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THERAPEUTIC EFFICACY OF MYOFASCIAL RELEASE FOR PATIENTS WITH 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

THERAPEUTIC EFFICACY OF MYOFASCIAL RELEASE FOR PATIENTS WITH KNEE OSTEOARTHRITIS

Submitted by **Farzana Sharmin** for the partial fulfilment of the requirements for the degree of Bachelor of Science in Physiotherapy (B.Sc. PT).

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Declaration

I hereby declare that the present dissertation entitled **"Therapeutic Efficacy of Myofascial Release for patients with knee Osteoarthritis"** is an original work of my own and this work has not previously been accepted in substance for any degree. All sources used have been cited appropriately and any mistakes or inaccuracies are my own. I also declare that for any publication, presentation or dissemination of information of the study, I would be bound to take written consent from the Department of Physiotherapy, Bangladesh Health Professions Institute (BHPI).

Signature: Farzana Sharmin Date: 02 . 12 . 2019

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List of Abbreviations

&:	And
Cm:	Centimeter
CRP:	Center for the Rehabilitation of the Paralysed
Lt:	Left
MFR:	Myofascial Release
MTrPs:	Myofascial Trigger points
NSAID:	Non Steroid Anti-inflammatory Drug
OA:	Osteoarthritis
RCT:	Randomize Control Trial
RT:	Reaction Time
Rt:	Right
TENS:	Transcutaneous Electrical Nerve Stimulation
WHO:	World Health Organization

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Abstract

Purpose: To identify the efficacy of Myofascial Release along with conventional physiotherapy for Knee Osteoarthritis patients. ***Objectives:*** To compare intensity of pain, estimate range of motion (ROM), muscle power and functional outcome before and after application of Myofascial release along with conventional physiotherapy and conventional physiotherapy alone in patients with Knee Osteoarthritis. ***Methodology:*** 22 patients with Knee osteoarthritis were randomly selected from outdoor musculoskeletal unit, CRP and then 11 patients with Knee Osteoarthritis were randomly assigned to Myofascial release with conventional physiotherapy group and 11 patients to the only conventional physiotherapy group for this randomize control trial study. ***Outcome measurement tools:*** Numerical pain rating scale (NPRS) was used to measure pain and universal goniometer to measure ROM, manual muscle testing to measure muscle strength and The Western Ontario and McMaster Universities Arthritis Index (WOMAC) scale to measure disability. ***Analysis of data:*** Inferential statistics such as Mann-Whitney U test and Wilcoxon test was done using SPSS version 22. ***Results:*** In this study, the result shows that pain and disability had reduced and ROM and muscle strength improved ($p < 0.05$) in both between group analysis in Mann Whitney U test and in within group Wilcoxon Sign ranked test results except knee extension ROM and Quadriceps muscle strength ($p > 0.05$) in between groups and among Within (Control) group. ***Conclusion:*** This experimental study showed that Myofascial Release combined with conventional physiotherapy is more effective than conventional physiotherapy alone for patients with Knee Osteoarthritis.

Key words: Knee Osteoarthritis, Myofascial Release, Conventional physiotherapy

CHAPTER-I INTRODUCTION

1.1 Background

Osteoarthritis of the knee joint is characterized by a progressive degenerative condition which usually described by the loss of articular cartilage and alteration of subchondral bone (Pereira et al., 2011). It is a chronic joint disorder affecting more than 250 million individuals globally with a significant effect on health care and society (Hunter et al., 2014). As per The Global Burden of Disease Study 2010 hip and knee of World Health Organization (WHO), OA is the eleventh prime reason of disability (Lohmander, 2013). In addition to the knee, OA mainly affects the lower back, smaller peripheral joints including the hands and ankle (Sofat et al., 2011). Statistical studies compared incidence of osteoarthritis between genders have found that women tends to have and are at higher danger for evolving severe knee and hip OA in comparison with male, especially above 55 years of age (Plotnikoff et al., 2015).

The progression of OA comprises with the whole joint which usually indicates the unpleasant tissue components functioning and therefore place an unusual stress transition that are categorized as either major (primary) or minor (secondary), depending on the reasons where primary osteoarthritis of the knee joint happens as result of articular cartilage deterioration without any specific causes or age and Secondary knee osteoarthritis is the outcome of articular cartilage degeneration due to some known or possible reasons like posttraumatic, postsurgical, congenital or malformation of the limb, malposition (Varus/Valgus), rheumatoid arthritis, gout etc (Hulshof et al., 2019; Manlapaz et al., 2019). While OA may be inherited, its growth is connected with a number of risk factors such as aging, body mass index and gender and in addition, extreme mechanical loading, extreme bodily activities and an insufficient supply of nutrients also recognized as joint degeneration contributors (Yucesoy et al., 2015). At first, osteoarthritis used to viewed as a syndrome which has been affected the articular cartilages only but later research has been shown that the condition includes the whole joint of the knee, where the stiffening of the subchondral bone, formation of osteophytes, synovial tenderness at a various grade, ligaments deterioration usually happens in the

knee as well as in the menisci and also the joint capsule becomes hypertrophied and they also affects the periarticular muscles, nerves, bursa, and local fat pads which may have a large contributions to knee osteoarthritis or the indications of knee osteoarthritis (Dieppe, 2011; Loeser et al., 2012). OA indications consist of pain, discomfort, synovial capsule irritation, joint stiffness and loss of joint function or may also progress asymptomatically when radiographic proof of the disease demonstrates the reduction of the joint space, the presence of osteophytes and the thickening of the synovial (Crema et al., 2011).

The frequency of osteoarthritis is intensifying due to the elderly population and the wide-ranging of obese individuals where the intensity of pain is the first as well as predominant symptom of osteoarthritis which is usually recurrent, irregular, naturally most awful throughout and afterwards the weight-bearing activities, morning stiffness generally greater than thirty minutes(>30 min) or stiffness after a period of inactivity, or mostly in the evening, loss of motion and decrease the functional activities for example climbing the stairs, walking and performing household tasks, depression and disturbed sleep are the chief medical criteria's that lead to management including therapeutic, pharmacological and operative methods (Bijlsma et al., 2011).

The whole management program for knee osteoarthritis is usually established after the assessment of the patient, according to the signs and symptoms of the disease state, disease phase, therapeutic and clinical history of the patient and his/her conditions of the health (Zhang et al., 2010). Suitable knee osteoarthritis management generally incorporated with biomechanical procedures, intra-articular corticosteroids, ground and water-based exercises, education as well as self-management, strengthening exercises and management of the weight (McAlindon et al., 2014). Pharmacological management approach mostly prescribed acetaminophen/ paracetamol as 1st line drugs and NSAIDs (topical or oral, 2nd line) and Intra-articular corticosteroids are usually prescribed for osteoarthritis of the hip and knee joint (Nelson et al., 2014). The primary purpose of Osteoarthritis administration, however, is not only to regulate the painful and difficult signs of these joints but also to enhance the functionality and quality of life for which non-pharmacological interventions should always be tried as the first line of management

for the osteoarthritis of the knee (Mora et al., 2018). Exercise and physiotherapy is one of the foremost talked about and disputable non pharmacologic administration methodologies for OA of the knee that focuses on aerobic/circulatory conditioning and strengthening training of lower extremities with solid proof of advantages (Esser & Bailey, 2011). As pain and physical dysfunction of knee osteoarthritis can also occurs due to myofascial pain or dysfunctions that usually characterized by the attendance of a palpable stiff band within the skeletal muscles or presents of an oversensitive area within the stiff band where the physiotherapist generally provides myofascial releases (Rahbar et al., 2013).

Myofascial release (MFR) is one of the frequently applied mechanical approaches that generally encouraged the persistent extension of tissue comparison or enhance the soft tissue extensibility with the help of compression whereas reestablishing the limited fascia or ordinary muscle length by mechanical forces of low load and lengthy duration to the limited fascia (Jung et al., 2017). Among the distinct methods that operate on the fascial tissue structures, the method of myofascial Release technique (MRF) was regarded to have pain reduction potentiality, improvement of flexibility, reduction of disability and hence improvement of function in the daily living activities (Beardsley & Škarabot, 2015; Joshi et al., 2018).

1.2 Rationale

The main purpose of this study is to investigate the effectiveness of myofascial release with conventional physiotherapy. By this project we will be able to spot the efficacy of myofascial release with conventional physiotherapy comparing with only conventional physiotherapy for the patients with knee osteoarthritis.

It has often said that osteoarthritis is the planet's oldest known degenerative disease where arthritis is the most prevalent that usually considered to be a cause of impaired mobility. Despite having treated this diseases for over a hundred years, the definition, diagnosis, pathology and most effective treatments are still greatly unclear. Some researcher found that a part of OA pain originates from the myofascial trigger points around the muscle that may pain in knee OA and disability which could be recovered by releasing the myofascial trigger points.

Myofascial release is a gentle long sustained pressure of the fascial system that enables us to deal with many issues that haven't replied to medication, exercise and traditional stretching. So there is a big chance that the outcome of this research may assist physiotherapists to provide the effective treatment in osteoarthritis. There are some studies about myofascial release that has been published in other countries of the world which helps to know about the release of myofascial broadly and its efficacy, but no research has been conducted in Bangladesh in this regard. So, I believe this research findings could be one of the best solution for medical professionals to treat the Knee OA patients in our country.

1.3 Aim

Identify the therapeutic efficacy of Myofascial release with conventional physiotherapy for knee osteoarthritis patients.

1.4 Objectives

1.4.1 General objective

To identify the efficacy of Myofascial Release in knee osteoarthritis.

1.4.2 Specific objectives

1. To explore the socio-demographic related information.
2. To find out the comparisons of pain status in experimental and control group after introducing myofascial release.
3. To determine the range of motion and muscle power in experimental and control group after providing myofascial release.
4. To estimate the status of disability in experimental and control group after applying myofascial release.

1.5 Hypothesis and Null hypothesis

Null hypothesis (H_0)

Myofascial release along with conventional physiotherapy is no more effective than only conventional physiotherapy for the treatment of knee osteoarthritis.

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

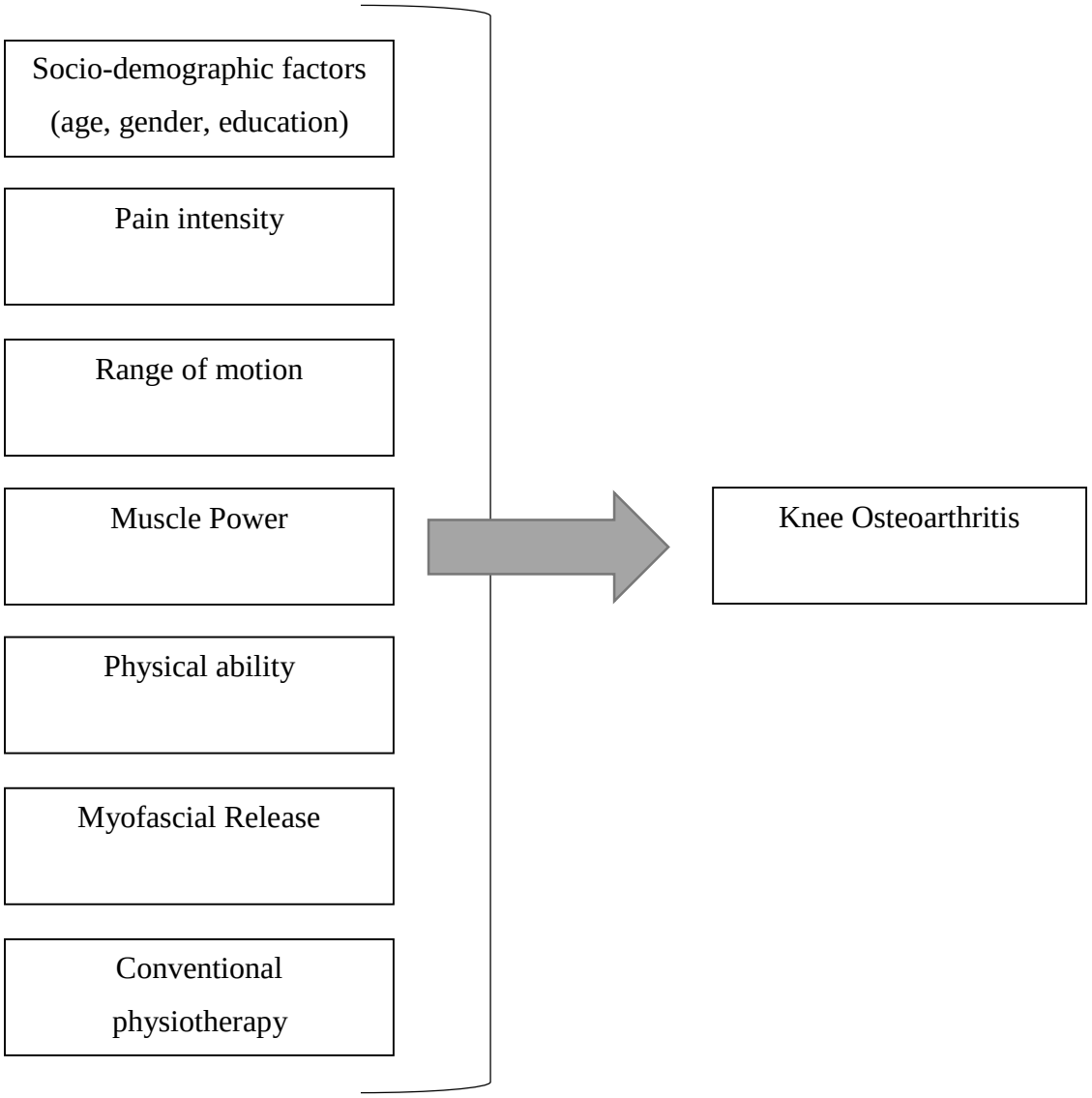
Alternative Hypothesis (H_1)

Myofascial release along with conventional physiotherapy is better than only conventional physiotherapy for the treatment of knee osteoarthritis.

