or angle-dependent load discomfort. Knee ligament injuries may reduce joint stability and, as a result, may contribute to joint deterioration (Heijink et al., 2012).

Quadriceps weakness, often associated with knee osteoarthritis, and is commonly seen as a result of disuse atrophy due to pain in the affected joint. However, quadriceps weakness may be an etiologic factor in the development of osteoarthritis. The primary treatment goals for OA are to reduce and control pain, improve function, improve, or maintain joint mobility, and reduce or prevent physical disability (Paul & Selvabharathi, 2019). Some studies have shown that the quadriceps is the major muscle groups responsible for increasing gait speed and plays an important role in maintaining functional mobility. Weakness of this muscle group limits the intensity and duration of these tasks because it increases metabolic spending during functional activity. Therefore, reduced ability to generate quadriceps strength, characteristic in patients with KOA, can negatively affect

gait pattern, with a greater probability of becoming dependent on daily tasks, which leads to a decrease in quality of life and an increase in public expenditures to care services for this population (Alkjaer et al., 2015).

Over the previous few decades, fascia has been largely ignored in mainstream medicine, and its importance in biomechanics and physiology has been underestimated. However, in recent years, academic researchers have become more interested in this ‘‘Cinderella tissue’’. Recent advancements in tissue imaging and other sophisticated evaluation technologies have allowed for more acuity in the study of fascial behaviour differences, such as distinguishing between pathological and healthy fascia (Schleip et al., 2012).

Fascia is a tough connective tissue that runs from head to toe in a three-dimensional web throughout the body. The fascial system tightens as a protective mechanism in response to trauma on a histologic, physiologic, and biomechanical level. The fascia loses its pliability, tightens, and becomes a source of strain for the rest of the body. Myofascial release is a hands-on soft tissue technique that facilitates stretch into the restricted fascia. A persistent pressure is given to the restricted tissue barrier; the tissue undergoes histological length changes after 90-120 seconds, allowing the initial release to be felt. The therapist continues the release into a new tissue barrier and holds it in place. The tissue will soften and become more supply after a few releases. The release will relieve strain on pain-sensitive tissues like nerves and blood vessels while also restoring joint alignment and mobility (Barnes, 2004).

Myofascial release (MFR) is a manual soft tissue technique that stretches restricted fascia. Connective tissue surrounds and connects muscles, myofibrils, and all the organ in the human body. The connective tissue in these muscles’ changes and the ratio of collagen, in case of immobilized muscle. Many manual therapies focus on only treating the fascia. MFR is one such technique and appears useful in physical therapy for alleviating muscle stiffness, reducing pain, and improving range of motion (ROM). Several stretching techniques are available to achieve these goals, but they include joint movements. Therefore, they need to be carefully managed to avoid or exacerbate joint dysfunction (Kuruma et al., 2013).

Myofascial release (MFR) is a manual therapy technique that makes use of low load and long duration mechanical forces to manipulate the myofascial complex. MFR has been

widely employed to treat myofascial restrictions and to improve sports performance. The main objectives of MFR are restoration of tissue length and elasticity, a decrease of pain, improvement of function and reduction of fibrous adhesions occurring between the layers of fascia. These fibrous adhesions may occur from injuries, fatigue and muscular imbalances, in addition to recurrent microtrauma and inflammation (de Almeida et al., 2021).

Hence, the aim main purpose of this study is to evaluate the effect of quadriceps muscle release technique for the treatment of the knee.

1.2 Rationale

Musculoskeletal disorder is the leading contributor to disability worldwide and approximately 1.71 billion people have musculoskeletal disorders worldwide. Osteoarthritis is considered as one the commonest musculoskeletal disorder. In an article from 2020 it is estimated that more than 22% of adults around the world who are older than 40 have knee osteoarthritis. According to the national musculoskeletal study, knee osteoarthritis was the second most prevalent condition.

Numerous studies have demonstrated that people with knee osteoarthritis had considerably diminished quadriceps strength compared to age-matched controls. Specifically, quadriceps strength is a strong predictor of both performance-based and self-reported physical function (Alnahdi et al., 2012). Myofascial release is a soft tissue massage treatment which helps to increase myofascial mobility and reduce pain within the musculoskeletal system. Injury, surgery, poor posture, or inflammation of tissues can create myofascial restrictions that produce pressure and pain upon sensitive structures. This technique helps to detect restrictions and facilitate the release of fascia. Also, it will reduce pain and disability among the patient suffering from knee osteoarthritis.

Several studies have shown myofascial release technique to be effective in treating the musculoskeletal disorder. But not much review is done stating the effect of knee osteoarthritis using the quadriceps myofascial release technique. This study will be showing comparison between the conventional physiotherapy treatment and the quadriceps myofascial release to measure the effectiveness among them. Therefore, this research will show how using quadriceps myofascial release technique can reduce the effect of knee osteoarthritis. The results of the study may assist physiotherapists in providing evidence-based treatment to patients with knee osteoarthritis, which will be useful for both the patients and the discipline of physiotherapy.

1.3 Aim

The aim of the study is to explore the effectiveness of quadriceps myofascial release technique for the treatment of knee osteoarthritis.

1.4 Objectives

1.4.1 General objective

To signify the effectiveness of quadriceps myofascial release technique for patient with knee osteoarthritis.

1.4.2 Specific objectives

1. To determine the most affected age group.
2. To find out the socio-demographic factors that affects the level of pain within and between groups.
3. To find out the socio-demographic factors affect the level of disability within and between groups.
4. To discover the effectiveness of quadriceps myofascial release technique on pain and disability within and between groups.

1.5 Hypothesis

1.5.1 Null Hypothesis (H_0)

Quadriceps myofascial release technique along with conventional physiotherapy is no more effective than only conventional physiotherapy to reduce pain and disability.

H_0: $\mu_1 - \mu_2 = 0$ or $\mu_1 = \mu_2$, where the experimental group and control group initial and final mean difference is same.

1.5.2 Alternative Hypothesis (H_1)

Quadriceps myofascial release technique along with conventional physiotherapy is more effective than only conventional physiotherapy to reduce pain and disability.

H_1: $\mu_1 - \mu_2 \neq 0$ or $\mu_1 \neq \mu_2$, where the experimental group and control group initial and final mean difference is not same.

1.6 Operational Definition

Osteoarthritis: Arthritis means ‘inflammation of the joints’.Osteoarthritis (OA) is the most prevalent joint disease worldwide. OA can be diagnosed based on joint symptoms, structural pathology (e.g. X-rays), or a combination of the two. Joint pain and stiffness are the predominant symptoms. Over time, the cartilage may wear away in some areas, greatly decreasing its ability to act as a shock absorber. As the cartilage deteriorates, tendons and ligaments stretch, causing pain. Later on, the condition worsens and the bones rub against each other.

Knee Osteoarthritis: Knee osteoarthritis (OA), commonly known as degenerative joint disease of the knee, is primarily caused by gradual articular cartilage loss and wear and tear. Knee OA affects the three compartments of the knee joint (medial, lateral, and patellofemoral joint) and develops progressively over 10 to 15 years, making daily tasks difficult. Knee OA is characterized by the gradual onset of knee discomfort accompanied by gelling and restricted range of motion. Frequently, knee pain and restriction are linked with a feeling of instability or "giving out." A "locking" sensation in the knee may result from joint stiffness, loose bodies in the joint area, or meniscal lesions.

Myofascial Release: Myofascial release is a manipulative treatment that aims to alleviate fascial tension caused by trauma, poor posture, or inflammation. It is a manual soft-tissue treatment that allows fascial stretching. Myofascial release cures immobility and pain in skeletal muscles by relaxing constricted muscles, enhancing blood and lymphatic circulation, and triggering the muscular stretch reflex.

CHAPTER II LITERATURE REVIEW

Anatomy of the knee joint is variable, and the only constant is its complex function, which is the result of an optimal interplay of bony structures such as femur, tibia, patella and fibula as well as its ligaments, tendons, muscles and joint capsule. Only a few anatomical structures are responsible for a single function. In general, each knee function is the product of a complicated collaboration of various anatomical systems (Hirschmann & Muller, 2015). The medial tibiofemoral, lateral tibiofemoral, patellofemoral, and proximal tibiofibular joints constitute the knee joint. The knee joint is a trochoginglymos, meaning gliding hinge joint. The knee joint has a range of motion of six degrees of freedom. Flexion–extension, internal–external, and varus–valgus are examples of rotational movement that are found in the knee joint (Musumeci, 2017).

The knee joint comprises two distinctly separate joints, the tibiofemoral (TF) joint which is the articulation of the femur over the tibia and the patellofemoral (PF) joint which is the articulation of the patella over the femur. The knee joint serves as a pivot between the human body's two longest bones, while the strongest muscles (the quadriceps muscles) act across it. Knee provides for optimal weight support and stability when fully extended (Masouros et al., 2010). Quadriceps weakness is common in people with osteoarthritis of the knee, and it may contribute to the significant functional losses that develop as the illness progress. Quadriceps weakness may result from the pain of osteoarthritis. Inability to appropriately attenuate strong compressive forces at the knee can lead to impulsive loading, which has been linked to quadriceps weakness and inactivity, as well as osteoarthritic alterations (Lewek et al., 2004).

As the quadriceps muscle is an active contributor to joint stiffness, quadriceps muscular weakening may result in greater stresses on the passive components that contribute to joint stiffness and increasing the risk of knee joint injury. Despite no significant difference in BMI, studies have found that women have 60% less of the quadriceps muscle strength than males. Women have more laxity in the knee joints due to lesser quadriceps muscle power (Segal & Glass et al., 2011).

Quadricep muscles mechanism has been investigated from various angles. The leverage of the quadriceps muscles during active extension of the knee has been demonstrated to remain fairly consistent from 90 to 20 degrees of flexion, but thereafter diminishes, requiring more effort to extend the knee joint through the last 20 degrees of flexion to full extension. The vastus intermedius (VI) has been found to be the most efficient extensor, while the vastus medialis (VM) has only one specialized function: patella alignment. The muscles that cross the knee joint also help to protect it against varus and valgus stress. The quadriceps muscles, in particular, have been proven to help in valgus stress resistance. (Andriacchi et al., 1983). The American Academy of Orthopedic Surgeons has recognized quadriceps weakness as a risk factor for knee joint structural injury. Weakening of the muscles compromises the anteroposterior stability of the knee joint, causing patients to experience instability. In knee OA patients, this results in a loss of confidence, as well as impaired performance and independence in daily duties, culminating in impairment and dysfunction (Olagbegi et al., 2017).

A study done in 2010 showed that, in knee osteoarthritis, exercise, primarily dynamic strengthening activities, appears to produce small-to-moderate pain and function advantages. Moreover, exercise trials tend to be well tolerated by patients and pose little danger. On the contrary hand, exercise appears to alleviate pain in individuals with hip osteoarthritis, but its effect on function is less evident (Iversen, 2010).

It has also been said that 20% to 70% of knee OA patients have been observed to have quadriceps weakness. As the lower limb musculature is the natural brace for the knee joint, potentially significant muscular dysfunction may result from quadriceps weakness or relative weakness of the hamstrings in contrast to the quadriceps, which is typically measured as the hamstrings: quadriceps (H: Q) ratio. Joint damage increases the probability of knee OA. After knee injury, women had a threefold risk of developing knee osteoarthritis, while men had a fivefold to six-fold risk, compared to healthy controls. Injury to the anterior cruciate ligament is the strongest predictor of knee osteoarthritis occurrence (15-20 %) (Hafez et al., 2014). Any gain in muscle strength or peak power of the lower extremities with decreased levels of specific pain may be significant and is an excellent predictor of functional ability (Heijink et al., 2012).

Osteoarthritis (OA) is a debilitating chronic illness that affects 10–15% of persons over the age of 60. Chronic pain, stiffness, and decreased movement are all symptoms of joint inflammation, cartilage loss, and bone remodeling. OA is the most common type of joint disease in the world, and its incidence is increasing in parallel with rising life expectancy and risk factors including obesity. The pain and reduced function associated with OA play a significant burden on communities, as well as health and social care systems, hip and knee OA are among the most common causes of disability worldwide (Wehling et al., 2017). Osteoarthritis is not considered a lethal condition. Less than one percent of all registered deaths in Australia in 2007 were attributed to illnesses of the musculoskeletal system (Busija et al., 2010).

The Framingham Osteoarthritis Study discovered that 6.8% and 19% of people, respectively, had radiographic hand and knee OA. In the Johnston County Osteoarthritis Project, both hip and knee OA were found in 28% of African American and Caucasian men and women. This could have been due to differences in genetics, anatomy, or occupation. The prevalence of symptomatic OA is lower since it is defined by a combination of symptoms including pain, soreness, and stiffness, as well as radiographic characteristics. Framingham reported the prevalence of symptomatic hand OA to be 26% and 13% in women and men, respectively, and knee OA to be 7%. The prevalence rates for symptomatic knee OA and symptomatic hip OA in the Johnston County cohort were 17% and 10%, respectively. However, not all people with radiographic OA experience symptoms. Furthermore, structural and clinical illness risk factors may not be the same (Johnson et al., 2014).

Despite the fact that osteoarthritis (OA) is complex, genetic factors have been discovered to be important determinants of the illness. Several types of evidence for a genetic influence on OA include epidemiological studies of family history and family clustering, twin studies, and exploration of rare genetic illnesses. In radiographic OA of the hand and knee in women, the contribution of hereditary variables is between 39 % and 65 %, around 26% in OA of the hip, and about 70 % in OA of the spine, according to classic twin studies. These findings reveal that OA has a heritability of 50% or higher, implying that genetic variable account for half of the diversity in disease susceptibility in the population. In the

overall population, genes are the strongest risk factor for OA. A simplified view of the role of genes in OA is shown in this study. Genes act through a complicated web of pathways that include injury and its avoidance, reaction to injury, body weight, muscle mass, bone structure and turnover, or cartilage structure and turnover, or a combination of the two (Spector & MacGregor et al., 2004).