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 List of variables

Independent variables **Dependent Variable**



1.7 Operational Definition

Myofascial Release

It is a secure and very efficient manual therapeutic technique involving applying gentle long sustained pressure usually in line with the fiber direction of restricted fascia of connective tissues to eradicate pain and re-establish movements.

Osteoarthritis

Osteoarthritis is the foremost prevalent type of arthritis known as the joint degenerative disease that is categorized by articular cartilage degeneration, subchondral bone sclerosis and osteophyte formation with chief medical indications, containing chronic pain, intense level of inflammation, joint instability, stiffness, and narrowing of the joint space in radiological investigations.

Conventional Physiotherapy

Physiotherapeutic interventions that are widely accepted and evidence based practice (like Stretching, Muscle strengthening, manual therapy technique, Soft tissue mobilization, Thermotherapy) which are used by graduate physiotherapist.

Pain

Pain is an unpleasant sensory or emotional experience associated with actual or potential tissue damage, or described in terms of such damage.

Disability

Disabilities is an umbrella term, covering impairments, activity limitations and participation restrictions.

CHAPTER-II LITARATURE REVIEW

Osteoarthritis is a degenerative disease that modifies the peripheral innervation with central pain processing and generates an intense amount of irritation as well as causes harm to the joint cartilage and synovium as well as to the joint capsule and bone, muscle, ligaments and tendons surrounding the joint (Loeser et al., 2012). In OA joint pain, rigidity, movement constraints, impairments in motor and sensory and functional abnormalities are most typical signs which prohibit individuals from frequent physical activity (Harish & Kashif, 2013).

Concurring to investigate Osteoarthritis (OA) is the foremost prevalent phenomenon of pain and disability of musculoskeletal system, with knee being the most acquainted zone of OA (Dor & Kalichman, 2017). It impacts 27% of females and 21% of males, with a rise in frequency from the age of 45 years for both races (Pereira et al., 2011). Global statistics demonstrate that more than 100 million individuals globally are suffering from OA, now regarded among the most prevalent causes of disability (Kaur et al., 2018). Younger individuals may also suffer from OA due to any kind of injury or trauma (Bhatia et al., 2013). In a Bangladeshi rural community, the annual incidence of knee pain was 6.5% in men and 8.4% in women, the knee being the second commonest site of new musculoskeletal pain after the spine (Haq & Davatchi, 2011). In United States, around 43 million people and in worldwide around 15% of population are suffered by OA (Neogi, 2013). Due to demographic modifications, the incidence of OA increases rapidly, resulting in an upward socio-economic and personal burden (Egloff et al., 2012).

Different risk factors at the individual level, including socio-demographic features, genetic predispositions, obesity, dietary factors and elevated bone density / mass and joint risk factors, include particular bone / joint shapes, thigh flexor muscle weakness, joint misalignments, involvement in certain work / sports events and trauma to the joint (Vina & Kwoh, 2018). In the human body, the knee joint is the biggest and most strongly loaded joint that is the altered hinge joint with the biggest range of motion that has been introduced to very heavy loads throughout sports and some employment activity, as a consequence, knee joints are complicated from different sources including the activities

of daily routine (Shim et al., 2019). The bones, ligaments, cartilage, joint capsule, muscles, tendons and menisci are uniquely connected in the knee joint, giving stability and flexibility (Heesterbeek et al., 2010). It offers stability in different kinds of loading conditions, consisting of two bony connections; the articulation between the thighbone that is known as femur and the leg bone known as tibia (femorotibial joint) that swallows most of the body weight whereas the articulation between the patella and the thighbone called femur (patellofemoral joint) creates a low friction alteration above the knee of the forces that made by the quadriceps femoris muscle constraction (Hirschmann & Müller, 2015). The knee joint comprises of three bones: The thigh bone known as Femur, Tibia (the shin bone) and patella (the knee cap) and Fibula is the smaller bone that passes alongside the tibia (Madeti & Rao, 2018).

The femur is the human body's biggest, lengthiest and the most powerful bone (Maharaj et al., 2013). The proximal portion of the femur together with the pelvis forms a joint called ball and socket and the distal portion has two condyles, the lateral and medial condyle whereas four ligaments of the knee are attached to the ' origo ' attachment site, as well as various muscle groups linked to it (Lögters et al., 2009).

The tibia, also known as the shin bone which provides the link between the knee and the ankle joint and consists of a plateau and the tibial tubercle in the proximal portion, is the second largest bone in the knee, whereas, as an insertion place, three knee ligaments are attached proximally to this bone, i.e. anterior cruciate ligament (ACL), posterior cruciate ligament (PCL) and medial collateral ligament (MCL) (Shapiro, 2019).

Fibula is the third long bone in the knee joint that runs from the knee to the ankle joint along the lateral side of the tibia whereas, another knee ligament known as the lateral collateral ligament (LCL) connects the fibula and the femur’s lateral side and another exiting bone of the knee joint is the patella known as the largest, flat and triangular sesamoid bone in the body that protects the front of the knee joint, play a primary to raise the lever arm of the Quadriceps femoris muscle complex (Madeti & Rao, 2018).

The distal portion of the femur and the tibia's proximal part are surrounded by cartilage known as the smooth joint layer that plays a major role in the lubrication of the joint and diminishes the joint contact forces known as articular cartilage (Greene, 2011).

The medial and lateral meniscus known as shock absorbers are situated between the surface of the femur's articular cartilages and the tibia that also function as the knee joint's load carriers & stabilizers (Fox et al., 2011).

The knee joint also has various type of muscles and as well as ligaments for controlling the movement and protecting it from injury (Halewood & Amis, 2015). There are four primary ligaments in the knee joint, i.e. two ligaments on both sides of the knee, called the lateral collateral ligament (LCL) and the medial collateral ligament (MCL) and two other ligaments known as the anterior cruciate ligament (ACL) and the posterior cruciate ligament (PCL), which are situated in the middle of the knee joint and crossed and have the role of stabilizing the knee in the anteroposterior and axial direction (Bronstein & Schaffer, 2017).

During flexion and extension, to give the support and move the knee, there are two chief muscle groups in lower extremity i.e. the hamstring muscles that are composed of three muscles (Semitendinosus, Semimembranosus and Biceps Femoris) that run along the back portion of the femur and attach to the tibia and fibula, helps to flex the knee and the quadriceps muscles (Battermann et al., 2010; van der Made et al., 2013). Oppositely, the quadriceps consist of four muscles (i.e. Rectus Femoris, VastusLateralis, VastusMedialis and VastusIntermedius) which occupy the front and side of the femur with the primary purpose of extending (straightening) the knee from a bent position (Abulhasan & Grey, 2017).

Anatomical progression of OA resulting in structural modification of the articular cartilage as a result of this generally occurs the narrowing of the joint space and on the contrary, the bone remodeling processes altered, underlying subchondral bone leads to sclerosis, results in the formation of osteophytes and chondrocytes in knee the osteoarthritis react to control synthetic activity or boost inflammatory cytokine production (Sharma et al., 2013). There is a link between modifications in subchondral bone and deterioration in articular cartilage, whereas with the higher level of cartilage degeneration, bone density and trabecular thickness are significantly higher (Man, G. S et al., 2014). The bone becomes more rigid during OA, which may result in less ability to absorb impact loads that generally lead to increased stress in the cartilage (Aspden & Saunders, 2019). About 1/4 of individuals with knee osteoarthritis usually have ruptures

in the anterior cruciate ligament (ACL) that act as an anterior/posterior stabilizer due to which patients may have varus alignment that may cause medial tibiofemoral osteoarthritis, and/or valgus alignment, which causes lateral osteoarthritis progression (Hasegawa et al., 2012; Sharma et al., 2012). While the pathogenic function of biomechanical dysfunction in OA is clearly checked, the complete reason for OA remains unclear but it is found in the study that for weight-bearing joints, modified loading mechanisms, abnormal mechanical forces and modified biomechanics, reduction in quadriceps muscle power are significant variables contributing to OA increase (Egloff et al., 2012; Takagi, 2014).

In 1986, according to Classification criteria of American College of Rheumatology (ACR), it is assumed that if a person has some typical signs and symptoms of Age $\geq$ 45 years, joint pain which is related to movements or activities, morning stiffness that lasts <30 minutes, crepitation during active movement, bony enlargement, absence of palpable warmth of synovium, presence of palpable synovial, there's no requirement of further investigations (Heidari, 2011). Additional characteristics that may include: deformity – especially the varus deformity in the medial compartment of the knee, instability, tenderness over joint-line or periarticular structures, pain during compression over the patellofemoral joint (Zhang et al., 2009). Though plain radiological investigations are not mandatory but sometimes, for atypical presentations it is required (Sakellariou et al., 2017).

According to research, treating pain and disability is the main focal point for the knee osteoarthritis where experts focus on various behavioral rules and specialist panels aimed at patient education and self-management policies that considered as significant elements of the administration of Knee OA (Nelson et al., 2014). Applications for conservative OA include non-pharmacological and pharmacological treatments (Bennell et al., 2009). They are implemented in early to less developed stages of the disease to alleviate pain and enhance the quality of life of OA patients. (McAlindon et al., 2014). Pharmacological managements consist of paracetamol, oral and topical anti-inflammatory drugs (NSAIDs), opioids, injections of corticosteroids, in reverse, non-pharmacological treatments comprises of physiotherapy, exercises, acupuncture, the use of a walking aid or knee

brace, valgus brace for medial compartment knee OA deformity, Self-management, education and healthy lifestyle (Conaghan, 2011). If not handled correctly, the most frequent reason for patients with knee OA is the pain which seek medical attention and rehabilitation will lead to loss of physical ability and independence (Ayanniyi et al., 2017). Several methods of physical therapy have been reported in the reviewed treatment protocols and scientific studies including ground-based exercises (strengthening and aerobic exercises) have been highly recommended by the majority of guidelines as well as hydrotherapy (aquatic exercises) and transcutaneous electrical nerve stimulation (TENS) seems to decrease pain and enhance short-term function in some cases and other patients may last longer than 4 weeks (Hochberg et al., 2012).

According to the research study, it is also discovered that a normal set of stretching exercises, pulsed electromagnetic field, ultrasound and strengthening exercises revealed important variations in intensity of pain, knee movement range, isometric quadriceps strength, and functional improvement in the knee where the amount change in moderate pain group was noteworthy than in mild and severe pain groups (Abdel-aziem et al., 2018). Myofascial release (MFR) is a widely used mechanical treatment that includes the specific implementation of mechanical forces of low load and long duration to influence the myofascial complex with the intension to rebuild optimum length, reduce the pain and enhance functional activities (Ajimsha et al., 2015).

The theory of myofascial release therapeutic impacts is based on the unique position of "fascia" connective tissue sheets that act as one of the primary factor in the functioning of the musculoskeletal system and according to this scheme, fascia components of the body are surrounded by loose collagenous and dense connective tissue and interpenetrating skeletal muscle, organs, joints, nerves and vascular beds that can act as an organ with different kinds of function and ability that contribute significantly to the body's dynamic characteristics (Bordoni et al., 2018). Tensioned or stiffened fascial tissue or its reduced sliding capacity (owing to either frequent micro-trauma or acute injuries) is regarded a source of concern leading to pain and loss of functional capability for the remaining body, whereas, manual myofascial therapies, as well as deliberately targeted fascial movement therapies, can help improve matrix remodeling, decrease pain, and

enhance functional skills (Klingler et al., 2014). There are two primary myofascial release methods: direct and indirect release while the direct release technique utilizes the knuckles, elbows or instruments of professionals and applies a few kilograms of stress directly to limited tissue obstacles for 120-300 seconds and in turn, the indirect release technique extends myofascial complex by reduced prssure and longer duration until free motion is obtained (Ajimsha et al., 2015). A Randomize control trial research was performed in patients with bilateral knee OA on the effectiveness of myofascial trigger point therapy where Sixty patients with osteoarthritis of the both knee were split equally into two groups (experimental and control) and among them 30 control group patients received 16 usual physical therapy sessions and 30 patients of the intervention group got the same physiotherapy accompanied by the foam, the stretching of tight muscles and the method of myofascial release to the muscles around the knee that includes quadriceps, hip adductors, ITB, tensor fascia lata, hamstring and calf muscles. Significant enhancement in pain has been found in the both knees in both groups ($p < 0.001$ and $p < 0.004$, consistently). However, the intervention group showed higher pain scores enhancement than controls ($p < 0.0001$ for pain in the right knee and $p < 0.01$ for pain in the left knee). Moreover, a major improvement was noted in both in disability index, range of motion as well as in joint stiffness and it has been showed significant outcomes in experimental group then the control group (Rahbar et al., 2013).

Including two observational studies evaluating the level of myofascial trigger points in OA individuals and six interventional research involving the therapy of myofascial pain in OA individuals where clinical studies indicated main evidence that during knee OA, MTrPs may play a significant role in pain and impairment. The occasional linkages could not be created due to the cross-sectional design of these research. In order to confirm this evidence, yet more studies are needed to explain whether MTrPs are accountable for OA or that OA is accountable for the creation of MTrPs. Different types of myofascial therapy methods have been included in each interventional research focusing on MTrPs that have the effectiveness to decrease pain and enhance function in OA patients (Dor & Kalichman, 2017). A study undertaken with a medium quality method (5/10PEDro) and 2b level in CBEM on the impacts of MFR and stretching method on movement range (ROM) and response time (RT). There were 40 Fit individuals who were allocated randomly to 4

groups: quadriceps and hamstrings MFR; quadriceps stretch; and controls. The two MFR groups were noticeably increased in active ROM and the stretch group and passive ROM in the quadriceps and stretching groups were significantly increased by MFR. In the quadriceps and hamstrings groups, pre-motor time was significantly minimized by MFR. After the interventions in the quadriceps and hamstrings groups, RT was considerably smaller compared to control groups (Kuruma et al., 2013).

In a systematic review, literature characteristics concerning the efficacy of MFR as a therapy for orthopedic circumstances were discovered to be mixed in both quality and outcomes, varying from high-quality experimental to case studies of lower quality. Overall, the studies had positive results with MFR where some of the case studies indicated that MFR could be effective for a variety of conditions but few conclusions could be drawn as a result of low quality. The studies contained in this review may provide a useful basis for future randomized controlled trials (McKenney et al., 2013).

In a parallel group randomized controlled trial study, 36 Knee osteoarthritis patients aged between 50 and 59 years were randomly divided into two groups: group A (control): 17 patients treated by the exercise program, group B (experimental): 19 patients treated by the exercise program in relation to the MFR method of the iliotibial band comprising four weeks of operation in which two methods known as the ischemic compression (IC) technique and neuromuscular technique (longitudinal strokes) were combined and the both groups showed a noteworthy improvement (P-value <0.05) in all calculated procedures to the favor of experimental group (B) which explained that in patients with KOA, the proposed exercise program alone or in combination with ITB, MFR technique has a remarkable effect which improves functional disability (Gomaa & Zaky, 2015).

One study evaluated that in acute case, SMFR appears to boost flexibility and decrease muscle soreness, but does not interfere with athletic performance. It may lead to enhanced cardiovascular function, enhanced endothelial vascular function and enhanced acute parasympathetic nervous system activity, which may be helpful in regeneration, and there's some proof that extended-term SMFR may result in greater mobility, while not all chronic trials verify these outcomes (Beardsley & Škarabot, 2015).

In another research, 22 participants who met the requirements for choice were researched. The male participants were averaging 22.93 years of age, 174.64 cm of height and 70.57

kg of body weight. The female participants averaged 21.13 years of age, 162.63 cm of height, and 53.00 kg of body weight. The SRT demonstrates important enhancement ($p<0.05$) when the self-MFR method was introduced to the sub-occipital, hamstring and plantar areas. There were also important increases in bilateral hip joint AROM and PROM ($p<0.05$). When self-MFR was applied to the hamstring ($F=3.511$, $p<0.05$), the pain stress threshold have shown important changes in the semimembranosus. Indirect anatomy-based implementation might be efficient for those who have to enhance muscle flexibility (Jung et al., 2017).

CHAPTER-III METHODOLOGY

This research was a quantitative evaluation of Randomize Control Trail (RCT) design to evaluate the comparison between the exercises programs of conventional physiotherapy with conventional physiotherapy combined with Myofascial Release for patients with knee osteoarthritis. To identify the efficacy of this treatment approach Numeric Pain Rating Scale (NPRS), The Western Ontario and McMaster Osteoarthritis Index (WOMAC) was used as measurement tool for measuring the pain intensity and functional disability caused by Osteoarthritis, Manual muscle testing scale (MMT) and Goniometer was also used as measurement tools for measuring the estimate muscle power and range of motion.

3.1 Study design

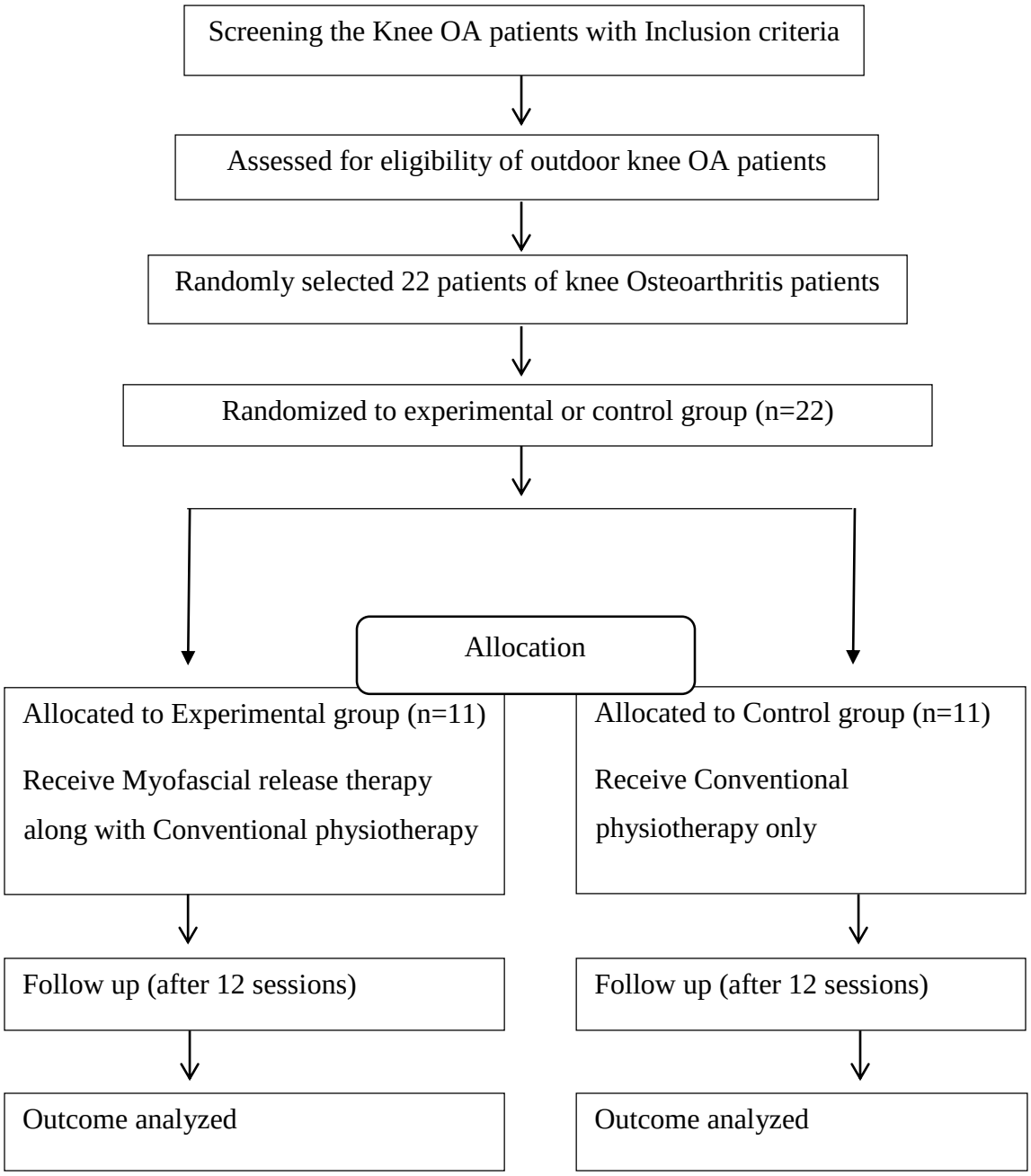
The study was conducted by using Randomized Control Trail (RCT) with two different subject groups. It was a single blinded study. From the outdoor patients with knee OA of musculoskeletal unit, 22 patients were randomly selected and then 11 patients were randomly assigned to experimental group and 11 patients to the control group for this RCT 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, range of motion and muscle power of the patients with knee OA before and after the treatment.

The design could be shown by a flow chart which is given below:

r o x o (experimental group)

r o o (control group)

CONSORT Flowchart of the phases of randomized controlled trial



Consolidated Standards of Reporting Trials for a randomized controlled trial of a treatment program including conventional physiotherapy with Myofascial release for patients with knee Osteoarthritis.

3.2 Study area

The study area was outpatient musculoskeletal physiotherapy unit of Centre for the Rehabilitation of the Paralysed (CRP), Savar, Dhaka-1343. As these patients come to CRP for extensive rehabilitation from all over Bangladesh, therefore it represents the whole population.

3.3 Study Population

The populations of this study were the knee osteoarthritis patients.

3.4 Sample Size

Sample size for this thesis was 22. Among them 11 participants were in trial group and 11 participants in control group.

3.5 Sampling Technique

The Subjects who meet the inclusion criteria were taken as sample by using the simple random sampling technique. 22 patients with knee Osteoarthritis were selected from musculoskeletal unit of physiotherapy department of CRP, Savar. Then they were randomly assigned into two different groups; experimental Group: MFR & Conventional physiotherapy (n=11) and Control Group: Conventional physiotherapy only (n=11). The study was a single blinded clinical trial.

3.6 Inclusion criteria

1. Patients who met the clinical criteria for diagnosis of KOA according to American College of Rheumatology (Gomaa & Zaky, 2015; 2016).
2. Patients with knee osteoarthritis who have myofascial trigger points in lower extremities (Rahbar et al., 2013).
3. Age range between 40-70 years (Rahbar et al., 2013).
4. Both male & female patients are included.
5. Subjects who are willing to participate with bilateral knee pain (Rahbar et al., 2013).

3.7 Exclusion Criteria

1. Patients with Clinical conditions that may have deteriorated with myofascial release such as skin disease, dermatitis, eczema (Rahbar et al., 2013).
2. Any history of rheumatic diseases such as rheumatoid arthritis or systemic lupus erythematous, recent operation or fracture of lower extremities or pathological conditions such as malignancy, heart disease etc (Gomaa & Zaky, 2015; 2016).
3. Severe disability such as walking disability with or without crutches, contraindications for physical modalities (Gomaa & Zaky, 2015; 2016).
4. Subjects with neurological impairments (Gomaa & Zaky, 2015; 2016).
5. Patients who were mentally unstable (Rahbar et al., 2013).
6. Patient who had previous history of taking intra-articular corticosteroids injection in the last 6 months (Rahbar et al., 2013).

3.8 Randomization

22 patients with knee OA who met the inclusion criteria were randomly chosen from outdoor musculoskeletal physiotherapy unit of CRP, Savar and then they were assigned by simple randomization process. The study was a single blinded where the subjects were blinded and among the 22 knee OA patients, 11 patients with knee OA was randomly allocated to myofascial release with conventional physiotherapy group and 11 patients to the only conventional physiotherapy group by computer generated random number using Microsoft Office Excel 2013 which improves internal validity of experimental research for this randomized control trial study. The samples were given numerical number C_1, C_2, C_3 etc. for the control group and E_1, E_2, E_3 etc. for experimental group.

3.9 Method of data collection

The investigator was gathered information by using various kinds of information collection instruments or tools to perform this research.

3.9.1 Intervention

A standard intervention program was carried out for both groups as conventional physiotherapy that consists of Stretching, Muscle strengthening such as static quad sets in knee extension, Manual therapy technique (Mobilization grades, Soft tissue mobilization), Thermotherapy involving ice massage which are the most frequently used intervention for knee osteoarthritis patients (Appendix- E). In addition, for the experimental group, myofascial release was applied to the knee OA patient by the clinical physiotherapist along with the conventional physiotherapy to conduct this research by the researcher for associated myofascial pain and dysfunction (Appendix-F). Both group received 12 sessions of intervention by the trained clinical physiotherapists of CRP, musculoskeletal unit. There is no exact evidence of repetition of myofascial release, but some research showed that 10-12 sessions of intervention is enough to heal the myofascial pain and dysfunction for knee OA patients.

Table 01: Control group treatment protocol

Treatment Options	**Duration/Repetitions**
Sustain Manual Stretching	15-35 sec hold with 3-5 repetitions
Static quad sets in Knee extension	10 sec contraction with 10 repetitions
Maitland mobilization	Grade I, II, III for 10 repetitions
Soft tissue mobilization	1-3 bouts for 30sec per area
Cryotherapy	5-10 minutes for 5days per week

Table 02: Experimental group treatment protocol

Treatment options	**Duration/ Repetitions**
Vastus medialis release	5 minutes per session with 3-4days per week for 12 sessions
Vastus lateralis release	5 minutes per session with 3-4days per week for 12 sessions
Iliotibial band release	5 minutes per session with 3-4days per week for 12 sessions
Gastrocnemius release	5 minutes per session with 3-4days per week for 12 sessions

3.9.2 Data collection tools

1. Record or Data collection form
2. Informed Consent
3. Structured questionnaire
4. Goniometer
5. Papers
6. Pen

3.9.3 Measurement tools

Depending on the criteria for the data to be measured, different tools were used to perform this research and under the continual guidance and permission of the supervisor, the questionnaires for this research were carefully developed.

3.9.4 Numeric Pain Rating Scale (NPRS)

The NPRS is a segmented numerical version of the Visual Analog Scale (VAS) where a participant are asked to circle the number between 0 and 10 that best reflects his / her pain intensity (Haefeli & Elfering, 2005).

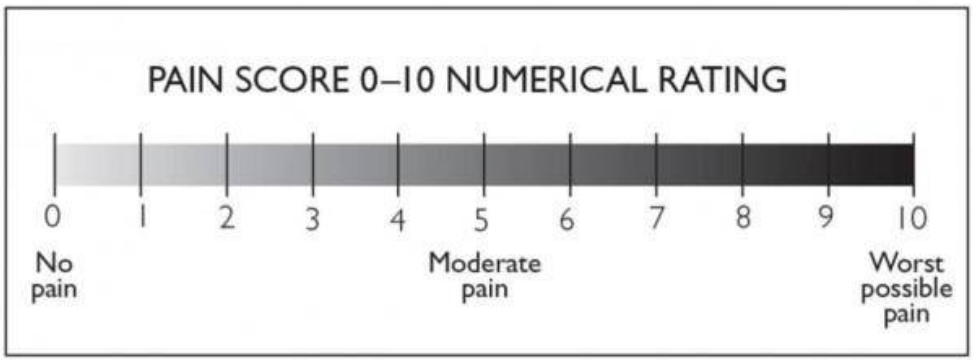


Figure 1: Numeric Pain Rating Scale (NPRS)

3.9.5 The Western Ontario and McMaster Universities Arthritis Index (WOMAC)

The Western Ontario and McMaster Universities Arthritis Index (WOMAC) is a set of standardized questionnaires consisting of 24 items (5 items asking pain at activity or rest, the stiffness dimension includes 2 questions and the function dimension explores the degree of difficulty in 17 activities) divided into 3 subscales is widely used to evaluate the pain, stiffness, and physical functioning of the Hip and Knee joint osteoarthritis where the patients were questioned on their pain, stiffness, dysfunction (disability) in following descriptions for all items: none, mild, moderate, severe and extreme and these correspond to an ordinal scale of 0-4 (Salaffi et al., 2003).