A study suggested that, there are three substantial risk factors for osteoarthritis (excessive musculoskeletal loading, high BMI, and past knee injury) that can be avoided. According to Hochberg, avoiding squatting and kneeling while at work, as well as carrying heavy weights, has been linked to a 15–30 % reduction in the occurrence of osteoarthritis in men. The International Group of the Osteoarthritis Research Society strongly advises overweight people with osteoarthritis to reduce weight and maintain a healthy weight. Maintaining a BMI of 25 kg/m 2 or less would minimize osteoarthritis by 27–53 % in the population. According to Felson, preventing joint traumas would reduce the prevalence of osteoarthritis by an additional 14–25% (Takeda et al., 2011).

According to research conducted in USA in 2007–08, 13.7 million (13.7M, 6.9% of the total US population at least 25 years of age [199M]; 95% CI 12.4M–15.3M) have symptomatic knee OA, with 7.7M (3.9%; 95% CI 7.0M–8.6M) having advanced symptomatic knee OA. The number of people with symptomatic knee OA rose to 15.1 million in 2011–12. (7.3% of 208M; 95% CI13.6M–16.8M) and the number with advanced symptomatic knee OA to 8.6M (4.2%; 95% CI 7.8M–9.6M). The study also showed the annual incidence of knee OA being highest between 55 and 64 years of age (Deshpande et al., 2016).

According to a study conducted in Bangladesh, the age-standardized prevalence was 7.7 (95%, Cl 4.6–10.7), with women having a statistically non-significant greater prevalence (11, 95% Cl 6.3–15.7) than men (5.9, 95% Cl 2.7–9.2). They discovered that patients with knee osteoarthritis had 3.2 (95% CI 2.0–5.1) and 2.1 (95% CI 1.3–3.3) times the chance of losing their job in the last 12 months and having moderate to severe disability, respectively. All 11 risk factors were included in the model, an increasing age (38 to 57 years) or 8.9, 95% CI 4.8–16.5; 58 and above: OR 13.9 95% CI 6.9–28.0, low education (primary or

less) level (OR 1.7, 95% CI 1.0–2.7) and overweight (BMI ≥ 25 Kg/m^2) (OR 1.9, 95% CI 1.2–2.9) were found to be significantly associated with knee osteoarthritis as well (Haider et al., 2022).

The prevalence of knee osteoarthritis in India's 1.252 billion population was determined in a community-based cross-sectional study with a sample size of 5,000 people. In the whole sample, the prevalence was found to be 28.7%. The prevalence was higher in villages (31.1%) and big cities (33.1%) as compared to towns (17.1%) and small cities (17.2%). OA of the knees was found to be more prevalent in females (31.6%) than in males (28.1%). This finding is statistically significant (P = 0.007). People aged 60 and above had the highest prevalence, whereas those aged 40–50 had the lowest (P = 0.001). Participants who did not exercise (83.9 %) had a greater prevalence rate than those who did (36.0%) (Pal et al., 2016).

Furthermore, those with knee OA and self-reported instability appear to rely less on their hip extensor and ankle plantar flexor muscle groups during the stance phase of walking. While increased knee extensor moment during locomotion may improve lower extremity stability by increasing quadriceps activity, the increased joint compressions may cause more pain and put articular cartilage at risk of additional erosion. It also causes high compressive and shear loads that challenges the passive stability of the knee joint in individuals with knee OA self-reported instability (Farrokhi et al., 2015).

A randomized controlled trial compared a home exercise program to a clinical physical therapy program of manual therapy of the lower quarter combined with supervised exercise applied by skilled physical therapists for improving function and decreasing stiffness and pain in subjects with OA of the knee. Over a 4-week period, both therapy groups had satisfactory outcomes, as evidenced by significant reductions in WOMAC scores and improvements in 6-minute walk test distances. The reductions in WOMAC scores in both groups were greater than the 20% to 25% range proposed by Barr et al. as minimally relevant. The post-treatment WOMAC scores in the group that got biweekly physical therapy treatments in the clinic were significantly higher than the WOMAC scores in the home exercise group. At 8 weeks, the improvements and discrepancies between groups shown at 4 weeks were still apparent. Neither group's gains from a 4-week intervention

were lost over a month of no therapy other than continued home activities. Subjects in the clinic therapy group looked to be satisfied with their total rehabilitative treatment than those in the home exercise group. These findings imply that an 8-week clinical intervention involving manual therapy and supervised exercise was more successful than a home exercise program in improving function and reducing pain and stiffness (Deyle et al., 2005). Physiotherapy have been shown to help people with knee OA reduce pain and improve function. Physiotherapy treatments attempt to reduce knee joint load, enhance range of motion, and restore normal neuromuscular function (Page et al., 2011).

According to a study for osteoarthritis patients with moderate to severe knee pain where initial treatment was conducted by a set of pulsed electromagnetic field, ultrasound (US), stretching and strengthening exercises showed great results in pain intensity, improved the knee ROM, isometric quadriceps strength, and level of functional performance of the knee (Abdel-Aziem et al., 2018).

A review was done to measure whether using a self-myofascial release was effective was beneficial for pre-exercise and recovery strategy. Individuals at various levels of fitness and competence utilize SMR using a foam roller or roller massager. The search strategy produced 107 items. Nine relevant articles were identified. Targeted muscle groups included the hamstrings (six studies), quadriceps (five studies), iliotibial band (ITB) (four studies), hip adductors (two studies), calf/gastrocnemius (two studies), trapezius (two studies), gluteal muscles (one study), and latissimus dorsi (one study). SMR has been shown to reduce discomfort in people suffering from delayed onset muscle soreness (DOMS), perhaps improving performance by allowing them to exercise longer and harder. The studies also revealed that SMR increased ROM (Schroeder et al.,2015).

Kuruma et al. (2013) stated in their research which included 40 participants showed that by using the myofascial release technique the range of motion of the quadriceps, hamstring has increased, alongside there was significate change in the stretch group and passive range of motion in the of quadriceps. MFR-Q repositioned the fascia surrounding the quadriceps, allowing for increased A-ROM and P-ROM of knee flexion. There were no significant variations in muscular stiffness between the groups. Participants found contraction of the quadriceps muscles easier following MFR, resulting in a decrease in premotor time (PMT)

and mean reaction time (RT). By reducing muscle and myofascial tension, both MFR and static stretching enhanced ROM. Only MFR helped with RT. Thus, the soft tissue proprioceptive sensory pathway is reset, enhancing both range of motion and ease of movement.

e Sliva et al. (2018) in their study included that the goal of the study was to see how a myofascial intervention on the posterior superficial train of patients with flexion contracture after TKA over KROM, knee pain, and myoelectric activity affected their symptoms. Total knee arthroplasty (TKA) is one of the most frequent treatments for degenerative knee diseases, such as osteoarthritis. The myofascial intervention causes an immediate increase in mobility, according to the findings. Their findings revealed a significant 5.7-degree increase in KROM. However, this may not imply a quick clinical benefit. The results also pointed out an increase in electric activation of rectus and biceps femoris muscle after myofascial release.

A randomized controlled trial was used to perform a research involving sixty patients. The main focus was to review if myofascial trigger point therapy was effective in patients with bilateral knee osteoarthritis. The control and experimental both groups received same physiotherapy treatment, but the experimental group also received treatment for associated myofascial pain and dysfunction. It was identified where trigger points in muscles and insertions around the knee were located (quadriceps, hip adductors, iliotibial band and tensor fascia lata, hamstring and calf muscles). Pain levels improved in both groups ($P<0.001$ in right knee in both groups, $P <0.004$ in left knee in control and $P <0.004$ in left knee in intervention group). The intervention groups pain levels improved more than the control groups. Both groups had increased knee range of motion ($P=0.003$ in right knee and $P<0.001$ in left knee of the control group and $P <0.001$ in both knees of the intervention group). When compared to the control group, the intervention group showed a substantial improvement in disability indices ($P=0.022$) (Rahbar et al., 2013).

The WOMAC physical function subscale is a popular patient-reported knee OA measuring tool. The WOMAC was created to meet the requirement for a post-clinical trial outcome tool that could respond to changes in OA-related symptoms. Bellamy and Buchanan interviewed 100 persons with knee OA and found 41 items in five categories that were relevant to them, one of which was physical function. The WOMAC has been used to

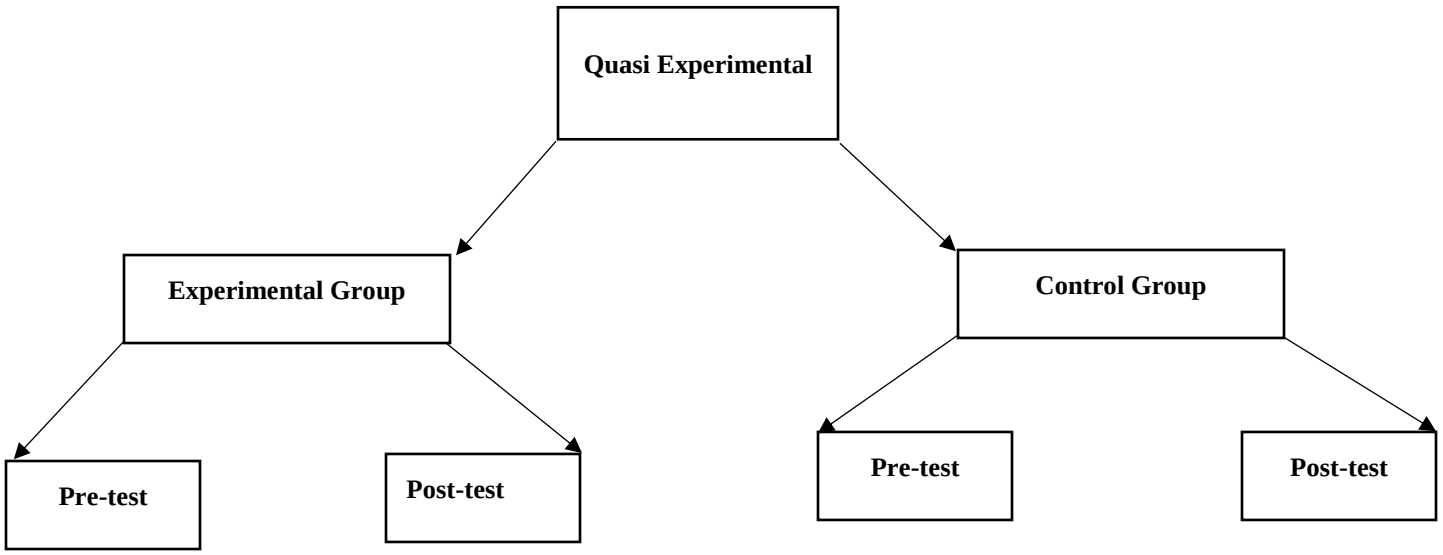
assess hip OA, rheumatoid arthritis (RA), fibromyalgia, and systemic lupus erythematosus, among other conditions The WOMAC physical function subscale has a high level of consistency. High test-retest reliability has also been demonstrated over time periods spanning from 6 days to 12 months. The WOMAC physical function subscale's main advantages are that it has been thoroughly validated, has strong test-retest reliability, and has established MCID (Minimum clinical important difference) levels. Furthermore, because the scale was designed to measure a disease-specific outcome, patients with knee OA are likely to struggle with the items. (White & Master, 2016). In an another study results showed that heavy domestic activities were found to be the most difficult in terms of physical functioning, with 27% of respondents with knee pain having severe or extreme difficulty. followed by bending (26%) and getting in or out of the bath (21%). 31% of respondents with knee pain experienced intense pain, 45% had serious difficulties with physical function, and 28% had both (Jinks et al., 2002).

CHAPTER III METHODOLOGY

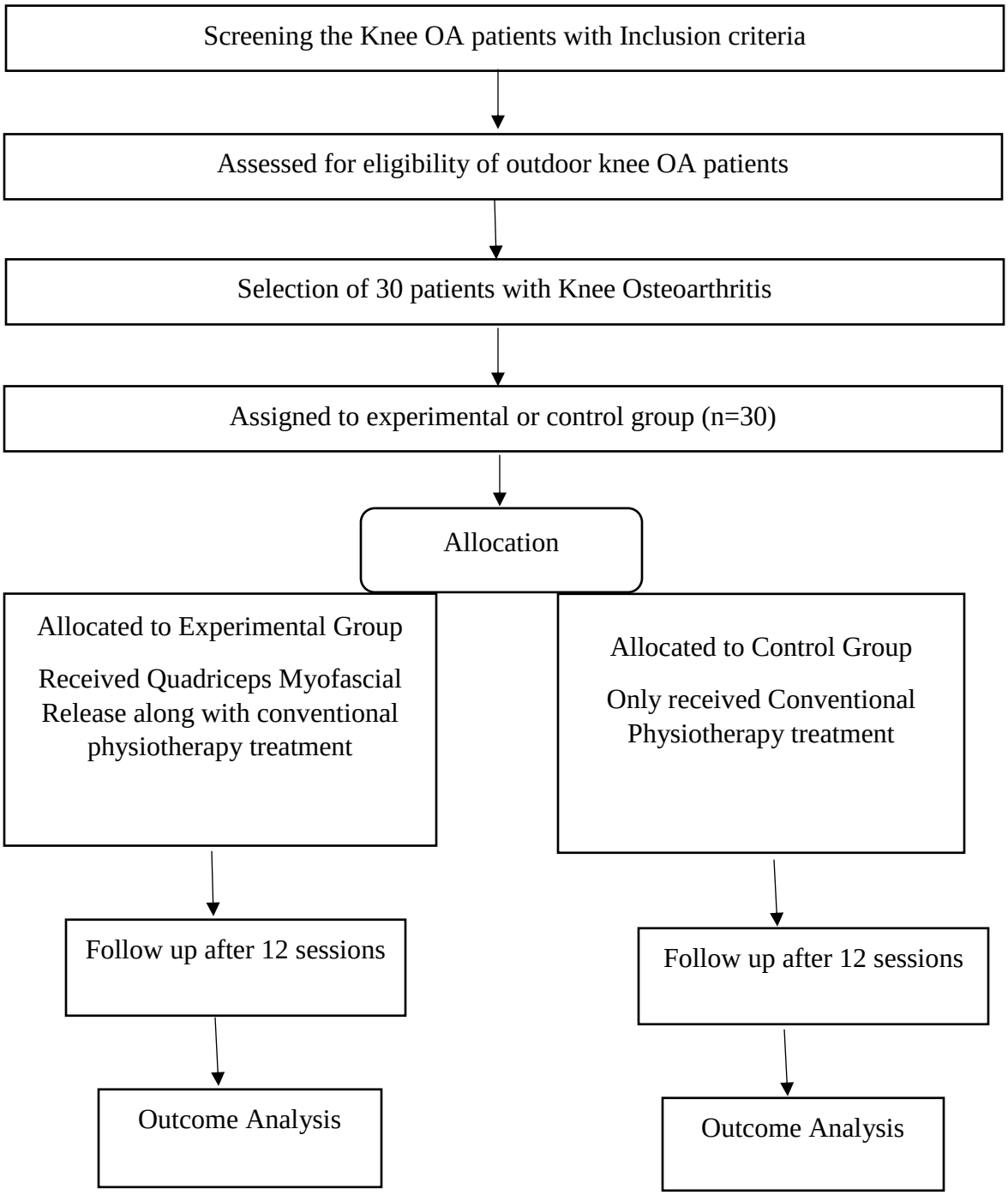
This research was a Quantitative evaluation of Quasi experimental study design to evaluate the effectiveness of quadriceps myofascial release technique in treatment of knee osteoarthritis. To identify the effectiveness of this treatment regimen Visual Analog Scale (VAS) and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) was used as measurement tools for measuring the pain intensity and disability caused by osteoarthritis. All patients signed an informed consent form prior to their inclusion into the study.