3.9.6 Goniometer

In this study Goniometer was used to evaluate range of motion of the knee flexion and extension.

3.9.7 Manual muscle testing (MMT) Scale

MMT is the most commonly used method for documenting impairments in muscle strength where the grading system based on the performance of the muscle in relation to the amount of manual resistance which is applied by the qualified physiotherapist (Cuthbert & Goodheart, 2007). The scoring system of this test are ranked from no contraction to Normal using 0-5 points where uses plus and minus designations (0=no visible/palpable muscle contraction, 1=Visible or palpable contraction, minus 2=Partial ROM, gravity eliminated, 2=Full ROM, gravity eliminated, plus 2= Gravity eliminated /slight resistance or <1/2 range against gravity, minus3 means >1/2 but <Full ROM, against gravity, 3=Full ROM against gravity, plus 3=Full range of motion against gravity with slight resistance, minus 4=Full ROM against gravity with mild resistance, Plus 4=Full ROM against gravity, almost full resistance and 5=Normal, maximal resistance) to grade the muscle strength more precisely (Bohannon, 2019).

3.9.8 Ethical Issues

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.

3.10 Data collection procedure

The procedure were performed by the assessor through structured questionnaires, face to face interview with close ended question. The patient were evaluated by the qualified physiotherapist after screening the patient at the musculoskeletal unit. 12 treatment sessions were given for each subject. For socio-demographic indices, the investigator himself created a structured closed-ended questionnaire to find out the real data from every aspect of the participant. According to the inclusion criteria 22 patients were selected, divided into two groups and were coded C1, C2, C3, C4, C5 etc. for control group and E1, E2, E3, E4, E5 etc. for experimental group. Data were collected through a pre-test, intervention and post-test and the information were obtained using a written questionnaire format that the investigator formatted. Pre- test has done before the beginning of the treatment session and the intensity of pain, disability level, range of motion and the muscle power of the each subject had noted in the questionnaire form and after the end of the 12 sessions of treatment the same procedure were performed. The researcher used both English and Bengal questionnaires for easy understanding of the participants and in order to reduce the biasness, collected the data of the both experimental and control group in front of the qualified physiotherapist.

3.11 Data Analysis

Using the software called the Statistical Package for Social Science (SPSS) version 22, data analysis had performed as a consequence of an experiment in this study. Mann Whitney u test and Wilcoxon Sign ranked test were used for data analysis where a significance level of 0.05 was set for all data analysis.

3.11.1 Statistical Test

A statistical test were performed for the significant of the study. Statistical analysis refers to the well-defined organization and interpretations of the data by systemic and mathematical procedure and rules (DePoy & Gitlin, 2015). For between groups comparison Mann Whitney "U" test was used to analyze the pain, disability, range of motion and muscle strength after 12 sessions of treatment of both control and trial groups and for within groups comparison of the pain, disability, range of motion and muscle strength, were analyzed by Wilcoxon signed rank test.

Mann-Whitney U test:

It is a non-parametric test that is simply compares the result obtained from the each group to see if they differ significantly. This test can only be used with ordinal or interval/ ratio data.

The formula of Mann-Whitney U-test:

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

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

T_x= The larger rank total

Wilcoxon sign-ranked test:

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

Where,

n = number of pairs where difference is not 0

Ws = Smallest of absolute values of the sum

3.11.2 Level of Significant

The "p" value was calculated to determine the significance of the result. The researcher has used 5% level of significant to test the hypothesis. The p values refer 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. In this way researcher had calculated nonparametric *U* value and significant level for post-test pain, range of motion, muscle power and disability, between group and presented in the following tables.

Table 03: Characteristics and level of significance before and after intervention among different variables between experimental and Control Group

No.	variables		Observed u value	Observed p value	Significant/ Not significant
01	**Variables of pain**		2.0	0.00	Significant
02	**Variables of Disability**		1.5	0.00	Significant
03	**Variables of ROM**	**Knee Flexion**	25.5	0.02	Significant
		Knee Extension	32	0.06	Not significant
04	**Variables of Muscle Power**	**Quadriceps**	36	0.11	Not Significant
		Hamstring	29.5	0.00	Significant

Table 04: Characteristics and level of significance before and after intervention among different variables among experimental group (Within groups)

No.	variables		Observed Z value	Observed p value	Significant/ Not significant
01	**Variables of pain**		-2.93	0.00	Significant
02	**Variables of Disability**		-2.93	0.00	Significant
03	**Variables of ROM**	**Knee Flexion**	-2.80	0.00	Significant
		Knee Extension	-2.80	0.00	significant
04	**Variables of Muscle Power**	**Quadriceps**	-2.85	0.00	Significant
		Hamstring	-3.00	0.00	Significant

Table 05: Characteristics and level of significance before and after intervention among different variables among control group (Within groups)

No.	variables		Observed Z value	Observed p value	Significant/ Not significant
01	**Variables of pain**		-2.96	0.03	Significant
02	**Variables of Disability**		-2.93	0.00	Significant
03	**Variables of ROM**	**Knee Flexion**	-2.82	0.00	Significant
		Knee Extension	-1.63	0.10	Not significant
04	**Variables of Muscle Power**	**Quadriceps**	-1.34	0.18	Not Significant
		Hamstring	-1.89	0.05	Significant

CHAPTER-IV RESULTS

In this study the results which were found have been shown in different bar diagrams, pie charts and tables.

4.1 Socio-Demographic Related Information

Table 06: Demographic variable of Experimental (n: 11) and control group (n: 11)

Variables	Experimental	Control
	n=11	n=11
Age, Mean (SD), years	59.55±10.434 years	50.73±10.021 years
Gender	7 male (64%), 4 Female (36%)	6 male (54%), 5 Female (46%)
Education	4 (37%) Primary, 2 (18%) secondary, 1 (9%) Higher secondary, 3 (27%) Masters, 1 (9%) Illiterate	4 (37%) primary, 3 (27%) secondary, 2 (18%) Masters, 2 (18%) Illiterate

4.1.1 Age of the participants

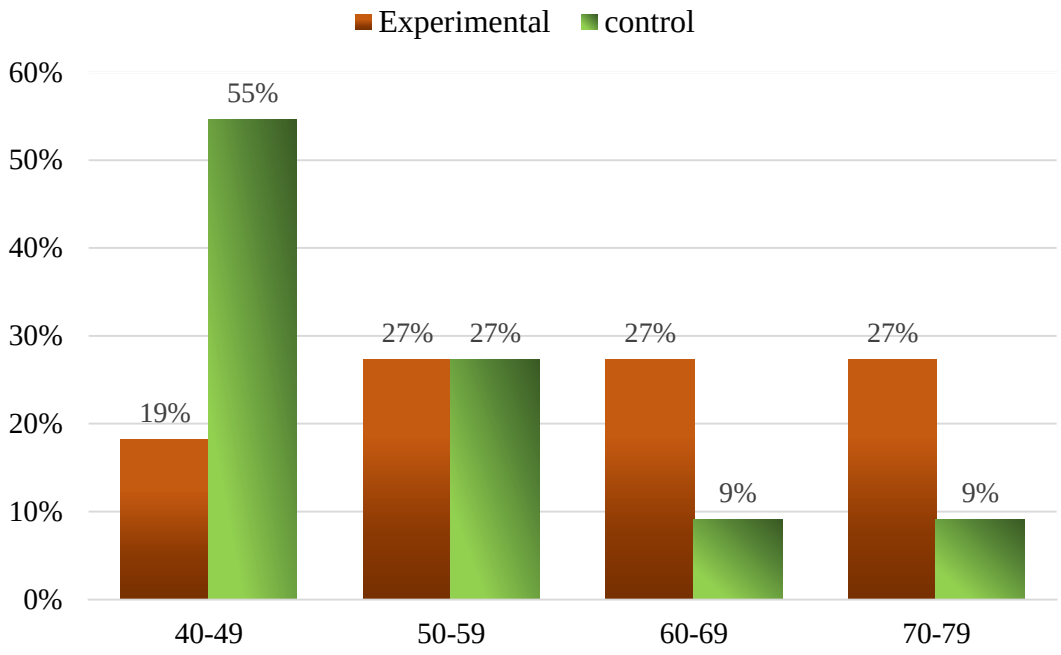


Figure 2: Age of the participants

Among total twenty two (n=22) participants, experimental group (n=11) age range was between '43-70' years, where 27% (n=3) was in '50-59' years followed by '60-69' years as well as in '70-79'years and 19% (n=2) were in '40-49' years and the control group (n=11) age range was '40-70' years, where the majority of the participants 55% (n=6) was in '40-49' years of age followed by 27% (n=3) was in '50-59' years, 9% (n=1) was in '60-69' years and '70-79' years of age range group. Moreover, the mean age range of experimental group was 59.55±10.434 years and the mean age range of control group was 50.73±10.021 years.

4.1.2 Gender ratio of the participants

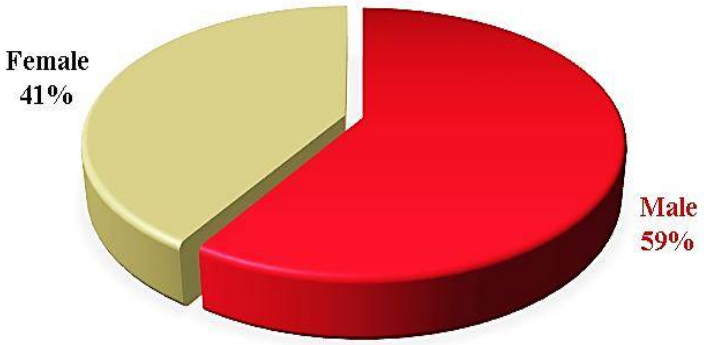


Figure 3: Gender ratio of the participants

Among the 22 participants of knee OA, 13 participants were male (59%) and 9 participants were female (40%).

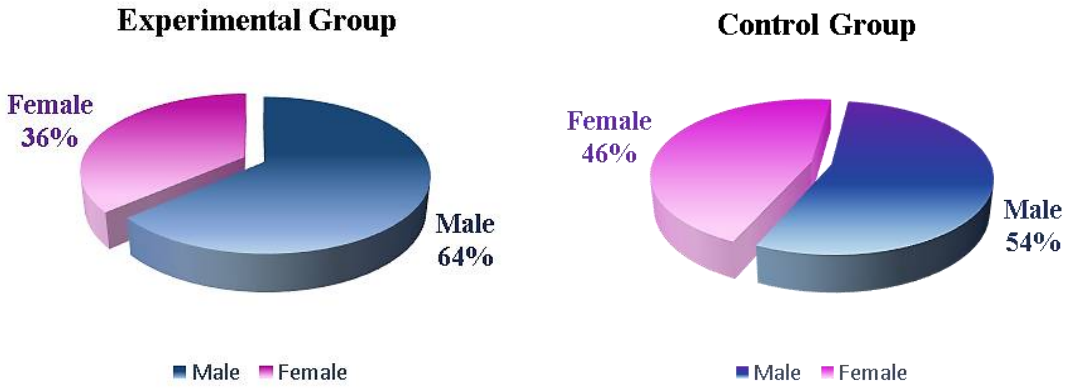


Figure 4: Gender ratio of the participants in experimental and control group

On the other hand, in experimental group 64% (n=7) was male and 36% (n=4) was female and in control group among 11 participants 54% (n=6) was male and 46% (n=5) was female.

4.1.3 Educational Status

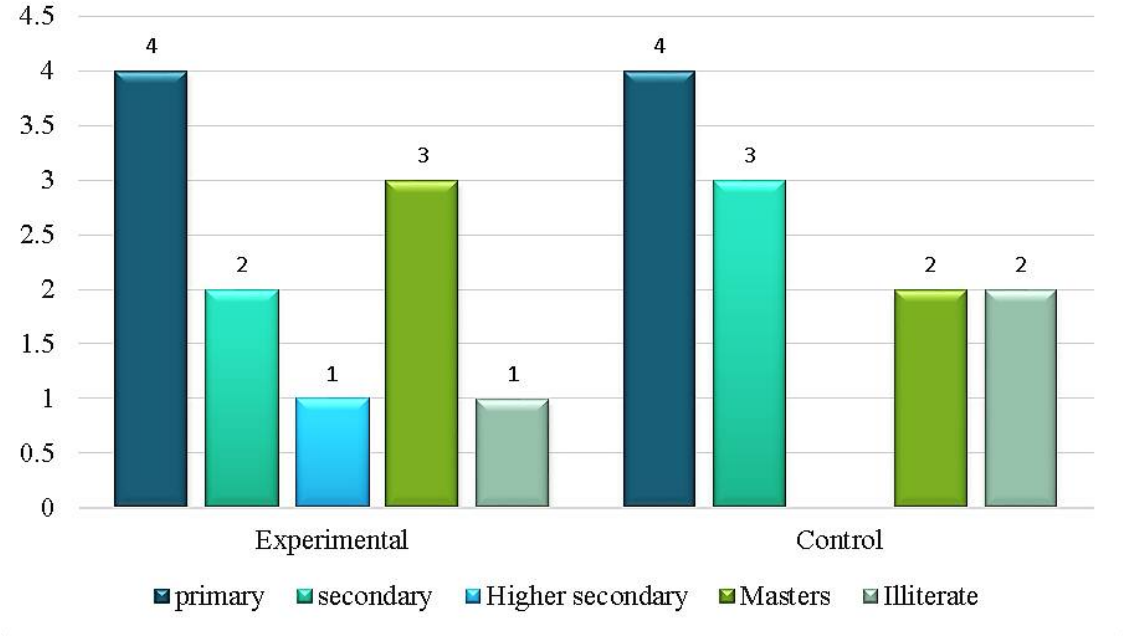


Figure 5: Educational status among Experimental and Control Group

In this study, Among 11 participants in the experimental group 37% (n=4) was completed Primary school, 18% (n=2) was finished secondary school, 9% (n=1) was completed higher secondary, 27% (n=3) was accomplished masters and 9% (n=1) was Illiterate and in control group, 37% (n=4) was finished primary school, 27% (n=3) was completed secondary school, 18% (n=2) was accomplished Masters and 18% (n=2) was Illiterate.