3.1 Study Design

Quasi experimental study design, where two separate groups are evaluated, one of which receives the intervention of interest and another that serves as a control or comparison group. In case of true experimental study design three components-manipulation, control and randomization are required. Absence of any one of those three will make the study not a true experimental study design. Thirty patients from musculoskeletal outpatient unit with knee osteoarthritis were selected and then 15 patients were assigned to experimental group and 15 patients to the control group for this quasi study. A pre-test (before intervention) and post-test (after intervention) was administered with each subject of both groups to compare the effects of pain, functional ability of the patients with knee OA before and after the treatment.



Flowchart for Quasi Experimental Trail



3.2 Study Area

The study area was Musculoskeletal Outpatient Unit of Physiotherapy Department of Centre for the Rehabilitation of the Paralysed (CRP), Savar, Dhaka.

3.3 Study Population

The study area was Musculoskeletal Outpatient Unit of Physiotherapy Department of Centre for the Rehabilitation of the Paralysed (CRP), Savar, Dhaka.

3.4 Sample Size

In this study, 30 participants were selected according to inclusion and exclusion criteria. 15 participants were in experimental group and 15 participants in control group.

3.5 Sampling Technique

Hospital Based Randomization was used as the sampling technique. Subjects, who met the inclusion criteria, were taken as sample in this study. 30 patients with osteoarthritis were selected from outpatient musculoskeletal unit of physiotherapy department of CRP, Savar and then 15 patients were assigned to Experimental group for the treatment of quadriceps myofascial release technique and 15 of the patients for conventional physiotherapy technique. The samples were given numerical number C1, C2, C3 etc. for the control group and E1, E2, E3 etc. for experimental group. The study was a single blinded technique.

3.6 Inclusion Criteria

1. Patient who is diagnosed by knee osteoarthritis.
2. Both male and female are included (Jakobsson & Hellberg et al., 2002).
3. Age includes 40-75 years (Jakobsson & Hellberg et al., 2002).
4. Pain in either one knee joint or both.
5. Patient with heart disease and diabetic mellites (McAlindon et al., 2015).
6. Subjects who are willing to participate.

3.7 Exclusion Criteria:

1. Any history of recent surgery or fracture of femur, tibia, fibula, or foot bones (McAlindon et al., 2015).
2. Any history of pathological condition (like malignancy etc).
3. Any previous or current history of psychiatric or psychological treatment.
4.Severe disability such as walking disability with or without crutches, contraindications for physical modalities (Gomaa & Zaky, 2016).
5. Subjects with neurological impairments (Gomaa & Zaky, 2016).

3.8 Data collection procedure

All the data were collected from the musculoskeletal unit. The researcher fixed a time and date with the participant to his/her accessible time. Then the participant was informed about the purpose of the research and well informed about the content of the consent form. Each participant received physiotherapy intervention for knee osteoarthritis.

The participants who were included in the study received treatment as regular patients in the MS department of CRP, they continued their treatment as per their schedule. Each participant received 3 sessions per week. Treatment programs was carried out for 4 weeks by the researcher.

After meeting inclusion and exclusion criteria the data collection procedure was conducted through assessing the patient, initial recording, treatment and final recording. After screening at the department, patients were assessed by a graduate physiotherapist. 12 sessions of treatment were provided for each participant. Data was gathered through a pre-

test, intervention and post-test and the data was collected by using a written questionnaire form which was formulated by the researcher.

3.9 Data collection tools

a) Data collection form.

b) Informed consent.

c) Visual Analogue Scale (VAS)-for measuring pain.

d) WOMAC questionnaire.

e) Pen

f) Laptop

3.10 Questionnaire

The questionnaire for this study was designed meticulously under the supervision, counsel, and approval of the supervisor and in accordance with specific requirements. There were close ended questions with Visual Analogue Scale (VAS) and The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) with some objective questions which were measured by the examiner and each question was formulated to compare the effect of quadriceps myofascial release technique along with the conventional physiotherapy and only the effect of conventional physiotherapy for the treatment of knee osteoarthritis.

3.11 Measurement Tools

3.11.1 The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC)

The Western Ontario and McMaster Universities Arthritis Index (WOMAC) is a commonly used self-administered health status measure for individuals with OA of the hip or knee that assesses pain, stiffness, and function. For reliability, validity, and responsiveness, the WOMAC Osteoarthritis Index has been thoroughly validated. The WOMAC measures three separate dimensions: Pain (5 questions), Stiffness (2 questions), and Function (17 questions). The three dimensions has scores that ranges from 0-20 in pain, 0-8 in stiffness ,0-68 in functional limitations. The questions cover daily activities such as using stairs, standing up from a sitting or lying position, bending, walking, getting in and out of a car, shopping, putting on or taking off socks, lying in bed, getting in or out of a bath/toilet, and heavy and light household duties (Roos et al., 1999).

The test questions are scored on a scale of 0-4, which correspond to: None (0), Mild (1), Moderate (2), Severe (3), and Extreme (4). The WOMAC is a 12-minute questionnaire that can be completed on paper, over the phone, or on a computer. The computerized and mobile versions of the test were found to be nearly identical to the paper version, with no discernible differences. Higher scores on the WOMAC indicate worse pain, stiffness, and functional limitations.

3.11.2 A Visual Analogue Scale (VAS)

A Visual Analogue Scale (VAS) is a measurement tool that attempts to assess a trait or attitude that is thought to range throughout a continuum of values but is difficult to measure directly. Operationally a VAS is usually a horizontal line. The patient marks on the line the point that they feel represents their perception of their current state. The VAS score is calculated by measuring in millimetres from the line's left end to the point marked by the patient. It is calculated in a 0-100 mm scale (Crichton et al., 2001).

3.12 Intervention

In this study along with conventional physiotherapy, quadriceps myofascial release is given to the experimental group. And the control group only received conventional physiotherapy for knee osteoarthritis patients. All the participants received conventional physiotherapy three days a week with the recommended exercises for 4 weeks.

The treatment was given by the clinical physiotherapists of musculoskeletal unit of CRP, Savar. Patients were instructed to adhere to the directions.

3.13 Data Analysis

To ensure that the research have some values, the meaning of collected data has to be presented in ways that other research workers can understand. In other words, the researcher must make sense of the results. As the result came from an experiment in this research, data analysis was done by using the software named Statistical Package for Social Science (SPSS) version 25.

The data was analyzed using the Mann Whitney U test and the Wilcoxon test. To maintain participant confidentiality, all participants were coded by group, and both the experiment and control groups rated their pain intensity on the Visual Analogue Scale (VAS) and their disability level on the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) before and after the intervention sessions.

3.13.1 Mann Whitney U Test

The Mann-Whitney U test is used to determine whether there is a difference between two independent groups on the dependent variable. It compares whether the distribution of the dependent variable is the same between the two groups and, consequently, whether they come from the same population (Karadimitriou et al., 2018).

$$\mathbf{U = n_1\, n_2 \frac{n_x(n_x + 1)}{2} - Tx}$$

n_1 = The number of the subjects in trail group

n_2= The number of the subject in control group

n_x= The number of the subjects of the group with larger rank total

Tx= The larger rank total

3.13.2 Wilcoxon Signed rank Test

The Wilcoxon Signed-Rank test is a nonparametric approach for analyzing matched-pair data or the one-sample problem. In the setting of matched pairs, it is used to test the hypothesis that the probability distributions of the first and second samples are equal (Taheri & Hesamian, 2013).

$$\mathbf{Z= \frac{W_S - \frac{n(n+1)}{4}}{\sqrt{\frac{n(n+1)(2n+1)}{24}}}}$$

Where,

n = number of pairs where difference is not 0

Ws = Smallest of absolute values of the sum

3.14 Level of Significant

The "p" value was calculated to determine the significance of the result. The researcher tested the hypothesis using a 5% level of significance. The ‘p’ values indicates to the probability of the experimental study outcomes. The word probability refers to the accuracy of the findings. A p value is called level of significance for an experiment and a p value of <0.05 was accepted as significant result for health service research. If the p value is equal or smaller than the significant level, the results are said to be significant. Moreover, calculated the value and compared with standard U value. Null hypothesis will be rejected when observed U value is smaller than the standard U value and alternative hypothesis is accepted.

3.15 Ethical Considerations

The proposal of the dissertation including methodology was approved by Institutional Review Board (IRB) after obtaining the permission from the concerned authority of ethical committee of Bangladesh Health Professions Institute (BHPI). The whole process of this research project was done by following the Bangladesh Medical Research Council (BMRC) and World Health Organization (WHO) Research guidelines. Once again, before the data collection began, the researcher obtained permission from the clinical setting authorities and allow full involvement of physiotherapist who have been working in musculoskeletal physiotherapy department, CRP, Savar, concerned to ensure the safety of the participants and was allotted with a witness from the authority to verify the data collected. The investigator retained strict confidentiality with respect to the situation and treatments of the participant. The investigator acquired each participant's permission to participate in this research and each participant obtained a signed informed consent form.

3.16 Treatment Protocol

3.16.1 Control Group Treatment

Table 01

Treatment Options	**Duration/Repetition**
Soft Tissue Mobilization	3-5 minutes
Patellar Mobilization	5 minutes
Mobilization with Movement (MWM)	6 repetitions with 2 sets
Quadriceps and Hamstring strengthening exercise	10 repetitions with 15 seconds hold
Sustained Manual Stretching	3-5 repetitions with 15-20 seconds hold
UST	5-7 minutes
IRR	15 minutes

3.16.2 Experimental Group Treatment

Table 02

Treatment Options	**Duration/Repetition**
Vastus Medialis Release	3-5 minutes per session with 3-4days per week for 12 sessions
Vastus Lateralis Release	4 minutes per session with 3-4days per week for 12 sessions
Rectus Femoris Release (Combined)	3-4 minutes per session with 3-4days per week for 12 sessions

CHAPTER IV RESULTS

4.1 Age of the Participants:

The Sociodemographic information shows that 30 participants with knee osteoarthritis has a mean age of 53.43 and a standard deviation of 10.74 in which the experimental group has a mean age and standard deviation of 51.27 & 12.01; whereas the control group has mean age and standard deviation of 55.60 & 9.18.

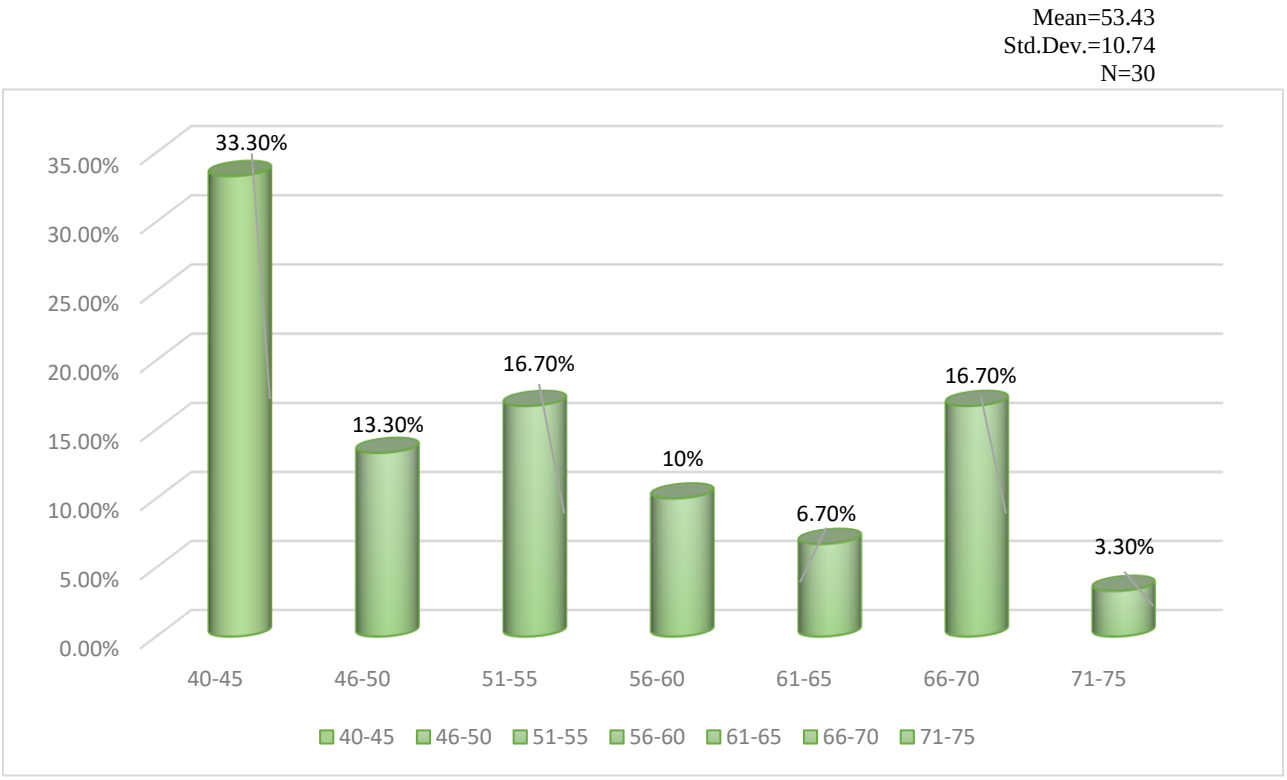


Figure 01: Age of the Participants

4.1.1 Age Variables

Table 03: Mean age of the Participants

Experimental Group		**Control Group**	
Subjects	**Age**	**Subjects**	**Age**
E1	45	C1	60
E2	44	C2	65
E3	42	C3	52
E4	50	C4	55
E5	45	C5	51
E6	40	C6	55
E7	69	C7	43
E8	75	C8	69
E9	68	C9	58
E10	63	C10	49
E11	58	C11	70
E12	41	C12	40
E13	40	C13	48
E14	42	C14	52
E15	47	C15	67
Mean Age = 51.27 ± 12.02		**Mean Age = 55.60 ± 9.18**	

In this study, the age variables of 30 participants were measured, 15 in the experimental group and 15 in the control group. The mean ages of experimental group were 51.27±12.02 and control group were 55.60±9.18.