4.2 Pain Status

4.2.1 Comparison of pain in general

Table 07: Comparison of changes of pain on Numeric pain rating scale (NPRS) between experimental and control group

Experimental				Control			
Subject	Pretest	Posttest	Differences	Subject	Pretest	Posttest	Differences
E1	7	2	5	**C1**	6	4	2
E2	5	1	4	**C2**	5	2	3
E3	8	2	6	**C3**	6	4	2
E4	8	2	6	**C4**	6	3	3
E5	7	1	6	**C5**	7	4	3
E6	5	1	4	**C6**	7	3	4
E7	7	1	6	**C7**	7	3	4
E8	7	2	5	**C8**	6	4	2
E9	7	1	6	**C9**	8	4	4
E10	8	1	7	**C10**	5	3	2
E11	7	1	6	**C11**	9	4	5
Mean	6.90	1.36	5.55	**Mean**	6.55	3.45	3.09

Table 07 demonstrated that Mean pre-test score on numeric rating scale was 6.90 and posttest was 1.36 cm with a mean difference of 5.55 in experimental group. In contrast, the mean pretest pain score in the control group was 6.55 and posttest was 3.45 with a mean difference of 3.09. So, it is clear that pain on numeric rating scale had reduced in both groups. In this part, data analysis was done using Mann Whitney U test in between group. Conversely, Wilcoxon signed- rank test was done in within group analysis.

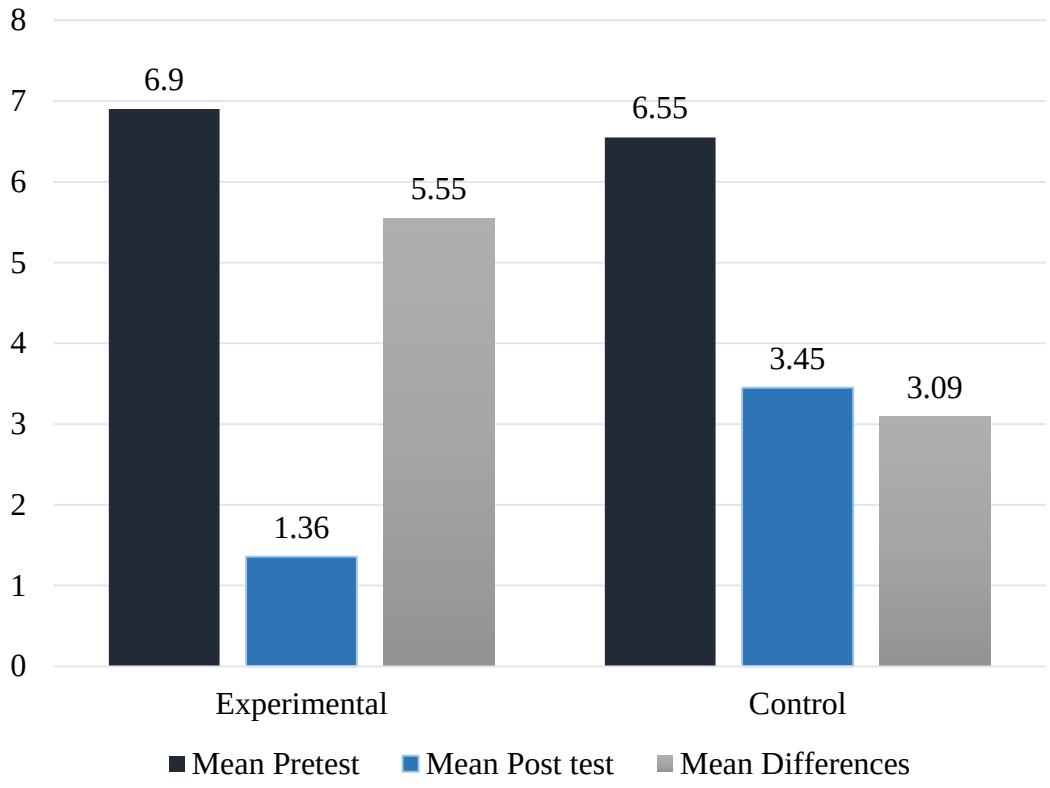


Figure 10: Comparison of changes of pain between experimental and control group

4.2.2 Calculation of U value of pain intensity (Between groups)

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

Table 08: Analysis of post-test pain (Between groups)

Numeric pain Rating Scale	Group	Number of the participants	Mean rank	Mann Whitney U score	P value
	Control	11	16.82	2.00	0.00
	Experimental	11	6.18		
	Total	22			

Table 08 showed that the observed value of U is 2.00 for pain in the between group and standard table value in U test was 30 for 0.05 in two tailed hypothesis which is larger than observed U value. So, it can be concluded that pain reduction score on the Numerical Pain Rating Scale (NPRS) in experimental group was statistically significantly higher than the control group (U = 2.00, p = 0.00). Null hypothesis was rejected and alternative hypothesis was accepted at 5% level of significant. That means that difference between trial group treatment (myofascial release along with usual care) and control group treatment (usual care only) was significant and trial group improvement was more than control group.

4.2.3 Calculation of Z value of Pre-test and post-test pain (Within groups)

Table 09: Calculation of Z value of Pre-test and post-test pain (within groups)

Experimental				**Control**			
Post pain intensity – Pre pain intensity				**Post pain intensity – Pre pain intensity**			
	N	**Test Statistics (Wilcoxon Signed-Rank Test)**			**N**	**Test Statistics (Wilcoxon Signed-Rank Test)**	
		Based on positive ranks Z	**P**			**Based on positive ranks Z**	**P**
Positive rank	0	-2.98	0.00	**Positive rank**	0	-2.96	0.00
Negative rank	11			**Negative rank**	11		
Ties	0			**Ties**	0		
Total	11			**Total**	11		

Table 09 showed that participants have decreased pain in both groups, after application of usual intervention in the control group and after applying myofascial release combined with usual care in the experimental group. In addition, 11 participants had current pain before application of usual care compare with after usual care in control group and as well as in experimental group, before application of myofascial release combined with

usual care. In addition, no participants had equal amount of pain before and after treatment in both group.

However, examining the final test statistics portion of table by Wilcoxon signed-rank test it was discovered that the experimental group for four weeks, four to thrice weekly myofascial release combined with usual treatment course showed a statistically significant change in current pain among individuals with knee OA ($Z= -2.98$, $p= 0.00$) and the control group with usual care also showed a statistically significant change in current pain ($Z= -2.96$, $p= 0.00$).

4.3 Range of motion status

4.3.1 Comparison of Range of motion in general

Table 10: Comparison of changes of Range of motion on goniometer during active knee flexion between experimental and control group

Experimental				**Control**			
Subject	Pretest	Posttest	Differences	Subject	Pretest	Posttest	Differences
E1	3	1	2	**C1**	2	1	1
E2	0	0	0	**C2**	2	0	2
E3	2	0	2	**C3**	3	1	2
E4	2	0	2	**C4**	2	1	1
E5	2	0	2	**C5**	0	1	1
E6	2	0	2	**C6**	2	2	0
E7	2	0	2	**C7**	0	1	1
E8	2	1	1	**C8**	2	0	2
E9	1	0	1	**C9**	3	1	2
E10	1	0	1	**C10**	0	0	0
E11	1	0	1	**C11**	2	2	0
Mean	1.64	0.18	1.45	**Mean**	1.64	0.90	1.09

Table 10 demonstrated that Mean pre-test score of range of motion score on goniometer was 1.64 and posttest was 0.18 with a mean difference of 1.45 in experimental group. In contrast, the mean pretest ROM score in the control group was 1.64 and posttest was 0.90 with a mean difference of 1.09. So, it is clear that after treatment, range of motion of knee flexion on goniometer had improved in both groups. In this part, data analysis was done using Mann Whitney U test in between group. Conversely, Wilcoxon signed- rank test was done in within group analysis.

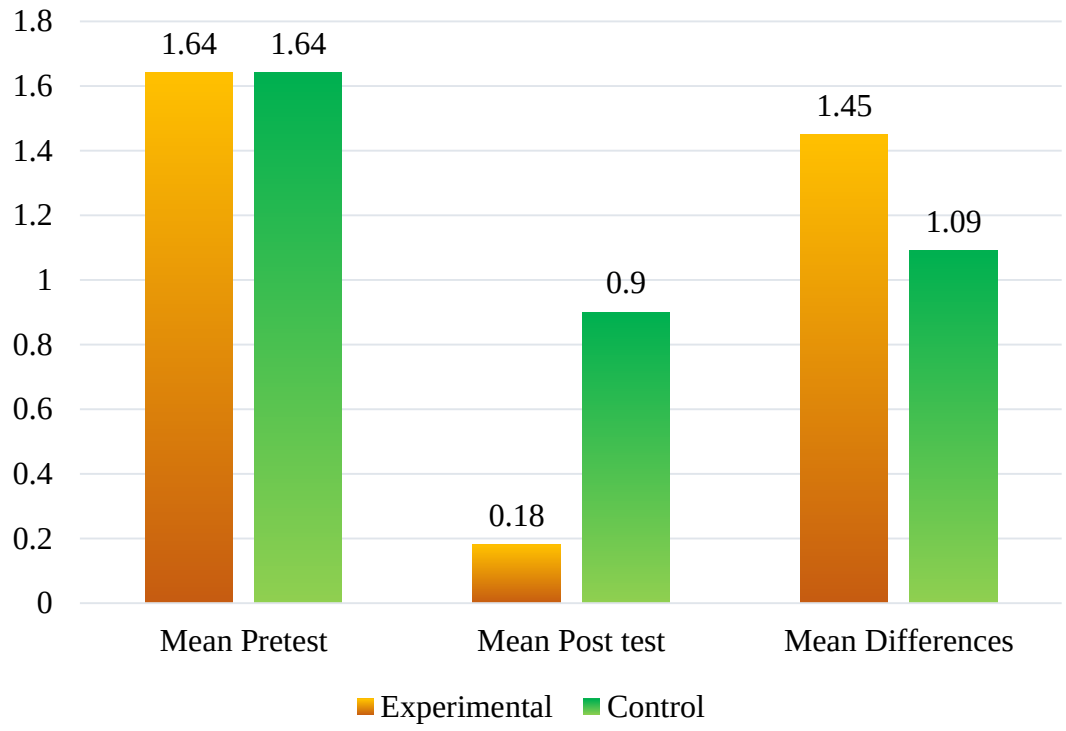


Figure 7: Comparison of changes of Range of motion during active knee flexion between experimental and control group.

Table 11: Comparison of changes of Range of motion on goniometer during active knee extension between experimental and control group

Experimental				Control			
Subject	Pretest	Posttest	Differences	Subject	Pretest	Posttest	Differences
E1	2	1	1	**C1**	1	1	0
E2	0	0	0	**C2**	0	0	0
E3	2	0	2	**C3**	0	0	0
E4	2	0	2	**C4**	1	1	0
E5	2	0	2	**C5**	2	1	1
E6	2	0	2	**C6**	3	1	2
E7	1	0	1	**C7**	2	1	1
E8	2	1	1	**C8**	0	0	0
E9	1	0	1	**C9**	1	1	0
E10	1	0	1	**C10**	0	0	0
E11	1	0	1	**C11**	2	2	0
Mean	1.45	0.18	1.27	**Mean**	1.09	0.73	0.36

Table 11 demonstrated that Mean pre-test score of range of motion score on goniometer was 1.45 and posttest was 0.18 with a mean difference of 1.27 in experimental group. In contrast, the mean pretest ROM score in the control group was 1.09 and posttest was 0.73

with a mean difference of 0.36. So, it is clear that after treatment, range of motion of knee extension on goniometer had improved in both groups. In this part, data analysis was done using Mann Whitney U test in between group. Conversely, Wilcoxon signed- rank test was done in within group analysis.

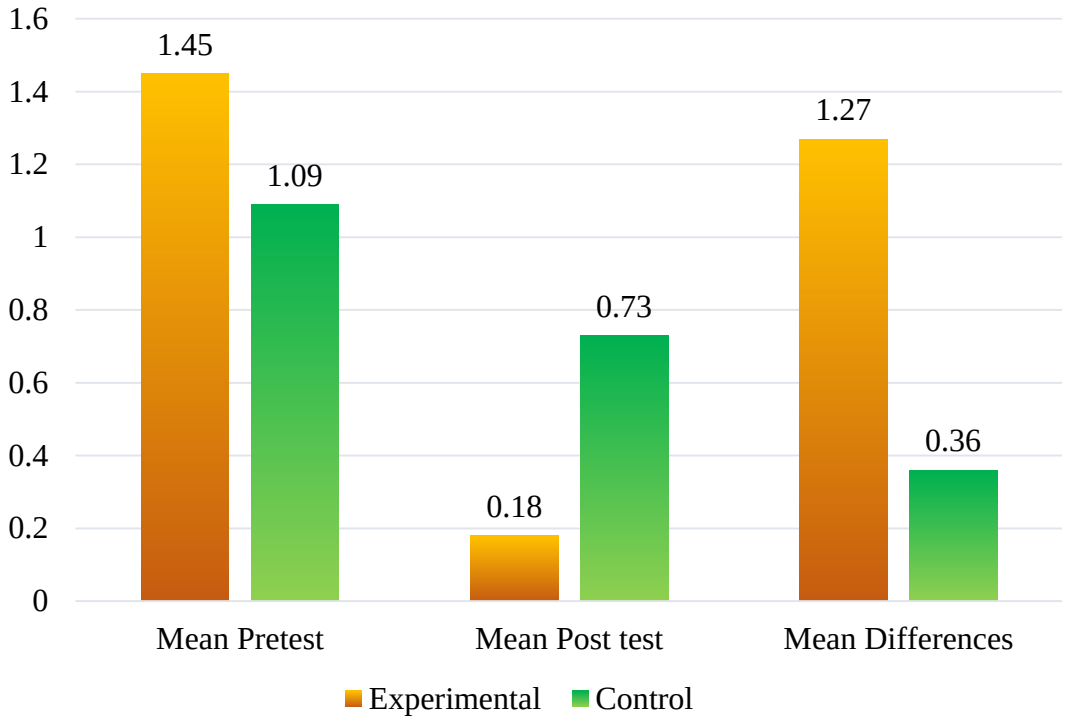


Figure 8: Comparison of changes of Range of motion on goniometer during active knee extension between experimental and control group

4.3.2 Calculation of U value of Range of motion (Between groups)

Mann Whitney U test analysis of post- test range of motion condition among the participants (Between Group Analysis).

Table 12: Analysis of post -test range of motion of knee active flexion (Between groups)

Range of motion (knee active flexion)	Group	Number of the participants	Mean rank	Mann Whitney U score	P value
	Control	11	14.68	25.5	0.02
	Experimental	11	8.32		
	Total	22			

Table 12 showed that the observed value of U is 25.5 for range of motion of knee flexion in between group and standard table value in U test was 30 for 0.05 in two tailed hypothesis which is larger than observed U value. From Comparison of range of motion data, it can be concluded that range of motion score on goniometer in experimental group was statistically significantly higher than the control group ($U = 25.5$, $p = 0.02$). So, null hypothesis was rejected and alternative hypothesis was accepted at 5% level of significant. That means that difference between trial group treatment (myofascial release along with usual care) and control group treatment (usual care only) was significant and trial group improvement was more than control group.

Mann Whitney U test analysis of post- test range of motion condition among the participants (Between Group Analysis).

Table 13: Analysis of post -test range of motion during knee active extension (Between groups)

Range of motion (knee active extension)	Group	Number of the participants	Mean rank	Mann Whitney U score	P value
	Control	11	14.09	32	0.06
	Experimental	11	8.91		
	Total	22			

Table 13 showed that the observed value of U is 32 for range of motion of knee extension in between group and standard table value in U test was 30 for 0.05 in two tailed hypothesis which is smaller than observed U value. So, it can be concluded that range of motion score on goniometer in experimental group was not statistically significantly higher than the control group ($U = 32$, $p = 0.06$). So, Null hypothesis was accepted and alternative hypothesis was rejected at 5% level of significant. That means the difference between trial group treatment (myofascial release along with usual care) and control group treatment (usual care only) didn't show any significant change.

4.3.3 Calculation of Z value of Pre-test and post-test Range of motion (Within groups)

Table 14: Calculation of Z value of Pre-test and post-test Range of motion (Within groups) during knee active flexion

Experimental				**Control**			
Post knee flexion ROM(active) – Pre knee flexion ROM(active)				**Post knee flexion ROM(active) – Pre knee flexion ROM(active)**			
	N	**Test Statistics (Wilcoxon Signed-Rank Test)**			**N**	**Test Statistics (Wilcoxon Signed-Rank Test)**	
		Based on positive ranks Z	**P**			**Based on positive ranks Z**	**P**
Positive rank	0	-2.88	0.00	**Positive rank**	0	-2.82	0.00
Negative rank	10			**Negative rank**	8		
Ties	1			**Ties**	3		
Total	11			**Total**	11		

Table 14 showed that participants have increased range of motion in both groups, after application of usual intervention in the control group and after applying myofascial release combined with usual care in the experimental group. In addition, 8 participants

had increased ROM before application of usual care compare with after usual care in control group and as well as 10 participants had increased ROM in experimental group, before application of myofascial release combined with usual care. Besides, 1 participants from experimental group and 3 from control group had equal amount of range of motion before and after treatment.

However, examining the final test statistics portion of table by Wilcoxon signed-rank test it was discovered that the experimental group for four weeks, four to thrice weekly myofascial release combined with usual treatment course showed a statistically significant change in range of motion during knee flexion among individuals with knee OA ($Z= -2.88$, $p= 0.00$) and the control group with usual care also showed a statistically significant change in range of motion ($Z= -2.82$, $p=0.00$).

Table 15: Calculation of Z value of Pre-test and post-test Range of motion (Within groups) during knee active extension

Experimental				Control			
Post knee extension ROM(active) – Pre knee extension ROM(active)				Post knee extension ROM(active) – Pre knee extension ROM(active)			
	N	Test Statistics (Wilcoxon Signed-Rank Test)			N	Test Statistics (Wilcoxon Signed-Rank Test)	
		Based on positive ranks Z	P			Based on positive ranks Z	P
Positive rank	0	-2.88	0.00	Positive rank	0	-1.63	0.10
Negative rank	10			Negative rank	3		
Ties	1			Ties	8		
Total	11			Total	11		

Table 15 showed that participants have increased range of motion in both groups, after application of usual intervention in the control group and after applying myofascial release combined with usual care in the experimental group. In addition, 3 participants had increased ROM before application of usual care compare with after usual care in control group and as well as 10 participants had increased ROM in experimental group,

before application of myofascial release combined with usual care. Besides, 1 participant from experimental group and 8 from control group had equal amount of range of motion before and after treatment.

However, examining the final test statistics portion of table by Wilcoxon signed-rank test it was discovered that the experimental group for four weeks, four to thrice weekly myofascial release combined with usual treatment course showed a statistically significant change in range of motion during knee extension among individuals with knee OA ($Z= -2.88$, $p= 0.00$) but the control group with usual care didn't show a statistically significant change during range of motion of knee extension ($Z= -1.63$, $p= 0.10$).

4.4 Muscle Power status

4.4.1 Comparison of muscle power in general

Table 16: Comparison of changes of Quadriceps Muscle power on Manual muscle testing scale between experimental and control group

Experimental				**Control**			
Subject	Pretest	Posttest	Differences	Subject	Pretest	Posttest	Differences
E1	3	2	1	**C1**	2	1	1
E2	1	1	0	**C2**	2	2	0
E3	2	1	1	**C3**	2	2	0
E4	2	1	1	**C4**	1	1	0
E5	3	1	2	**C5**	3	2	1
E6	3	1	2	**C6**	2	1	1
E7	4	1	3	**C7**	1	2	1
E8	2	1	1	**C8**	1	1	0
E9	5	2	3	**C9**	2	2	0
E10	2	0	2	**C10**	1	1	0
E11	2	1	1	**C11**	3	2	1
Mean	2.63	1.09	1.55	**Mean**	1.82	1.55	0.45

Table 16 demonstrated that Mean pre-test score on manual muscle testing scale was 2.63 and posttest was 1.09 with a mean difference of 1.55 in experimental group. In contrast, the mean pretest manual muscle testing score in the control group was 1.82 and posttest was 1.55 with a mean difference of 0.45. So, it is clear that Quadriceps muscle power on manual muscle testing scale had increased in both groups. In this part, data analysis was done using Mann Whitney U test in between group. Conversely, Wilcoxon signed- rank test was done in within group analysis.

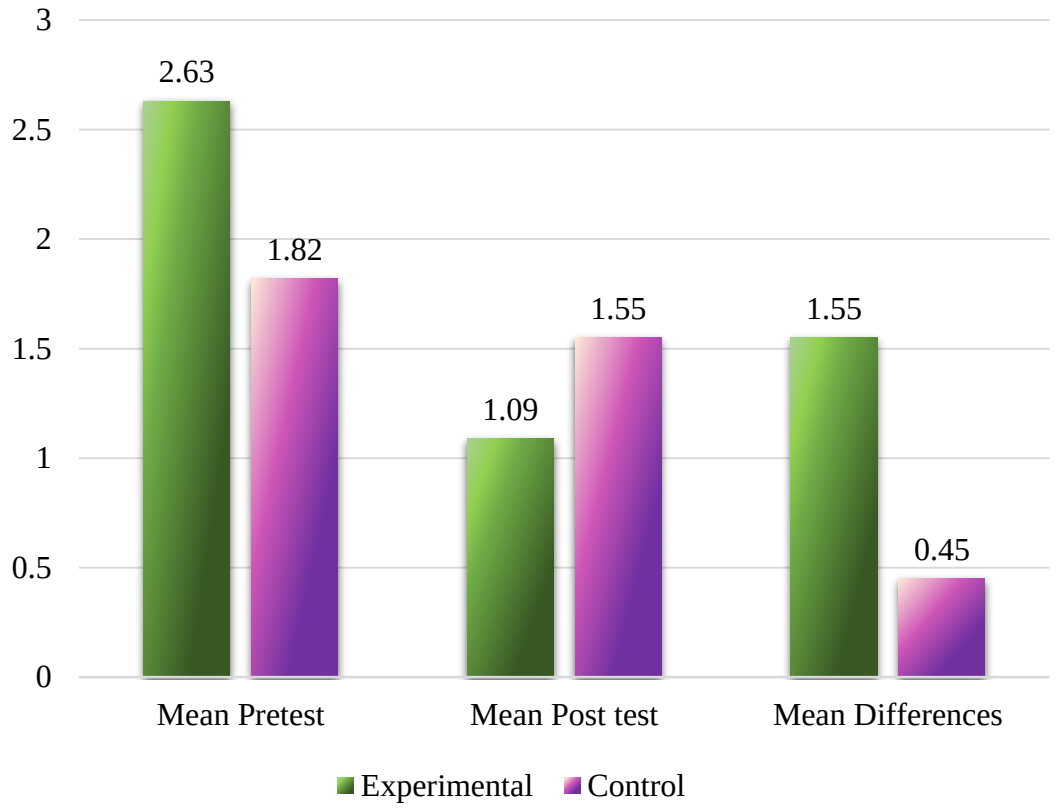


Figure 9: Comparison of changes of Quadriceps Muscle power in experimental and control group

Table 17: Comparison of changes of Hamstring Muscle power on Manual muscle testing scale between experimental and control group

Experimental				Control			
Subject	Pretest	Posttest	Differences	Subject	Pretest	Posttest	Differences
E1	3	1	2	**C1**	2	1	1
E2	1	0	1	**C2**	2	1	1
E3	2	1	1	**C3**	2	2	0
E4	2	1	1	**C4**	1	2	1
E5	3	1	2	**C5**	3	2	1
E6	3	1	2	**C6**	2	1	1
E7	4	1	3	**C7**	1	1	0
E8	2	1	1	**C8**	1	1	0
E9	4	2	2	**C9**	3	2	1
E10	2	0	2	**C10**	1	1	0
E11	2	0	2	**C11**	3	2	1
Mean	2.55	0.82	1.73	**Mean**	1.90	1.45	0.64

Table 17 demonstrated that Mean pre-test score on manual muscle testing scale was 2.55 and posttest was 0.82 with a mean difference of 1.73 in experimental group. In contrast, the mean pretest manual muscle testing score in the control group was 1.90 and posttest

was 1.45 with a mean difference of 0.64. So, it is clear that Hamstring muscle power on manual muscle testing scale had increased in both groups. In this part, data analysis was done using Mann Whitney U test in between group. Conversely, Wilcoxon signed- rank test was done in within group analysis.