4.2 Gender Ratio:

Between the thirty participants with knee osteoarthritis who participated in this study 57% (n=17) participants were male and 43% (n=13) participants were female.

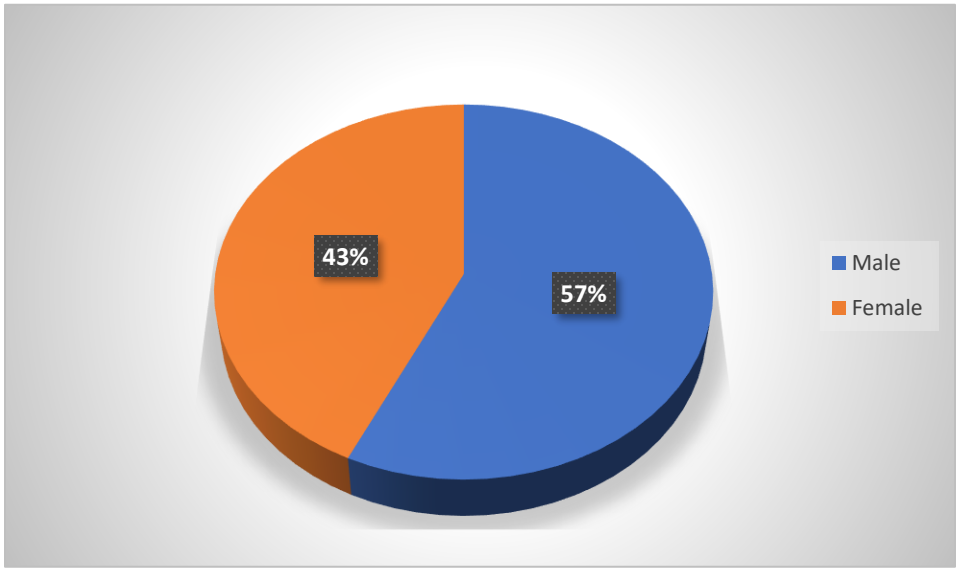


Figure 02: Gender Ratio of the participants

Among them, in experimental group 60% (n= 9) participants were male, and 40% (n=6) participants were female. On the other hand, 53.3% (n=8) participants were male, and 46.7% (n=7) participants were female in control group.

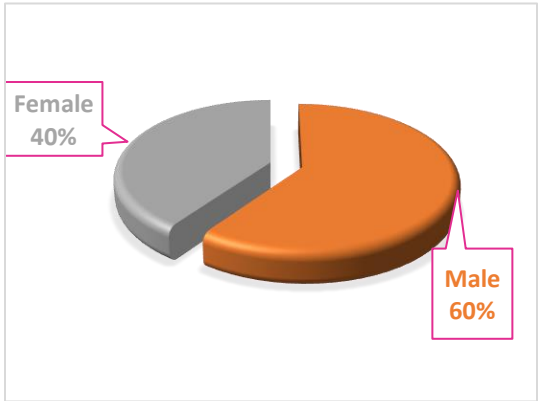


Figure 2.1: Experimental group

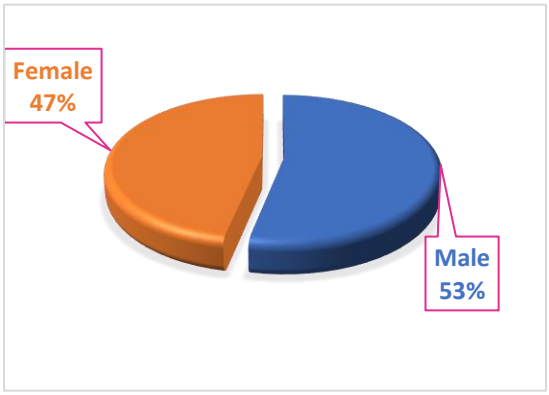


Figure 2.2: Control group

4.3 Side Involved in Participants:

The participants had right, left or both knee pain due to knee osteoarthritis. In which n=8 (26.70%) of the participants reported of right knee pain, n=6 (20%) of them reported left knee pain & n=16 (53.30%) of them had both knee pain.

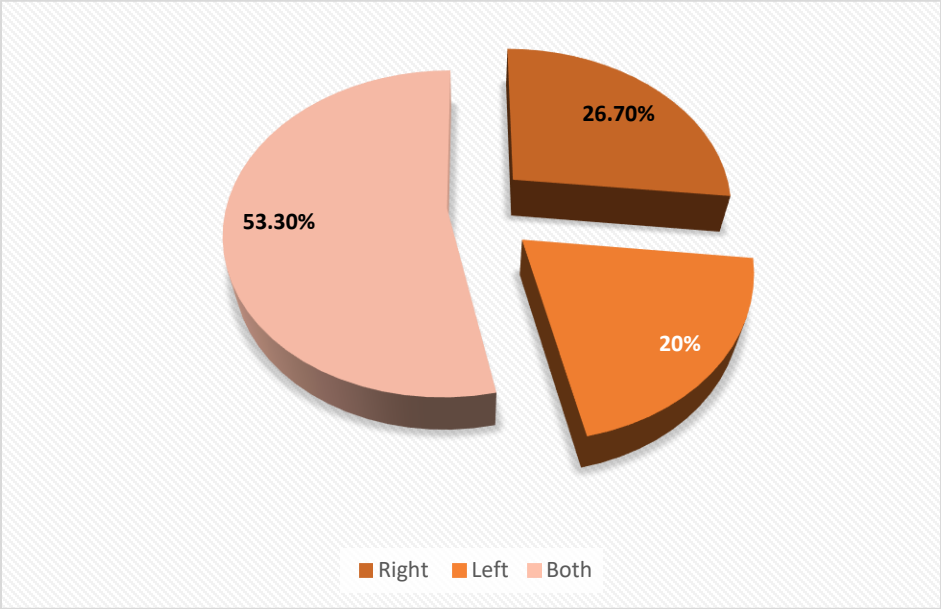


Figure 03: Side Involved in participants

In the experimental group participants has 40% (n=6) who have right side involvement, 26.7% (n=4) have left side involvement and 33.3% (n=5) have both side involvement.

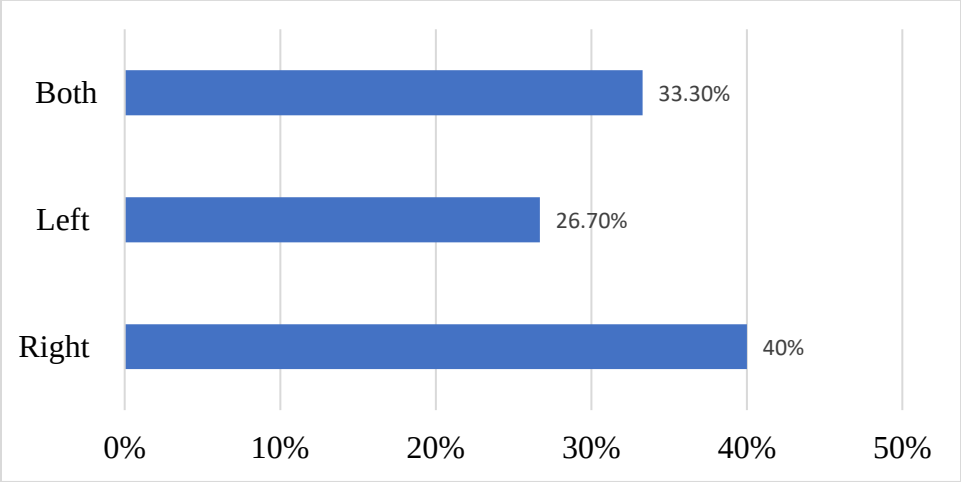


Figure 3.1: Side involvement in Experimental Group

In the control group participants has 13.3% (n=2) who have right side involvement 13.3% (n=2) have left side involvement and 73.3% (n=11) have both side involvement.

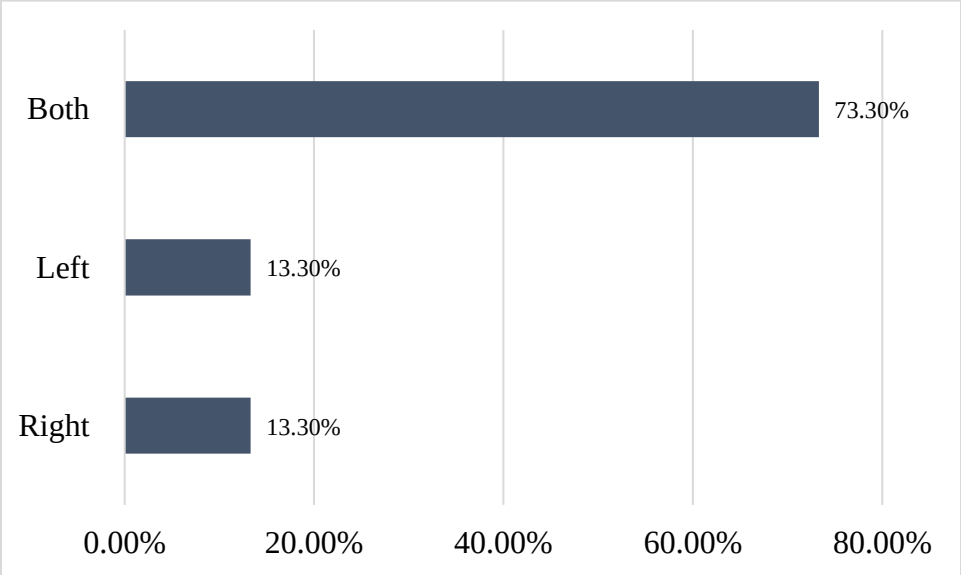


Figure 3.2: Side involvement in Control Group

4.4 Body Mass Index:

Among the 30 participants 13 of them had Normal weight (43.30%), 14 of them were Overweight (46.70%) and 3 of the participants were considered obese (10%).

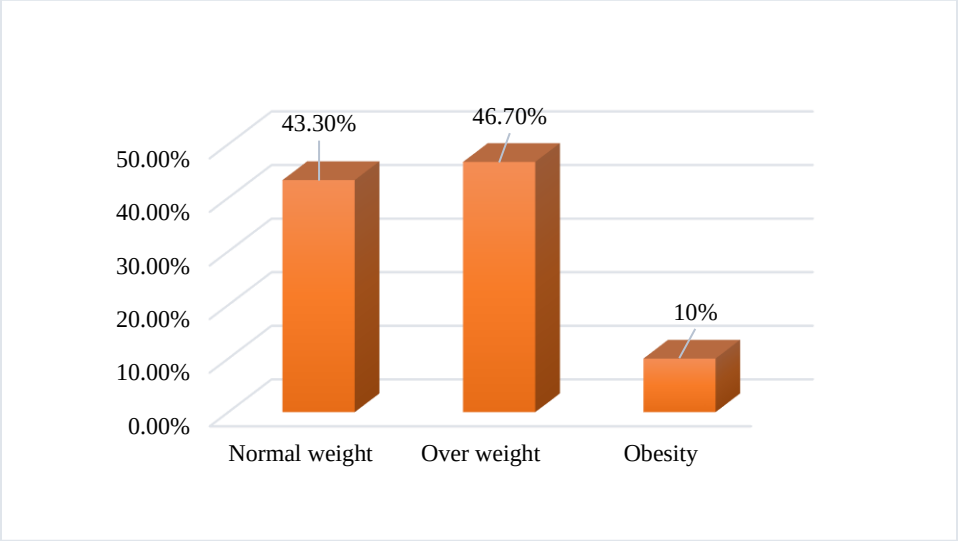


Figure 04: BMI of the participants

4.5 Pain Status

Table 04: Mean pain status of the participants

Experimental Group				Control Group			
Subjects	**Pre-test**	**Post-test**	**Differences**	**Subjects**	**Pre-test**	**Post-test**	**Differences**
E1	6.00	2.00	4.00	**C1**	5.00	1.00	4.00
E2	5.00	1.50	3.50	**C2**	9.70	2.70	7.00
E3	6.10	2.50	3.60	**C3**	9.30	5.50	4.20
E4	6.00	3.10	2.90	**C4**	5.00	.50	4.50
E5	6.50	1.20	5.30	**C5**	6.50	3.00	3.50
E6	5.00	2.00	3.00	**C6**	9.00	1.00	8.00
E7	7.90	2.00	5.90	**C7**	7.30	1.00	6.30
E8	7.00	4.50	2.50	**C8**	7.20	3.50	3.70
E9	8.80	1.30	7.50	**C9**	4.50	2.00	2.50
E10	9.00	1.70	7.30	**C10**	8.20	2.70	5.50
E11	5.00	1.00	4.00	**C11**	6.50	1.50	5.00
E12	7.90	1.50	6.40	**C12**	5.00	1.20	3.80
E13	3.50	1.70	1.80	**C13**	6.30	3.70	2.60
E14	6.60	1.60	5.00	**C14**	5.00	1.00	4.00
E15	5.50	1.00	4.50	**C15**	7.00	1.50	5.50
Mean	**6.38**	**1.90**	**4.48**	**Mean**	**6.76**	**2.12**	**4.67**

Table shows that Mean Pre-test score on visual analogue scale was 6.38 and post-test was 1.90 with a mean difference of 4.48 in the experimental group. On the other hand, the mean pre-test score in the control group was 6.67 and post-test was 2.12 with the mean difference was 4.67. So, it is seen that pain in the visual analogue scale had reduced in both groups.