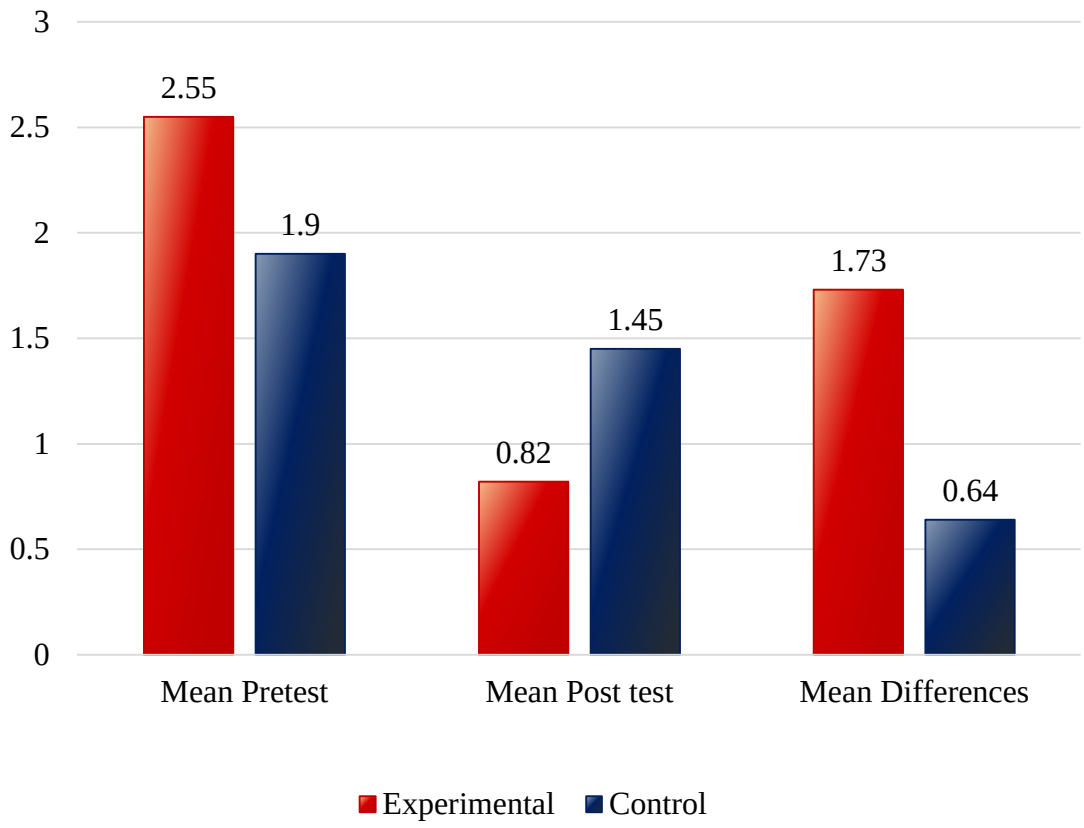


Figure 10: Comparison of changes of Hamstring Muscle power on Manual muscle testing scale between experimental and control group

4.4.2 Calculation of U value of manual muscle testing (Between groups)

Mann Whitney U test analysis of post-test muscle power condition among the participants (Between Group Analysis).

Table 18: Analysis of post -test Manual muscle testing of Quadriceps (Between groups)

Manual muscle testing (Quadriceps)	Group	Number of the participants	Mean rank	Mann Whitney U score	P value
	Control	11	13.73	36	0.11
	Experimental	11	9.27		
	Total	22			

Table 18 showed that the observed value of U is 36 for Quadriceps Muscle power on manual muscle testing in between group and standard table value in U test was 30 for 0.05 in two tailed hypothesis which is smaller than observed U value. So, it can be concluded that Quadriceps muscle power score in experimental group was not statistically significantly higher than the control group ($U = 36$, $p = 0.11$). So, Null hypothesis was accepted and alternative hypothesis was rejected at 5% level of significant. That means the difference between trial group treatment (myofascial release along with usual care) and control group treatment (usual care only) didn't show any significant change.

Mann Whitney U test analysis of post- test muscle power condition among the participants (Between Groups Analysis):

Table 19: Analysis of post -test manual muscle testing of hamstring (Between groups)

Manual Muscle testing (Hamstring)	Group	Number of the participants	Mean rank	Mann Whitney U score	P value
	Control	11	14.32	29.5	0.04
	Experimental	11	8.68		
	Total	22			

Table 19 showed that the observed value of U is 29.5 for Hamstring Muscle power on manual muscle testing in between group and standard table value in U test was 30 for 0.05 in two tailed hypothesis which is larger than observed U value. So, it can be concluded that Hamstring muscle power score in experimental group was statistically significantly higher than the control group ($U = 29.5$, $p = 0.04$). So, null hypothesis was rejected and alternative hypothesis was accepted at 5% level of significant. That means the difference between trial group treatment (myofascial release along with usual care) and control group treatment (usual care only) showed significant change and trial group improvement was more than control group.

4.4.3 Calculation of Z value of Pre-test and post-test muscle testing (Within groups)

Table 20: Calculation of Z value of Pre-test and post-test manual muscle testing of Quadriceps (Within groups)

Experimental				**Control**			
Post quadriceps muscle power – Pre quadriceps muscle power				**Post quadriceps muscle power – Pre quadriceps muscle power**			
	N	**Test Statistics (Wilcoxon Signed-Rank Test)**			**N**	**Test Statistics (Wilcoxon Signed-Rank Test)**	
		Based on positive ranks Z	**P**			**Based on positive ranks Z**	**P**
Positive rank	0	-2.85	0.00	**Positive rank**	1	-1.34	0.18
Negative rank	10			**Negative rank**	4		
Ties	1			**Ties**	6		
Total	11			**Total**	11		

Table 20 showed that participants have increased muscle strength after applying myofascial release combined with usual care in the experimental group. In addition, 4 participants had higher muscle strength deficit score before application of usual care compare with after usual care in control group and as well as 10 participants had higher

muscle strength deficit score in experimental group, before application of myofascial release combined with usual treatment. Besides, 1 participants from experimental group and 6 from control group had equal amount of muscle strength before and after treatment.

However, examining the final test statistics portion of table by Wilcoxon signed-rank test it was discovered that the experimental group for Four weeks, four to thrice weekly myofascial release combined with usual treatment course showed a statistically significant change in Quadriceps muscle strength among individuals with knee OA (Z= -2.85, p= 0.00) but the control group with usual care didn't show a statistically significant changes in quadriceps muscle strength (Z= -1.34, p= 0.18)

Table 21: Calculation of Z value of Pre-test and post-test manual muscle testing of Hamstring (Within groups)

Experimental				**Control**			
Post hamstring muscle power – Pre hamstring muscle power				**Post hamstring muscle power – Pre hamstring muscle power**			
	N	**Test Statistics (Wilcoxon Signed-Rank Test)**			**N**	**Test Statistics (Wilcoxon Signed-Rank Test)**	
		Based on Positive ranks Z	**P**			**Based on Positive ranks Z**	**P**
Positive rank	0	-3.00	0.00	**Positive rank**	1	-1.890	0.05
Negative rank	11			**Negative rank**	6		
Ties	0			**Ties**	4		
Total	11			**Total**	11		

Table 21 showed that participants have increased muscle strength after applying myofascial release combined with usual care in the experimental group. In addition, 6 participants had higher muscle strength deficit score before application of usual care compare with after usual care in control group and as well as 11 participants had higher muscle strength deficit score in experimental group, before application of myofascial

release combined with conventional physiotherapy. Besides, 4 participants from control group had equal amount of muscle strength before and after treatment.

However, examining the final test statistics portion of table by Wilcoxon signed-rank test it was discovered that the experimental group for four weeks, thrice weekly myofascial release combined with usual treatment course showed a statistically significant change in hamstring muscle strength among individuals with knee OA ($Z= -3.00$, $p= 0.00$) and the control group with usual care also showed a statistically significant changes in hamstrings muscle strength ($Z= -1.89$, $p= 0.05$)

4.5 Disability Status

4.5.1 Comparison of Disability status in general

Table 22: Comparisons of changes of functional ability on Womac index between experimental and control group

Experimental				**Control**			
Subject	Pretest	Posttest	Differences	Subject	Pretest	Posttest	Differences
E1	61	7	54	**C1**	55	20	35
E2	21	10	11	**C2**	27	12	15
E3	61	8	53	**C3**	48	15	33
E4	53	8	45	**C4**	58	15	43
E5	40	10	30	**C5**	45	17	28
E6	53	6	47	**C6**	61	14	47
E7	57	6	51	**C7**	41	10	31
E8	44	10	34	**C8**	48	14	34
E9	38	8	30	**C9**	56	16	40
E10	63	4	59	**C10**	43	15	28
E11	35	7	28	**C11**	62	18	44
Mean	47.82	7.64	40.18	**Mean**	49.45	15.09	31.18

Table 22 demonstrated that mean pre-test score on Womac Index scale was 47.82 and posttest was 7.64 with a mean difference of 40.18 in experimental group. In contrast, the mean pretest disability score in the control group was 49.45 and posttest was 15.09 with a mean difference of 31.18. So, it is clear that disability on Womac Index scale had reduced in both groups. In this part, data analysis was done using Mann Whitney U test in between group. Conversely, Wilcoxon signed- rank test was done in within group analysis.

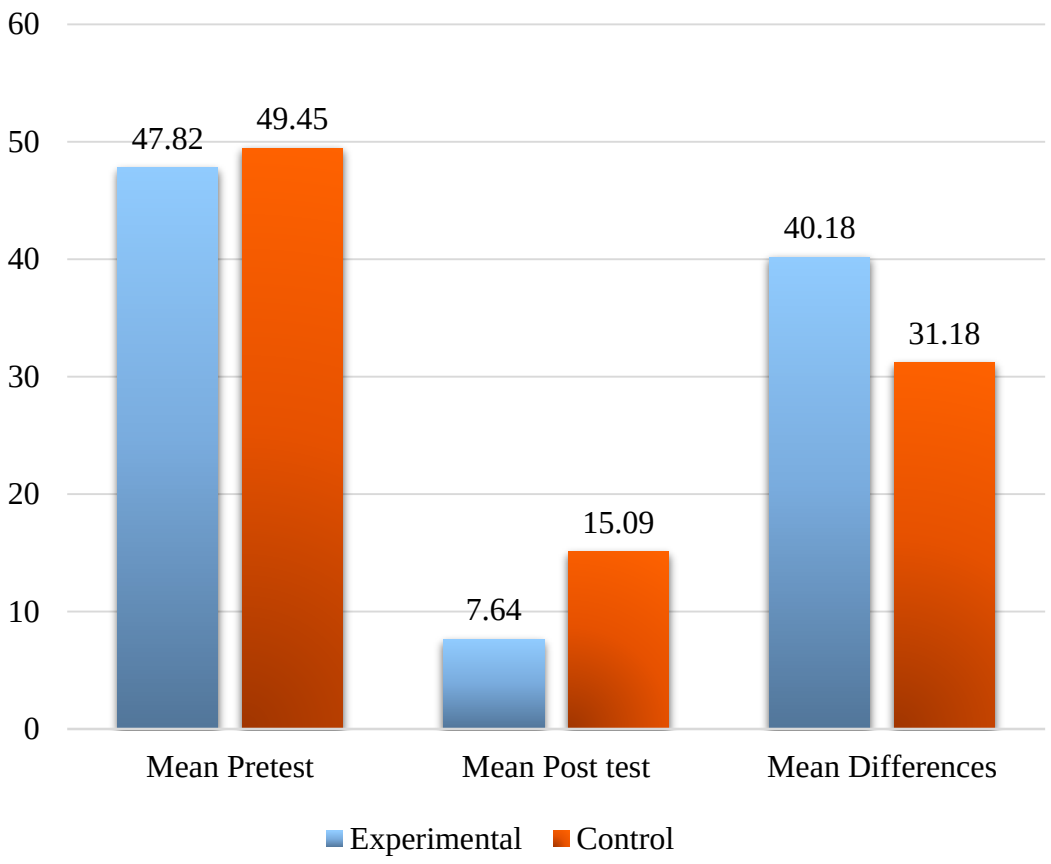


Figure 11: Comparison of functional outcome on Womac index in experimental and control group

4.5.2 Calculation of U value of Disability (Between groups)

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

Table 23: Analysis of post -test disability score (Between groups)

Womac Index	Group	Number of the participants	Mean rank	Mann Whitney U score	P value
	Control	11	16.86	1.5	0.00
	Experimental	11	6.14		
	Total	22			

Table 23 showed that the observed value of U is 1.5 for Disability score on The Western Ontario and McMaster Universities Arthritis Index (WOMAC) Scale in between group and standard table value in U test was 30 for 0.05 in two tailed hypothesis which is larger than observed U value. So, it can be concluded that Disability score on Womac Index Scale in experimental group was statistically significantly higher than the control group ($U = 1.5$, $p = 0.00$). So, Null hypothesis was rejected and alternative hypothesis was accepted at 5% level of significant. That means the difference between trial group treatment (myofascial release along with usual care) and control group treatment (usual care only) was significant and trial group improvement was more than control group.

4.5.3 Calculation of Z value of Pre-test and post-test disability status (Within groups)

Table 24: Calculation of Z value of total Pre-test and post-test disability womac score (Within groups)

Experimental				**Control**			
Post-test disability – Pre-test disability				**Post-test disability – Pre-test disability**			
	N	**Test Statistics (Wilcoxon Signed-Rank Test)**			**N**	**Test Statistics (Wilcoxon Signed-Rank Test)**	
		Based on positive ranks Z	**P**			**Based on positive ranks Z**	**P**
Positive rank	0	-2.93	0.00	**Positive rank**	0	-2.93	0.00
Negative rank	11			**Negative rank**	11		
Ties	0			**Ties**	0		
Total	11			**Total**	11		

Table 24 showed that participants have increased ability in both groups, after application of usual care in the control group and after applying myofascial release combined with usual care in the experimental group. In addition, 11 participants had disability before application of usual care compare with after usual care in control group and as well as in

experimental group, before application of myofascial release combined with usual treatment.

However, examining the final test statistics portion of table by Wilcoxon signed-rank test it was discovered that the experimental group for four weeks, thrice to fouth weekly myofascial release combined with usual treatment course showed a statistically significant change in disability among individuals with knee OA ($Z= -2.93$, $p= 0.00$) and the control group with usual care also showed a statistically significant change in functional ability ($Z= -2.93$, $p= 0.00$).

CHAPTER-V DISCUSSION

5.1 Discussion

The result of this study found that among the 22 participants of knee OA, 13 patients were male (59.1%) and 9 patients were female (40.9%), whereas in experimental Group, 63.6% (n=7) were male and 36.4% (n=4) were female and in Control Group among 11 participants 54.5% (n=6) were male and 45.5% (n=5) were female. Moreover, the mean age range of experimental group were 59.55±10.434 years and the control group were 50.73±10.021 years. Rahbar et al. (2013) examined the effectiveness of myofascial trigger point therapy where 83.3% of patients (25 patients) were female and 16.7% (5 patients) male in experimental group and in control group, 80% (n = 24) patients were female and 20% (6 cases) male and among them the mean of age of control and intervention groups were 59.13 ± 0.30 and 56 ± 5.44.