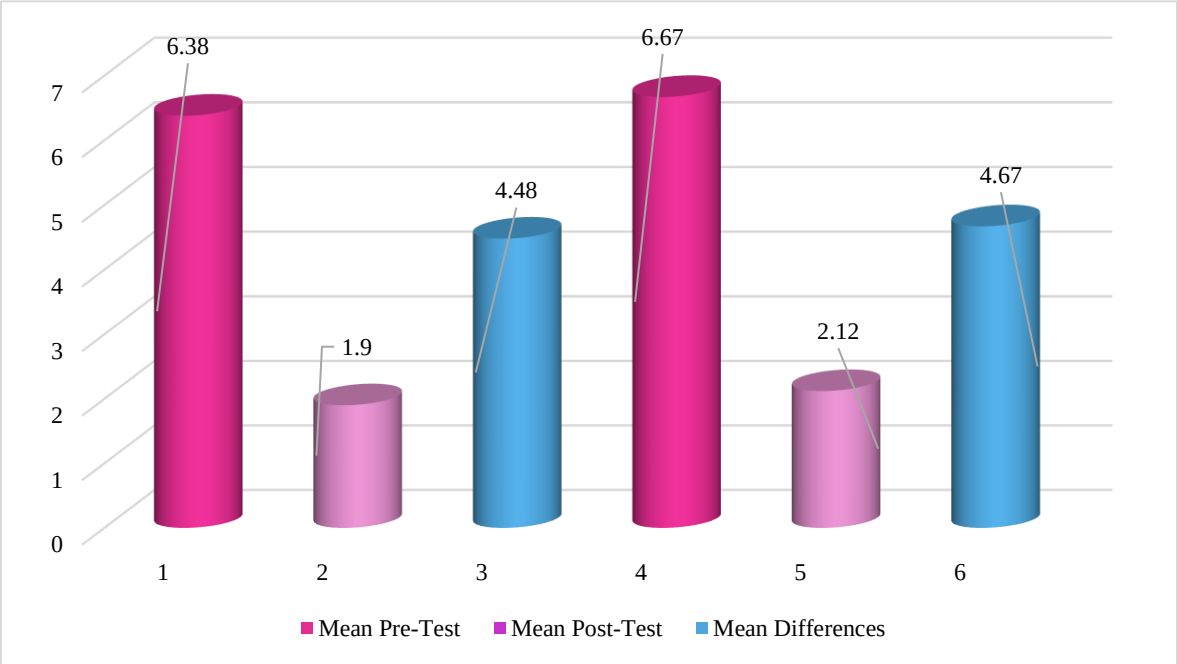


Figure 05: Comparison of pain in experimental and control group

4.6 Pain and Disability Related Information

4.6.1 Comparison of Pain

- **Mann Whitney U test analysis of post- test pain condition among the participants (Between Group Analysis)**

Table 05: Analysis of post-test pain (Between group analysis)

Visual Analogue Scale (VAS)	Category of the Patient	Number	Mean Post-test pain	Mean Rank	Mann Whitney U Score	P value
	Experimental Group	15	1.84±.937	15.37	110.5	0.93
	Control Group	15	2.12±1.376	15.63		
	Total	30		**0.26**		

The above data shows the Mean rank of the experimental group is 15.37, and the mean rank for the control group is 15.63. The difference among those two values is close. It can be concluded that pain reduction score on the Visual Analogue Scale (VAS) in experimental group and control group does not have any significant difference. The table shows that the results of the Mann Whitney U test applied to the post test pain score of the participants in both the experimental and control groups reveals a statistically insignificant difference at the level of (p=0.93). By observing the above calculated numbers, it can be said that the null hypothesis is accepted, and alternative hypothesis is rejected. That means that difference between trial group treatment (Quadriceps myofascial release along with usual physiotherapy treatment) and control group treatment (usual physiotherapy treatment only) is insignificant . However, it should be noted that the experimental group experienced a 0.26 reduction in pain greater than the control group. However, the numbers are not significant.

4.6.2 Analysis of General pain of the Experimental group (Wilcoxon Signed Rank Test)

- **Statistics of patients general pain of the experimental group (Within Group)**

Table 06: Calculation of Z value for Pre-test and Post-test pain for Experimental Group

Experimental Group			
Pre-test and post-test pain intensity			
	N	**Test Statistics (Wilcoxon Signed Rank Test)**	
		Based on Positive ranks Z	**P**
Positive Ranks	0	-3.409	.001*
Negative Ranks	15		
Ties	0		
Total	15		

Table displays the comparison of the participants before (pre-test) and after (post-test) pain score for the experimental groups. According to the table's legend, none of the participants in the experimental group noticed higher discomfort after receiving Quadriceps Myofascial Release combined with conventional physiotherapy. The pain score of 15 experimental group participants was higher before the intervention, but it had reduced following the administration of quadriceps myofascial release along with conventional physiotherapy. Furthermore, no participants in the experimental group noticed an increase in pain following the therapy session, hence the positive rank is zero. The point 'ties' indicate that no patient's pain score remained same as the pre-test score. P value is < 0.05 which that there is less than a 5% chance that the results are due to random error, and it is significant. Therefore, it can be said that the alternative hypothesis is accepted and the null hypothesis is rejected.

4.6.3 Analysis of General pain of the Control group (Wilcoxon Signed Rank Test)

- **Statistics of patient's general pain of the Control group (Within Group)**

Table 07: Calculation of Z value for Pre-test and Post-test pain for Control Group

Control Group			
Pre-test and post-test pain intensity			
	N	**Test Statistics (Wilcoxon Signed Rank Test)**	
		Based on Positive ranks Z	**P**
Positive Ranks	0	-3.410	.001*
Negative Ranks	15		
Ties	0		
Total	15		

Table displays the comparison of the participants before (pre-test) and after (post-test) pain score for the control groups. According to the table's legend, none of the participants in the control group noticed higher discomfort after receiving conventional physiotherapy. The pain score of 15 control group participants was higher before the intervention, but it had reduced following the administration conventional physiotherapy. Furthermore, no participants in the control group noticed an increase in pain following the therapy session, hence the positive rank is zero. The point 'ties' indicate that no patient's pain score remained same as the pre-test score. P value is < 0.05 which that there is less than a 5% chance that the results are due to random error, and it is significant. Therefore, it can be said that the alternative hypothesis is accepted, and the null hypothesis is rejected.

4.7 Disability Status:

Table 08: Mean disability status of the participants

Experimental Group				Control Group			
Subjects	**Pre-test**	**Post-test**	**Differences**	**Subjects**	**Pre-test**	**Post-test**	**Differences**
E1	85	22	63	**C1**	66	16	50
E2	59	17	42	**C2**	76	23	53
E3	57	13	44	**C3**	83	40	43
E4	83	29	54	**C4**	55	11	44
E5	70	25	45	**C5**	70	27	43
E6	70	19	51	**C6**	81	20	61
E7	87	31	56	**C7**	47	28	19
E8	60	32	28	**C8**	79	15	64
E9	75	24	51	**C9**	82	30	52
E10	71	27	44	**C10**	83	27	56
E11	71	17	54	**C11**	74	26	48
E12	80	19	61	**C12**	71	17	54
E13	59	24	35	**C13**	78	29	59
E14	60	13	47	**C14**	68	17	51
E15	61	7	54	**C15**	60	15	45
Mean	**69.866**	**21.266**	**48.6**	**Mean**	**71.533**	**22.733**	**49.466**

Table shows that Mean Pre-test score on WOMAC was 69.866 and post-test was 21.266 with a mean difference of 48.6 in the experimental group. On the other hand, the mean pre-test score in the control group was 71.533 and post-test was 22.733 with the mean difference was 49.466. So, it is seen that the disability in the WOMAC scale had reduced in both groups.

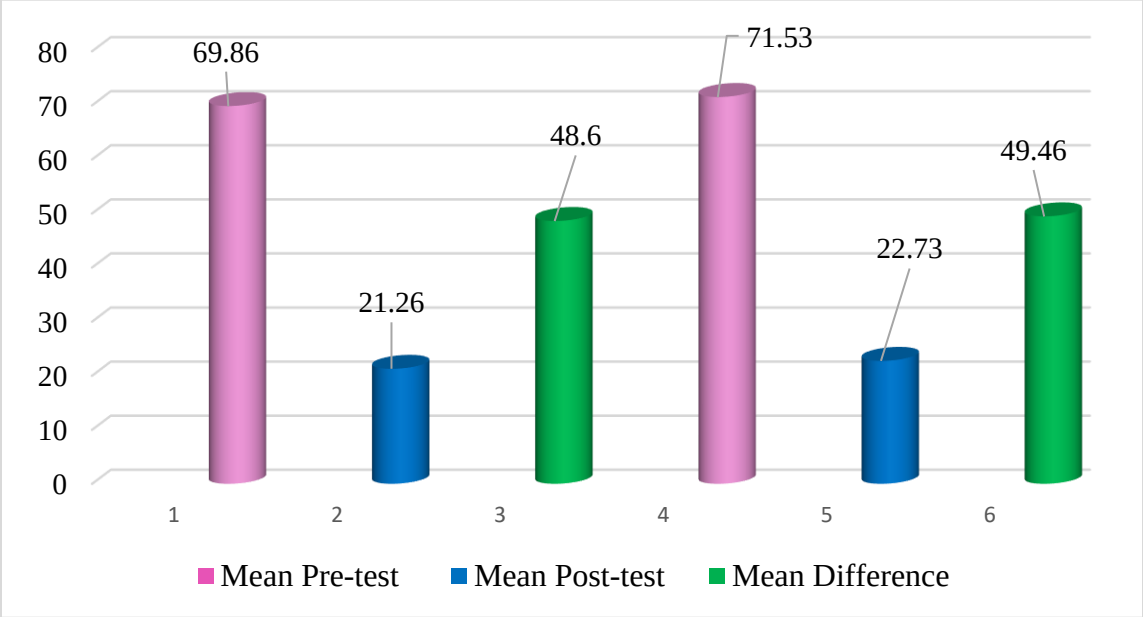


Figure 06: Comparison of disability in experimental and control group

4.7.1 Comparison of Disability

- **Mann Whitney U test analysis of post- test disability condition among the participants (Between Group Analysis)**

Table 09: Analysis of post- test disability (Between group analysis)

The Western Ontario and McMaster University Osteoarthritis Index (WOMAC) Score	Category of the Patient	Number	Mean of Post-test pain	Mean Rank	Mann Whitney U Score	P value
	Experimental Group	15	21.27±7.166	15.03	105.5	0.771
	Control Group	15	22.73±7.750	15.97		
	Total	30		**0.94**		

The above data shows the Mean rank of the experimental is 15.03 and the mean rank of the control group is 15.97. The difference among those two values is close. Therefore, it can be concluded that the disability reduction score on the WOMAC for experimental and control group does not have any significant difference. The table shows that the results of the Mann Whitney U Test applied to the post-test disability score of the participants in both experimental and control groups reveals statistically insignificant difference at the level of (P=0.771). By observing the above calculated numbers, it can be said that the null hypothesis is accepted, and the alternative hypothesis is rejected. That means the difference between the trail group treatment (Quadriceps myofascial release along with usual physiotherapy treatment) and control group treatment (usual physiotherapy treatment) is insignificant. However, it should be noted that the experimental group experienced a 0.94 reduction in disability status greater than the control group. However, the numbers are not significant.

4.7.2 Analysis of Disability for Experimental group (Wilcoxon Signed Rank Test)

- **Statistics of disability for the experimental group (Within Group)**

Table 10: Calculation of Z value for Pre-test and Post-test Disability for Experimental Group

Experimental Group			
Pre-test and post-test disability intensity			
The Western Ontario and McMaster University Osteoarthritis Index (WOMAC) Score	**N**	**Test Statistics (Wilcoxon Signed Rank Test)**	
		Based on Positive ranks Z	**P**
Positive Ranks	0	-3.412	.001*
Negative Ranks	15		
Ties	0		
Total	15		

Table displays the comparison of the participants before (pre-test) and after (post-test) disability score for the experimental groups. According to the table's legend, none of the participants in the experimental group noticed higher disability after receiving Quadriceps Myofascial Release combined with conventional physiotherapy. The disability score of 15 experimental group participants was higher before the intervention, but it had reduced following the administration Quadriceps Myofascial Release combined with conventional physiotherapy. Furthermore, no participants in the experimental group noticed an increase in disability following the therapy session, hence the positive rank is zero. The point 'ties' indicate that no patient's disability score remained same as the pre-test score. P value is <

0.05 which that there is less than a 5% chance that the results are due to random error, and it is significant. Therefore, it can be said that the alternative hypothesis is accepted, and the null hypothesis is rejected.

4.7.3 Analysis of Disability for Control group (Wilcoxon Signed Rank Test)

- **Statistics of disability for the Control group (Within Group)**

Table 11: Calculation of Z value for Pre-test and Post-test Disability for Control Group

Control Group			
Pre-test and post-test disability score			
The Western Ontario and McMaster University Osteoarthritis Index (WOMAC) Score	**N**	**Test Statistics (Wilcoxon Signed Rank Test)**	
		Based on Positive ranks Z	**P**
Positive Ranks	0	-3.408	.001*
Negative Ranks	15		
Ties	0		
Total	15		

Table displays the comparison of the participants before (pre-test) and after (post-test) disability score for the control groups. According to the table's legend, none of the participants in the control group noticed higher disability after receiving conventional physiotherapy. The disability score of 15 control group participants was higher before the intervention, but it had reduced following the administration conventional physiotherapy. Furthermore, no participants in the control group noticed an increase in disability following

the therapy session, hence the positive rank is zero. The point 'ties' indicate that no patient's disability score remained same as the pre-test score. P value is < 0.05 which that there is less than a 5% chance that the results are due to random error, and it is significant. Therefore, it can be said that the alternative hypothesis is accepted, and the null hypothesis is rejected.

CHAPTER V DISCUSSION

Thirty Patients with knee osteoarthritis were studied. Out of them 57% (n=17) were male and 43%(n=13) were female. In which the experimental group was consist of 60%(n=9) male and 40%(n=6) female; Meanwhile the control group was consist of 53.3% (n=8) male and 46.7%(n=7) female. The age range was taken from 40 to 75 year with those with knee osteoarthritis, having only one side or both side involvement.

The main objective of the study was to evaluate whether quadriceps myofascial release technique has beneficial effect in patients with knee osteoarthritis.

According to a study in Bangladesh, there were a total of 1843 individuals in the study (892 men and 951 women), of which 134 (60 men and 74 women) were diagnosed with knee osteoarthritis. Individuals with knee osteoarthritis had a mean (standard deviation) age of 51.7(11.2) years. Fifty percent (50%) were female homemakers. More than half (56.8%) were from rural areas, around 70.2% had completed elementary school or less, 13.4% participated in intense physical activity, 30% had a body mass index of 25 kg/m2 or more, and 13% had a history of diabetes mellitus (Haider et al., 2022).

The thirty participants had a mean age of 53.43% and a standard deviation of 10.74. In this study 43.30% (n=13) participants had normal BMI,46.70% (n=14) of them were overweight and 10% (n=3) of them were obese.

In contrast, few numbers of studies found different types of myofascial release methods that have the effectiveness to decrease pain and enhance function in osteoarthritis patients. (Dor & Kalichman, 2017).

A research was conducted were a sample of 33 patients of both genders who underwent TKA and exhibited flexion contracture of at least 5° following surgery and were authorized to begin rehabilitation. The intervention group was given myofascial release which showed immediate increase in mobility, increase in range of motion and decreased pain. After myofascial release, the data also revealed an increase in the electrical activation of the rectus femoris muscle (e Sliva et al., 2017).

The visual analogue scale showed a mean pain difference of 4.34 in the experimental group and a mean pain difference of 4.67 in the control group. The disability score in the

WOMAC had a mean difference of 48.6 in the experimental group and 49.46 mean difference in the control group.

The study focuses on the effect of quadriceps myofascial release technique along with conventional physiotherapy for the treatment of patients with knee osteoarthritis to reduce pain and disability. The nonparametric Mann-Whitney U test and Wilcoxon Singed Rank test was applied to examine the efficacy of the myofascial release technique of quadriceps muscle in correlation with conventional physiotherapy vs conventional physiotherapy alone for the treatment of osteoarthritis. The Mann-Whitney U test showed that there was a statistically significant relationship between the difference in the mean score of daily activities and a history of opium use ($U=1.90$, $p<0.05$), as well as between knee pain/knee stiffness and gender ($U=2.57$, $p<0.05$) and educational level ($U=2.11$, $p<0.05$) (Hamedi et al.,2021). In this study the Mann-Whitney U (between group) analysis of post-test pain the experimental and control group was 15.37 & 15.63 which showed 0.26 more reduction in the experimental group pain than the control group. The test also found the post-test disability score in the experimental and control group of 15.03 & 15.97 in which the results also showed the experimental group had 0.94 more reduction in disability in between group analysis than the control group. Results of the study showed that quadriceps myofascial release technique and conventional physiotherapy led to significant decrease in the within-group analysis both for pain and disability following a 12-session treatment program. But was not too significant for between group analysis. But the experimental group had more reduction in both of the results.

Before and after knee arthroplasty, the Wilcoxon test revealed a significant difference in the mean ratings of all subscales (pain with $Z=10.62$, knee pain/knee stiffness with $Z=10.54$, daily activity with $Z=10.62$, sport with $Z=2.95$, and quality of life with $Z=10.48$) (Hamedi et al.,2021). By using a non-parametric Wilcoxon Signed Rank test on the data the results were found to be significant ($p < 0.05$) in both groups. The test showed that pain intensity within group for experimental group was ($Z= 3.409$; $P=0.001$) and for control group it was ($Z = 3.410$; $P= 0.001$). The disability score within the group for experimental group was ($Z= 3.412$; $P=0.001$) and for control group it was ($Z= 3.408$; $P=0.001$). Meaning, both the control and experimental groups showed similar results.

The results of the present study showed that the 12-session intervention brought significant reduction in knee pain and disability in both the experimental groups and the control groups. Thus, the quadriceps myofascial release in conjunction with conventional physiotherapy and conventional physiotherapy on its own are both effective in treating knee osteoarthritis in their own respective ways. As, both of the treatment caused improvement in function and helped in stability of the knee.

5.1 Limitations of the study

The amount of time available for carrying out this research was limited. Sample size was really very small. There wew only thirty participants, so the result is difficult to generalize among whole population. This research was carried out in CRP, Savar such a small environment, so it was difficult to keep the study confidential for blinding procedure. Therefore, single blind method was used in this study. Another limitation of this study was the subjects with wide age range group between 40 to 75 years, the researcher couldn't find out which age group patients were more affected. Consequently, results could not be generalized to specific ages. If the most effective age group is identified, the outcome will be more precise.

There were no available studies demonstrating the efficacy of this intervention in Bangladesh. In this investigation, significant information regarding knee osteoarthritis patients with particular myofascial treatments in Bangladesh was insufficient. Therefore, it was difficult to compare the effectiveness with another research.

CHAPTER VI CONCLUSION AND RECOMMANDATION

6.1 Conclusion

This study found that conventional physiotherapy combined with quadriceps myofascial release technique is just as effective as conventional physiotherapy alone in improving pain and disability in knee osteoarthritis patients. There were 30 male and female participants. Experimental group included 15 participants and control group likewise had 15 people. The experimental group received both myofascial release of the quadriceps and conventional physiotherapy. In contrast, the control group received standard physiotherapy. Both groups received comparable reductions in pain and disability. The experimental group experiences a greater reduction in pain and disability, but the difference is not significant. This study found that conventional physiotherapy combined with quadriceps myofascial release technique and conventional physiotherapy alone both are effective in improving pain and disability in knee osteoarthritis patients. Both methods are successful in the treatment of knee osteoarthritis. Both aid in the alleviation of pain and disability. These two treatment protocols are a cost-effective solution for treating a variety of common injuries and overuse syndromes, restoring joint mobility and creating optimal structural alignment. The study expects to determine the efficacy of quadriceps myofascial approach in combination with traditional physiotherapy in reducing the symptoms of osteoarthritis patients, hence facilitating their rehabilitation and enhancing their functional activities. However, the conclusion was that both treatments are successful in treating knee osteoarthritis. Physiotherapists can use this study to aid in the rehabilitation and prevention of knee osteoarthritis-related problems even more.

6.2 Recommendations

Accordingly, a follow-up study involving only quadriceps myofascial release and conventional physiotherapy for knee osteoarthritis should be conducted with a well-blinding approach to examine the efficacy of these therapies. The functional outcome assessment of the patient and the average number of sessions needed to be discharged from treatment should also be included in the evaluation process. This will help validate the treatment technique. Physiotherapy intervention for knee osteoarthritis patients should be evaluated using randomization and then compared to a control group in future studies, so that this treatment can be more evidence-based for this type of patient. Further research is also recommended on this subject with a much larger population. Unfortunately, neither the researcher nor the equipment she had on hand was enough for the research project. As a result, the researcher recommended that additional research be conducted with ample time and equipment to ensure the study's validity.

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APPENDIX A

Treatment Protocol

For Control Group

Conventional physiotherapy for knee osteoarthritis patient

Treatment Options	**Duration/Repetition**
Soft Tissue Mobilization	3-5 minutes
Patellar Mobilization	5 minutes
Mobilization with Movement (MWM)	6 repetitions with 2 sets
Quadriceps and Hamstring strengthening exercise	10 repetitions with 15 seconds hold
Sustained Manual Stretching	3-5 repetitions with 15-20 seconds hold
UST	5-7 minutes
IRR	15 minutes

For Experimental Group

Conventional physiotherapy is applied along with below mentioned myofascial release techniques.

Myofascial Release Therapy

Vastus medialis, Vastus lateralis, Rectus femoris & Vastus Intermedius

Duration: 4weeks,3days per week for 12 sessions

Quadriceps Myofascial Release

Vastus Medialis Release

Starting position:

Patient in supine lying

Therapist stands by the affected side.

Steps:

1. Therapist places both of his/her hands in vastus medialis muscle.
2. Give a firm pressure based on patient's tolerance and continue massage from downward to upward direction towards the muscle fibre.
3. Duration: 3-5 minutes

Figure 07: Vastus Medialis Release

Vastus Lateralis Release

Starting position:

Patient is side lying

Therapist stands by the affected side.

Steps:

1. Therapist places both hands below the greater trochanter of the femur and the other above the knee joint. The hands crossed along the long axis of the vastus lateralis.

2. Give a firm pressure based on patient's tolerance and continue massage from downward to upward in between ITB and VL.

3. Duration: 4 minutes

Figure 08: Vastus Lateralis Release

Rectus Femoris Release

Starting position:
Patient in supine lying

Therapist stands by the affected side.

Steps:

1. Place patients affected leg over the therapist's leg. At the starting position patients leg is in an extension position and then slowly go into contraction.
2. The therapist then reinforces 3 fingers and apply firm pressure with the other hand along the rectus femoris muscle.
3. Duration: 3-4 minutes

Figure 9: Rectus Femoris Release

Figure 10: Demonstration of quadriceps myofascial release technique

APPENDIX B

Informed Consent (English)

Assalamu Alaykum,

I am Syeda Tamanna Afroze Sonali, student of 4th Professional (final year) B.Sc. in Physiotherapy,Bangladesh Health Professions Institute (BHPI), faculty of medicine under the University of Dhaka. For the partial fulfillment of my Bachelor's degree, I have to conduct a research project and it is a part of my study. My Research title is "**Effectiveness of Quadriceps Myofascial Release Technique for the Treatment of Knee Osteoarthritis**". Now I want to ask you some questions those are mentioned in this form. The conversation time will be 20-30 minutes. I would like to inform you that this is a purely academic study and will not to be used for any other purposes. I assure you that all the data will be kept confidential. Your participation will be voluntary. You may have the rights to withdraw your consent and discontinue from the study. You also have the right not to answer any other question that you don't like of this questionnaire.If you have any query about the study, you may contact me or my supervisor Fabiha Alam, Assistant Lecturer, Department of Physiotherapy, BHPI, CRP,Savar,Dhaka-1343.

Do you have any questions before I start? So, may I have your consent to proceed with the interview?

Yes ☐ No ☐

Signature of the participant …… Date ……

Signature of the researcher……Date……

APPENDIX C

Title: "Effectiveness of Quadriceps Myofascial Release Technique for the Treatment of Knee Osteoarthritis"

Questionnaire (English)

Patient's Code: Date:

Name of the Participant:

Address:

Mobile:

PART: I (SOCIO-DEMOGRAPHIC INFORMATION)

Age	
Gender	•Male •Female
Occupation	
Marital Status	•Unmarried •Married •Others
Start Date of Intervention	
End Date of Intervention	

PART: II (HEALTH RELATED INFORMATION)

Duration of this Problem:	Year…….. / Month…….
Side Involved:	o Right o Left o Both
Weight (kg)	
Height (cm)	
BMI (kg/m^2)	

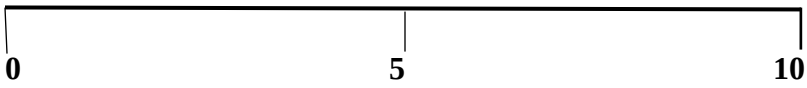
Questions before starting treatment

PART-III (PAIN RELATED INFORMATION)

Circle one number

0=None Pain 10=Extreme Pain

• How much pain do you feel today?



The Western Ontario and McMaster Universities Osteoarthritis Index

PART-IV: (PHYSICAL DISABILITY QUESTIONNAIRE)

The Questionnaire is developed according to 'The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC SCORE)' for measuring the pain and disability of the patient with knee osteoarthritis. Each question has 4 score. Total question is 24. Total number is 96. Pre-test score of the patient is _____ /96.

Instructions: Please rate the activities in each category according to the following scale of difficulty.

0 = None

1 = Slight

2 = Moderate

3 = Severe

4 = Extreme

Circle one number for each activity (○) :

A. Pain:

1. Walking	0	1	2	3	4
2. Climbing Stairs	0	1	2	3	4
3. Nocturnal	0	1	2	3	4
4. Rest	0	1	2	3	4
5. Weight Bearing	0	1	2	3	4

B. STIFFNESS

1. Morning Stiffness	0	1	2	3	4
2. Stiffness occurring later in the day	0	1	2	3	4

C. PHYSICAL FUNCTIONS

1. Descending stairs	0	1	2	3	4
2. Ascending stairs	0	1	2	3	4
3. Rising from sitting	0	1	2	3	4
4. Standing	0	1	2	3	4
5. Bending to floor	0	1	2	3	4
6. Walking on flat surface	0	1	2	3	4
7. Getting in / out of car	0	1	2	3	4
8. Going Shopping	0	1	2	3	4
9. Putting on socks	0	1	2	3	4
10. Lying in bed	0	1	2	3	4
11. Taking off socks	0	1	2	3	4
12. Rising from bed	0	1	2	3	4
13.Getting in/out of bath	0	1	2	3	4
14. Sitting	0	1	2	3	4
15. Getting in/ out of toilet	0	1	2	3	4

16. Heavy domestic duties	0	1	2	3	4
17. Light domestic duties	0	1	2	3	4

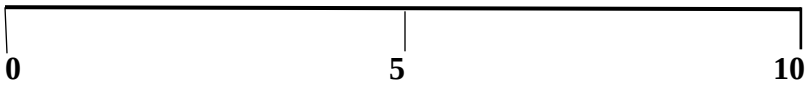
Questions after completing treatment

PART-III (PAIN RELATED INFORMATION)

Circle one number

0=None Pain 10=Extreme Pain

• How much pain do you feel today?



The Western Ontario and McMaster Universities Osteoarthritis Index

PART-IV: (PHYSICAL DISABILITY QUESTIONNAIRE)

The Questionnaire is developed according to 'The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC SCORE)' for measuring the pain and disability of the patient with knee osteoarthritis. Each question has 4 score. Total question is 24. Total number is 96. Post-test score of the patient is _____ /96.

Instructions: Please rate the activities in each category according to the following scale of difficulty.

0 = None

1 = Slight

2 = Moderate

3 = Severe

4 = Extreme

Circle one number for each activity (○) :

A. Pain:

1. Walking	0	1	2	3	4
2. Climbing Stairs	0	1	2	3	4
3. Nocturnal	0	1	2	3	4
4. Rest	0	1	2	3	4
5. Weight Bearing	0	1	2	3	4

B. STIFFNESS

1. Morning Stiffness	0	1	2	3	4
2. Stiffness occurring later in the day	0	1	2	3	4

C. PHYSICAL FUNCTIONS

1. Descending stairs	0	1	2	3	4
2. Ascending stairs	0	1	2	3	4
3. Rising from sitting	0	1	2	3	4
4. Standing	0	1	2	3	4
5. Bending to floor	0	1	2	3	4
6. Walking on flat surface	0	1	2	3	4
7. Getting in / out of car	0	1	2	3	4
8. Going Shopping	0	1	2	3	4
9. Putting on socks	0	1	2	3	4
10. Lying in bed	0	1	2	3	4
11. Taking off socks	0	1	2	3	4
12. Rising from bed	0	1	2	3	4
13.Getting in/out of bath	0	1	2	3	4
14. Sitting	0	1	2	3	4
15. Getting in/ out of toilet	0	1	2	3	4

16. Heavy domestic duties	0	1	2	3	4
17. Light domestic duties	0	1	2	3	4

APPENDIX D

সম্মতি পত্র (বাংলা)

আসসালামু আলাইকুম/নমস্কার,

আমি সৈয়দা তামান্না আফরোজ সোনালী, ঢাকা বিশ্ববিদ্যালয়ের চিকিৎসা অনুষদের অধীনে বাংলাদেশ হেলথ প্রফেশনস ইন্সটিটিউট এর বি.এস.সি ইন ফিজিওথেরাপি কোর্সের ৪র্থ(চূড়ান্ত) বর্ষের একজন শিক্ষার্থী। অধ্যয়নের অংশ হিসেবে আমাকে একটি গবেষণাসম্পাদন করতে হবে এবং এটা আমার প্রাতিষ্ঠানিক কাজের অংশ। আমার গবেষণার বিষয় হল **"হাঁটুর অস্টিওআর্থ্রাইটিস রোগীদের মধ্যেকোয়াড্রিসেপ্স মায়োফেসিয়াল রিলিজের চিকিৎসাবিদ্যাগত কার্যকারিতা"।** এন আমি আপনাকে কিছু প্রশ্ন করতে চাচ্ছি যা এই ফর্মে উল্লেখ আছে।এতে আনুমানিক ২০-৩০ মিনিট সময় নিবো।

আমি আপনাকে অবগত করছি যে,এটা আমার অধ্যয়নের অংশ এবং যা অন্য কোন উদ্দেশ্যে ব্যবহৃত হবে না।আপনি যেসব তথ্য প্রদান করবেন তার গোপনীয়তা বজায় রাখা হবে এবং এটা নিশ্চিত যে আপনি যে সকল তথ্য প্রদান করবেন তা অপ্রকাশিত থাকবে। এই অধ্যয়নে অংশগ্রহণ সেচ্ছা প্রণোদিত এবং আপনি যে কোন সময় এই অধ্যয়ন থেকে কোন কারণ ছাড়াই নিজেকে প্রত্যাহার করতে পারবেন। এছাড়াও কোন নির্দিষ্ট প্রশ্ন অপছন্দ হলে উত্তর না দেওয়ার এবং সাক্ষাৎকারের সময় কোন উত্তর না দিতে চাওয়ার অধিকার আছে।

এই অধ্যয়নে অংশগ্রহণকারী হিসেবে যদি আপনার কোন প্রশ্ন থাকে তাহলে আমাকে অথবা আমার সুপারভাইজার ফাবিহা আলম, সহকারী অধ্যাপক, ফিজিওথেরাপি বিভাগ, বি.এইচ.পি.আই, সিআরপি,সাভার,ঢাকা-১৩৪৩ তে যোগাযোগ করতে পারেন।

আমি শুরু করার আগে আপনার কোন প্রশ্ন আছে? তাহলে ইন্টারভিউ নিয়ে এগিয়ে যাওয়ার জন্য আমি কি আপনার সম্মতি পেতে পারি?

হ্যা ☐ না ☐

অংশগ্রহনকারীর স্বাক্ষর.....তারিখ.....

গবেষকের স্বাক্ষর ..... তারিখ.....

APPENDIX E

গবেষণার বিষয়: "হাঁটুর অস্টিওআর্থ্রাইটিস রোগীদের মধ্যে কোয়াড্রিসেপ্স মায়োফেসিয়াল রিলিজের চিকিৎসাবিদ্যাগত কার্যকারিতা"

প্রশ্নপত্র (বাংলা)

রোগীর কোড :

অংশগ্রহনকারীর নাম :

ঠিকানা : তারিখ:

ফোন নাম্বার :

অংশ- ১ (সামাজিক প্রেক্ষাপটের তথ্যাবলী)

➢ বয়স :	
➢ লিঙ্গ	○ পুরুষ ○ মহিলা
➢ পেশা	
➢ বৈবাহিক অবস্থা	○ অবিবাহিত ○ বিবাহিত ○ অন্যান্য
➢ চিকিৎসা শুরুর তারিখ:	
➢ চিকিৎসা শেষ হওয়ার তারিখ :	

অংশ-২ (স্বাস্থ্য সম্পর্কিত তথ্য)

➢ কত সময় ধরে সমস্যা ?	বছর..... / মাস.....
➢ কোন পাশে সমস্যা ?	○ ডান ○ বাম ○ উভয়
➢ ওজন (কেজি)	
➢ উচ্চতা (ফিট)	
➢ বি এম আই (কেজি/মি২)	

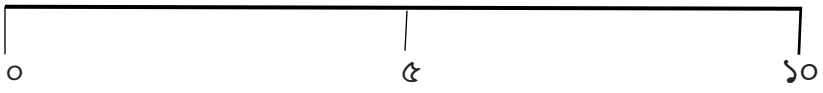
চিকিৎসা পূর্ববর্তী প্রশ্নাবলী :

অংশ - ৩ (ব্যথা সম্পর্কিত তথ্য)

যে কোন একটি সংখ্যায় গোল দাগ দিন :

০= কোন ব্যথা নাই ১০= সর্বাধিক ব্যথা

- আজকে আপনার ব্যথা কতটুকু?



ওয়েস্টার্ন অন্টারিও ও ম্যাকমাস্টার ইউনিভার্সিটি অস্টিওআর্থ্রাইটিস ইনডেক্স

অংশ- ৪ (শারীরিক অক্ষমতার প্রশ্নবালী)

এই প্রশ্নপত্রটি তৈরি করা হয়েছে ওয়েস্টার্ন অন্টারিও ও ম্যাকমাস্টার ইউনিভার্সিটি অস্টিওআর্থ্রাইটিস ইনডেক্স (ওম্যাক স্কোর) অনুযায়ী অস্টিওআথ্রাইটিস রোগীদের হাঁটুর ব্যাথা ও অক্ষমাতাজনিত তথ্যাবলি পরিমাপের জন্য।

প্রতিটি প্রশ্নের চারটি স্কোর আছে,প্রশ্ন ২৪ সর্বমোট এবং সর্বমোট ৯৬
চিকিৎসার রোগীর পূর্ব্বর্তী প্রাপ্ত নাম্বার_ _ _ _ _ _ /৯৬
নির্দেশনাবলী : দয়া করে প্রত্যেক ধরনের কাজকে নিচের কাঠিন্যের মাপকাঠি অনুযায়ী নির্ধারণ করুন

০ = নাই;১ = অল্প; ২=মাঝারি; ৩= অনেক; ৪= সর্বাধিক

প্রতিটি কাজের জন্য একটা সংখ্যায় গোল দাগ দিন (○)

ক) ব্যথা

১।যখন হাঁটেন	০	১	২	৩	৪
২।যখন সিঁড়িতে উঠেন	০	১	২	৩	৪
৩।রাতের বেলা	০	১	২	৩	৪
৪।বিশ্রামের সময়	০	১	২	৩	৪
৫।যখন ওজন বহন করেন	০	১	২	৩	৪

খ) শক্ত হয়ে যায়

১।সকালে শক্ত হয়	০	১	২	৩	৪
২।দিনের অন্য সময় শক্ত হয়	০	১	২	৩	৪

গ) শারীরিক কাজ

১।সিঁড়ি দিয়ে নামতে	০	১	২	৩	৪
২।সিঁড়ি দিয়ে উঠতে	০	১	২	৩	৪
৩।বসা থেকে উঠার সময়	০	১	২	৩	৪
৪। দাঁড়িয়ে থাকার সময়	০	১	২	৩	৪
৫।আসন দিয়ে বসার সময়	০	১	২	৩	৪
৬।সমতলে হাঁটার সময়	০	১	২	৩	৪
৭।যানবাহনে উঠার সময় /নামার সময়	০	১	২	৩	৪
৮।কেনাকাটা করার সময়	০	১	২	৩	৪
৯।মোজা পড়ার সময়	০	১	২	৩	৪
১০।বিছানায় শুতে	০	১	২	৩	৪
১১।মোজা খোলার সময়	০	১	২	৩	৪
১২।শোয়া থেকে উঠার সময়	০	১	২	৩	৪

১৩।গোসলে যাওয়ার সময়/বের হওয়ার সময়	০	১	২	৩	৪
১৪।বসে থাকা অবস্থায়	০	১	২	৩	৪
১৫।টয়লেটে যাওয়া বা আসার সময়	০	১	২	৩	৪
১৬।ভারী গৃহস্থালি কাজের সময়	০	১	২	৩	৪
১৭।হালকা গৃহস্থালি কাজের সময়	০	১	২	৩	৪

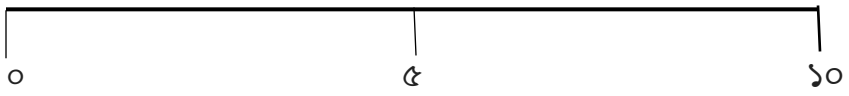
চিকিৎসা পরবর্তী প্রশ্নাবলী

অংশ - ৩ (ব্যথা সম্পর্কিত তথ্য)

যে কোন একটি সংখ্যায় গোল দাগ দিন :

০= কোন ব্যথা নাই ১০= সর্বাধিক ব্যথা

- আজকে আপনার ব্যথা কতটুকু?



ওয়েস্টার্ন অন্টারিও ও ম্যাকমাস্টার ইউনিভার্সিটি অস্টিওআর্থ্রাইটিস ইনডেক্স

অংশ- ৪ (শারীরিক অক্ষমতার প্রশ্নবালী)

এই প্রশ্নপত্রটি তৈরি করা হয়েছে ওয়েস্টার্ন অন্টারিও ও ম্যাকমাস্টার ইউনিভার্সিটি অস্টিওআর্থ্রাইটিস ইনডেক্স (ওম্যাক স্কোর) অনুযায়ী অস্টিওআথ্রাইটিস রোগীদের হাঁটুর ব্যাথা ও অক্ষমাতাজনিত তথ্যাবলি পরিমাপের জন্য।

প্রতিটি প্রশ্নের চারটি স্কোর আছে,প্রশ্ন ২৪ সর্বমোট এবং সর্বমোট ৯৬
চিকিৎসার রোগীর পরবর্তী প্রাপ্ত নাম্বার_ _ _ _ _ _/৯৬
নির্দেশনাবলী: দয়া করে প্রত্যেক ধরনের কাজকে নিচের কাঠিন্যের মাপকাঠি অনুযায়ী নির্ধারণ করুন

০ = নাই;১ = অল্প; ২=মাঝারি; ৩= অনেক; ৪= সর্বাধিক

প্রতিটি কাজের জন্য একটা সংখ্যায় গোল দাগ দিন (○)

ক) ব্যথা

১।যখন হাঁটেন	০	১	২	৩	৪
২।যখন সিঁড়িতে উঠেন	০	১	২	৩	৪
৩।রাতের বেলা	০	১	২	৩	৪
৪।বিশ্রামের সময়	০	১	২	৩	৪
৫।যখন ওজন বহন করেন	০	১	২	৩	৪

খ) শক্ত হয়ে যায়

১।সকালে শক্ত হয়	০	১	২	৩	৪
২।দিনের অন্য সময় শক্ত হয়	০	১	২	৩	৪

গ) শারীরিক কাজ

১।সিঁড়ি দিয়ে নামতে	০	১	২	৩	৪
২।সিঁড়ি দিয়ে উঠতে	০	১	২	৩	৪
৩।বসা থেকে উঠার সময়	০	১	২	৩	৪
৪। দাঁড়িয়ে থাকার সময়	০	১	২	৩	৪
৫।আসন দিয়ে বসার সময়	০	১	২	৩	৪
৬।সমতলে হাঁটার সময়	০	১	২	৩	৪
৭।যানবাহনে উঠার সময় /নামার সময়	০	১	২	৩	৪
৮।কেনাকাটা করার সময়	০	১	২	৩	৪
৯।মোজা পড়ার সময়	০	১	২	৩	৪
১০।বিছানায় শুতে	০	১	২	৩	৪
১১।মোজা খোলার সময়	০	১	২	৩	৪
১২।শোয়া থেকে উঠার সময়	০	১	২	৩	৪

১৩।গোসলে যাওয়ার সময়/বের হওয়ার সময়	০	১	২	৩	৪
১৪।বসে থাকা অবস্থায়	০	১	২	৩	৪
১৫।টয়লেটে যাওয়া বা আসার সময়	০	১	২	৩	৪
১৬।ভারী গৃহস্থালি কাজের সময়	০	১	২	৩	৪
১৭।হালকা গৃহস্থালি কাজের সময়	০	১	২	৩	৪

APPENDIX F **PERMISSION LETTER**

Permission letter

March 12, 2022

Head of the Physiotherapy Department

Centre for the Rehabilitation of the Paralysed (CRP)

Chapain, Savar, Dhaka-1343.

Through: Head, Department of Physiotherapy, BHPI

Subject: Seeking permission for data collection of 4th year Physiotherapy Research Project.

Sir,

With due respect and humble submission to state that I am Syeda Tamanna Afroze Sonali, a student of 4th year B.Sc. in Physiotherapy at Bangladesh Health Professions Institute (BHPI). In 4th year course curriculum, I have to conduct a research project. The ethical committee has approved my research project entitled on"**Effectiveness of Quadriceps Myofascial Release Technique for the Treatment of Knee Osteoarthritis**" under the supervision of Fabiha Alam, Lecturer, Physiotherapy Department, Bangladesh Health Professions Institute (BHPI). I would like to collect data,for which I need your kind approval. I assure that anything of my study will not be harmful for my participants.

I therefore, pray and hope that you would be kind enough to grant my application and give me permission for data collection and oblige thereby.

Yours faithfully

Syeda Tamanna Afroze Sonali

Syeda Tamanna Afroze Sonali

4th year, B.Sc. in Physiotherapy

Roll: 24, Session: 2016-2017, ID No: 112160348

Bangladesh Health Professions Institute (BHPI)

CRP, Chapain, Savar, Dhaka-1343.

Forwarded
12.03.2022

Approved
12/3/22
MOHAMMAD ANWAR HOSSAIN
Senior Consultant &
Head of Physiotherapy Dept
Associate Professor, BHPI
CRP Savar, Dhaka-1343

Recommended
12.03.22
Md. Shofiqul Islam
Associate Professor & Head
Department of Physiotherapy
Bangladesh Health Professions Institute (BHPI)
CRP, Chapain, Savar, Dhaka-1343

APPENDIX G **Institutional Review Board (IRB)**

বাংলাদেশ হেল্‌থ প্রফেশন্স ইনস্টিটিউট (বিএইচপিআই)
Bangladesh Health Professions Institute (BHPI)
(The Academic Institute of CRP)

Ref: CRP/BHPI/IRB/03/2022/573

Date: 02/03/2022

Syeda Tamanna Afroze Sonali
4th Year B.Sc. in Physiotherapy
Session: 2016–2017
BHPI, CRP, Savar, Dhaka- 1343, Bangladesh

Subject: Approval of the research project proposal **"Effectiveness of Quadriceps Myofascial Release Technique for the Treatment of Knee Osteoarthritis"** by Ethics Committee.

Dear Syeda Tamanna Afroze Sonali,
Congratulations.
The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application to conduct the above-mentioned dissertation, with yourself, as the principal investigator and Fabiha Alam as thesis supervisor. The Following documents have been reviewed and approved:

Sr. No.	Name of the Documents
1	Dissertation Proposal
2	Questionnaire (English and Bengali version)
3	Information sheet & consent form.

The purpose of the study is to find out the effectiveness of quadriceps myofascial release technique for the treatment of knee osteoarthritis. Since the study involves questionnaire that takes maximum 20- 30 minutes and have no likelihood of any harm to the participants, the members of the Ethics Committee approved the study to be conducted in the presented form at the meeting held at 09:00 AM on October 12, 2021, at BHPI (30thIRB Meeting).

The institutional Ethics committee expects to be informed about the progress of the study, any changes occurring in the course of 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,

Muhammad Millat Hossain
Assistant Professor, Dept. of Rehabilitation Science
Member Secretary, Institutional Review Board (IRB)
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

CRP-Chapain, Savar, Dhaka-1343, Tel : 7745464-5, 7741404
E-mail : principal-bhpi@crp-bangladesh.org, Web: bhpi.edu.bd, www.crp-bangladesh.org

APPENDIX H Review and Ethical Approval

The Chairman
Institutional Review Board (IRB)
Bangladesh Health Professions Institute (BHPI)
CRP, Savar, Dhaka-1343, Bangladesh.

Subject: **Application for review and ethical approval.**

Dear Sir,

With due respect I am Syeda Tamanna Afroze Sonali, student of final year B.Sc. in Physiotherapy program at Bangladesh Health Professions Institute (BHPI) the academic institute of Centre for the Rehabilitation of the Paralysed (CRP) under the Faculty of Medicine, University of Dhaka. As per the course curriculum, I have to conduct a research project entitled "**Effectiveness of Quadriceps Myofascial Release Technique for the Treatment of Knee Osteoarthritis**" under the supervision of Fabiha Alam, Lecturer, Department of Physiotherapy, BHPI.

The purpose of the study is to gain in-depth insight and understanding from people with Knee Osteoarthritisand the Effectiveness of Quadriceps Myofascial Release Technique in order to Treat Knee Osteoarthritis .The study involves face-to-face and/or by over phone interview by using questionnaire among thepeople with Osteoarthritis who are attend at CRP hospital in Savar, that may take 20 to 30minutes to fill in the questionnaire and there is no likelihood of any harm to the participants. Related information will be collected from the patients'guidebooks. Data collectors will receiveinformed consent from all participants andthe collected data will be kept confidential.

Therefore, I look forward to having your kind approval for the research project and to start data collection. I can also assure you that I will maintain all the requirements for study.

Sincerely,

Thesis presentation date:12th October,2021

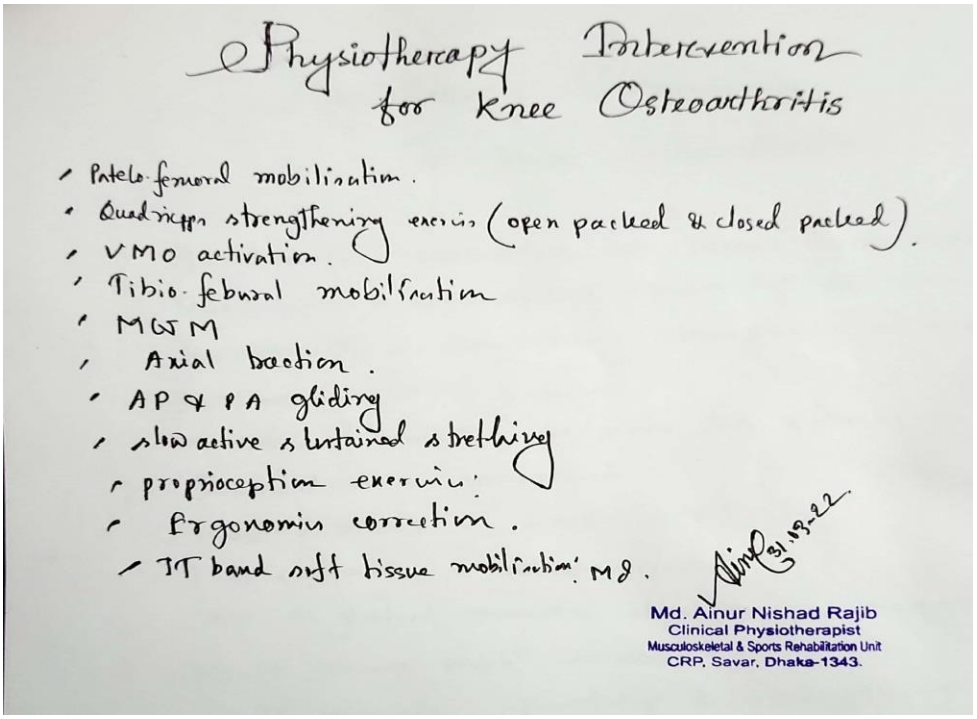
Syeda Tamanna Afroze Sonali
Syeda Tamanna Afroze Sonali
Final Year B.Sc. in Physiotherapy
Session: 2016 – 2017,
BHPI, CRP, Savar, Dhaka-1343, Bangladesh.

Head of Department
B.Sc. in Physiotherapy, BHPI.
Md. Shofiqul Islam
Associate Professor & Head
Department of Physiotherapy
Bangladesh Health Professions Institute (BHPI)
CRP, Chapain, Savar, Dhaka-1343

Recommendation from the Supervisor

Fabiha Alam
Lecturer,
Department of Physiotherapy, BHPI.

APPENDIX I CONVENTIONAL PHYSIOTHERAPY THERAPY

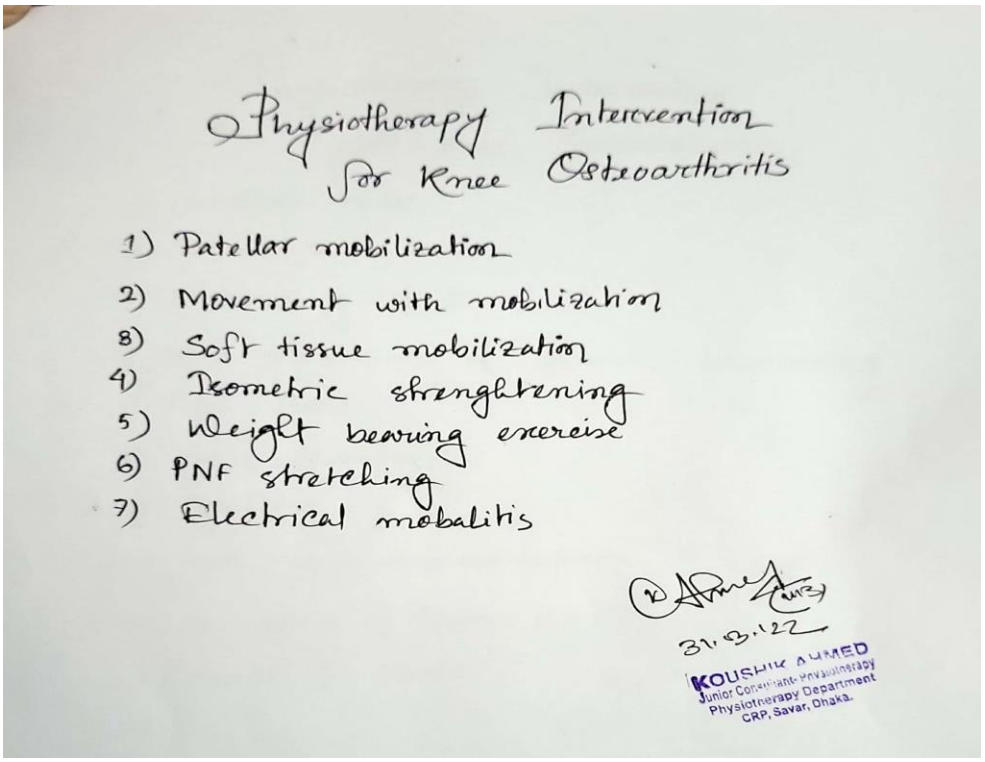


Physiotherapy Intervention for Knee Osteoarthritis

- Patelo-femoral mobilisation.
- Quadriceps strengthening exercise (open packed & closed packed).
- VMO activation.
- Tibio-febural mobilisation
- MWM
- Axial traction.
- AP & PA gliding
- slow active sustained stretching
- proprioception exercise.
- Ergonomic correction.
- IT band soft tissue mobilisation: MJ.

31.03.22

Md. Ainur Nishad Rajib
Clinical Physiotherapist
Musculoskeletal & Sports Rehabilitation Unit
CRP, Savar, Dhaka-1343.



Physiotherapy Intervention for Knee Osteoarthritis

1) Patellar mobilization
2) Movement with mobilization
3) Soft tissue mobilization
4) Isometric strengthening
5) Weight bearing exercise
6) PNF stretching
7) Electrical modalities

31.3.22

KOUSHIK AHMED
Junior Consultant (Physiotherapy)
Physiotherapy Department
CRP, Savar, Dhaka.

Physiotherapy Intervention for Knee Osteoarthritis

- Quadriceps isometric ex - 10 rep × 10 sec hold
- Quadriceps & hamstring stretching ex. 10 rep × 15 sec hold
- Quadriceps & hamstring strengthing ex. 10 rep × 15 sec hold
- Patellar mobn - 5 mins
- Maitland mobn - 60/min for 2 times
- Distraction - 10 rep × 1 set
- Mobn & mont - 6 rep × 2 set
- ITB release - ~~10 rep~~ 5 mins
- Hip & gluteal muscles strengthing - 10 rep × 1 set
- Soft tissue mobn ~~5 mins~~
- Calf muscle stretching & strengthing ex. - 10 rep × 1 set

01.04.22

Physiotherapy Intervention for Knee Osteoarthritis

→ Patellar mob.
→ Soft tissue mob.
→ Stretching of IT
→ Strengthening of Quards, Hamstring Abd - Add
→ Half Squatting
→ Cycling
→ SLR / SCE compression
→ Grapping of knee ie -
→ MWM of knee

31.03.22
ASMA ARJU
Jr. Consultant Physiotherapy
PT Dept. CRP, Savar, Dhaka