In this study, participants in the trial and control group received 3-4 sessions per week and totaling 12 sessions of treatment during the intervention period of study. As, in many studies, it was reported that the myofascial release was added to the session between 5 and 20 min depending on the targeted number of MTrPs for better outcomes. The duration of the exercise session ranged between 20 and 30 min every other day for four weeks (12 sessions) (Rahbar et al., 2013; Gomaa & Zaky, 2015; 2016).

The current study was focused on finding out the myofascial release combined with usual care comparing with only usual care and demonstrated that myofascial release combined with usual care showed significant effects on pain, ROM, muscle strength and disability score. Different studies found (Zhang et al., 2008; Hochberg et al., 2012; Abdel-aziem et al., 2018) conventional physiotherapy as an effective treatment for patients with knee osteoarthritis and in some studies said that the method of myofascial release technique (MRF) was considered to have the potential to reduce pain, improve flexibility, decrease disability and thus improve the functioning of daily living activities (Beardsley & Škarabot, 2015; Joshi et al., 2018). 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 (Rahbar et al., 2013; Dor & Kalichman, 2017).

Myofascial intervention is important because it stimulates mechanoreceptor sites that generate a reflex stimulation to relieve pain and also interferes with tissue extensibility (Schleip, 2003; Simmonds et al, 2012). The outcome was measured by using numeric pain rating scale (NPRS) for pain intensity before and after 12 sessions of treatment in this study. As, some study showed that numeric pain rating scale (NPRS) have outstanding test–retest reliability for the measurement of OA knee pain (Alghadir et al., 2018). However, From Comparison of pain data, it can be concluded that in experimental group, mean difference of reduction of resting pain was 5.55 which were 2.46 times more than Mean difference in control group and using U test for data analysis for between group, it showed that pain reduction score on the Numerical Pain Rating Scale (NPRS) in experimental group was statistically significantly higher than the control group ($U = 2.00$, $p = 0.00$) at %5 level of significant. Meanwhile, in this matter some study concludes that the myofascial release therapy is very effective in reducing the pain related disability, quality of sleep and depression (Harish & Kashif, 2013; Gomaa & Zaky, 2015; Arguisuelas et al., 2017). Pedrelli et al. (2009) showed that in the quadriceps of subjects with anterior knee pain, Fascial Manipulation was effective in reducing pain and enhancing muscle activation patterns in functional tasks.

In Knee range of motion (ROM) variable, during knee flexion, within group analysis have found that both trial group ($Z= -2.88$, $p= 0.00$) and the control group ($Z= -2.82$, $p=0.00$) showed a statistically significant change. However, during knee extension within group analysis, though the trial group was ($Z= -2.88$, $p= 0.00$) significant but the control group ($Z= -1.63$, $p= 0.11$) didn't show a statistically significant change. In addition, in between group analysis of Mann Whitney u test, it concluded that range of motion score on goniometer during Knee flexion in experimental group was statistically significantly higher than the control group ($U = 25.5$, $p = 0.02$) but the analysis of knee extension ROM in experimental group was not significantly higher than the control group ($U = 32$, $p = 0.06$). In this regard, Kuruma et al. (2013) studied effects of myofascial release and stretching technique on range of motion and reaction time, concluded that Myofascial release (MFR), has been identified in increasing quadriceps and hamstrings ROM as well as it ease the movements of the knee joint. Another study reported that the comparison of Maitland mobilization and myofascial release technique in reducing pain level and

increasing the ROM in knee OA patients. They observed a significant improvement in the patients' ROM and pain level after the treatments, but no significant difference between treatment options (Harish & Kashif, 2013).

Itoh et al. (2008) reported that the highest prevalence of MTrPs was found in the quadriceps, followed by the iliopsoas, adductors and hamstrings muscles. MTrPs cause muscle weakness and decreased ROM (Rahbar et al., 2013).

In the present thesis, from comparison of Manual muscle testing after MFR concluded that in between group analysis, Hamstring ($U = 29.5$, $p = 0.45$) muscle power score in experimental group was significantly higher than the control group but Quadriceps ($U = 36$, $p = 0.11$) muscle power score in experimental group was not significantly higher than the control group. Again, in within group analysis, it was discovered that the experimental group showed a statistically significant change in Quadriceps muscle strength among individuals with knee OA ($Z= -2.85$, $p= 0.00$) but the control group didn't show a statistically significant change in quadriceps muscle strength ($Z= -1.34$, $p=0.18$). Meanwhile, during Hamstring Muscle strength analysis, both the trial ($Z= -3.00$, $p= 0.00$) and control ($Z= -1.89$, $p=0.05$) group showed statistically significant change among individuals with knee OA. But according to some studies it is found that though myofascial release therapies improve ROM, it do not inhibit or improve muscular performance (MacDonald et al., 2013; Sullivan et al., 2013). Another systemic review had shown in North Carolina that myofascial release therapies do not decrease muscular activation or force production (Mauntel et al., 2014).

However, the realization of myofascial techniques together with hip exercises proved to be an effective alternative treatment for this population, since these techniques are simple and quick to be realized. The myofascial release technique has been demonstrated to be effective to improve pain and disability (Ajimsha et al., 2014). Arun (2014) showed that following the application of various myofascial release therapy, the pain related disability, quality of sleep and depression level were considerably reduced. In a similar approach, based on the results of this study, disability has reduced significantly after application of Myofascial release combined with usual interventions. In addition, only usual interventions was also found effective in this study. Examining the final test statistics portion of table by Wilcoxon signed-rank test in within group it was discovered that the

experimental group for four weeks, thrice to fouth weekly myofascial release combined with usual treatment course showed a statistically significant change in disability among individuals with knee OA (Z= -2.93, p= 0.00) and the control group with usual care also showed a statistically significant change in functional ability (Z= -2.93, p= 0.00). And again, from comparison of disability score on The Western Ontario and McMaster Universities Arthritis Index (WOMAC) Scale in between group, it concluded that Disability score on Womac Index Scale in experimental group was statistically significantly higher than the control group (U = 1.5, p = 0.00) and trial group improvement was more than control group. Overall, the study of Rahbar et al. (2013) agreed with the study and claimed that the physiotherapy can improve joint pain, stiffness, function and physical disabilities and adding, the myofascial pain and dysfunction treatment intensifies the effects of physical therapy. Other studies have shown that myofascial pain and dysfunction treatments are helpful in patients with musculoskeletal and knee arthritis (Itoh et al., 2008) or in combination with ITB, MFR technique has a significant effect in improving functional disability in patients with KOA (Gomaa & Zaky, 2015; 2016).

5.2 Limitations of the study

Despite of the effecacy of Myofascial release combined with usual care on dependent variable in this study, there were some limitations. In this study the sample size was really very small, so the result is difficult to generalize among whole population. Researcher has taken help from two assessors for data collection purpose, it may vary result. This research was carried out in CRP, Savar such a small environment, so it was difficult to keep confidential the aims of the study for blinding procedure. Therefore, single blind method was used in this study. Moreover, there was no available research done this area in Bangladesh. So, relevant information about knee Osteoarthritis patient with specific myofascial intervention for Bangladesh was very limited in this study. Another limitation of this study was the subjects with wide age range group between 40 to 70 years, thus results could not be generalized to individual age.

CHAPTER-VI CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The result of this study has shown that the efficacy of Myofascial release combined with conventional physiotherapy is superior to the basic physiotherapy treatment after 12 sessions of treatment for patients with knee Osteoarthritis that improve the daily living activities. In patients with knee osteoarthritis, conventional physical therapy alone has been effective in reducing pain and enhancing stiffness, motion and function joint range. But the addition of myofascial trigger point and dysfunction therapy and applying myofascial release, enhances the effectiveness of physiotherapy and helps to decrease pain and disability and improve range of motion, muscle power and physical performance in daily living. Though within group analysis showed a relevant significant improvement, between groups analysis findings gave a clear idea that Myofascial release along with conventional physiotherapy are more effective therapeutic approach for patients with knee Oa than only conventional physiotherapy.

6.2 Recommendations

The aim of the study was to find out the efficacy of Myofascial release among the patients with knee Osteoarthritis. Still, the study had some limitations. Some steps were recognized which could be taken for further research to be better accomplished. The primary suggestions are as follows:

1. Double blinding procedure.
2. Investigator use only 22 participants as the sample of this study, in future the sample size should be more.
3. In which stage patient will start this exercises and the specific protocol of home exercises should be included.
4. In order to formulate a concrete treatment plan, unusually large and high-quality RCTs are mandatory.

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APPENDIXES

APPENDIX-A

Institutional Review Board (IRB) Letter

বাংলাদেশ হেল্‌থ প্রফেশন্স ইনস্টিটিউট (বিএইচপিআই)

BANGLADESH HEALTH PROFESSIONS INSTITUTE (BHPI)

(The Academic Institute of CRP)

CRP-Chapain, Savar, Dhaka-1343. Tel: 02-7745464-5, 7741404

Ref: CRP-BHPI/IRB/09/19/1349 Date: 21/09/2019

To
Farzana Sharmin
B.Sc. in Physiotherapy
Session: 2014-2015 Student ID:112140245
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

Subject: Approval of thesis proposal, "**Therapeutic Efficacy of Myofascial Release for patients with Knee Osteoarthritis"** by ethics committee.

Dear Farzana Sharmin,

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. The Following documents have been reviewed and approved:

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

The purpose of the study is to see the therapeutic efficacy of Myofascial Release for patients with knee osteoarthritis. The study involves use of a questionnaire that includes Socio- Demographic information, Numeric Pain Rating Scale, Measurement of Range of motion by Goniometer, Manual muscle testing Scale and The Western Ontario and MacMaster Universities Osteoarthritis Index (WOMAC)Scale. It may take approximately 25-30 minutes to fill in the questionnaire and there is no likelihood of any harm to the participants. The members of the Ethics committee have approved the study to be conducted in the presented form at the meeting held at 10.00 AM on 11th August, 2018 at BHPI.

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,

Millat Hossain

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

21th September, 2019
The Chairman
Institute Review Board (IRB)
Bangladesh Health Professions Institute (BHPI) CRP Chapain,
Savar, Dhaka-1343, Bangladesh.

Subject: Application for the review and ethical approval.

Dear Sir,
With due respect, I am Farzana Sharmin, student of B.Sc in Physiotherapy at the Bangladesh Health Professions Institute (BHPI) under the faculty of medicine, University of Dhaka. As per the course curriculum, I have to conduct a thesis entitled on "**Therapeutic Efficacy of Myofascial Release for patients with Knee Osteoarthritis**" Under my honorable supervisor Md. Zahid Hossain. The aim of the study is to explore the effectiveness of Myofascial release on pain, range of motion, muscle power and physical disability in knee osteoarthritis patients. The study will accommodate 22 patients from CRP, Savar and will be conducted by using Randomized Control Trail (RCT) with two different subject groups. Patients will get a structural protocol of Myofascial release for 20 minutes following conventional physiotherapy for 10 minutes in a single session in trial group and the control group will receive the conventional physiotherapy for 30 minutes only. The exercise program will be carried out 3-4 days per week for 4 weeks. The patients will be evaluated by Numeric Pain Rating Scale (NPRS), Estimate Range of Motion by goniometer, Manual Muscle testing Scale (MMT) and The Western Ontario and MacMaster Universities Osteoarthritis Index (WOMAC) before and after intervention. A written consent will be taken and confidentially as well as safety will be ensured. Patient can withdraw themselves at any time during the study period according to their wish and won't be deprived from the usual treatment. The treatment protocol will be executed by trained professionals and data will be collected by two qualified therapists. Hopefully the study will be able to explore a specific efficacy of Myofascial release so that the patient in near future will be benefited.

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

Sincerely yours,
Farzana Sharmin
Farzana Sharmin
B.Sc in Physiotherapy, Roll: 13, Session: 2014-15
BHPI, CRP, Savar, Dhaka-1343, Bangladesh.
Recommendation from the thesis supervisor

Forwarded to Chairman, IRB, BHPI.

Zahid

MD. ZAHID HOSSAIN
Lecturer
Department of Physiotherapy
BHPI, CRP, Savar, Dhaka-1343

Md. Zahid Hossain
Lecturer
Department of Physiotherapy
BHPI, CRP, Savar, Dhaka-1343
Attachment: Thesis proposal including process and procedure for maintaining confidentiality, Questionnaire (English & Bangla version), Informed consent.

APPENDIX- B

Permission Letter

May 30, 2019

The Head of the Department,

Department of Physiotherapy,

Centre for the Rehabilitation of the Paralysed (CRP), Chapain, Savar, Dhaka - 1343.

Through: Head of the Physiotherapy Department, (BHPI).

Subject: Seeking permission for data collection to conduct my research project.

Dear Sir,

With due respect and humble submission to state that I am Farzana Sharmin, student of 4th Professional B. Sc in Physiotherapy at Bangladesh Health Professions Institute (BHPI) under University of Dhaka. According to the course curriculum, I have to conduct a research project for the partial fulfillment of the degree. My research project entitled on "**Therapeutic Efficacy of Myofascial Release for patients with Knee Osteoarthritis**". To conduct my research, I need to collect data from your Musculoskeletal Unit of Physiotherapy Department, CRP, Savar. I would like to assure that anything of my study will not be harmful for the participants.

I therefore, pray and hope that you would be kind enough to give me the permission to collect data from your department and complete the research project successfully.

Yours faithfully,

Farzana Sharmin

Farzana Sharmin

Student of 4th Professional B.Sc.in Physiotherapy

Roll: 13, Session: 2014-2015

Bangladesh Health Professions Institute (BHPI)

(An academic institute of CRP)

CRP, Savar, Dhaka-1343.

Forwarded to Head of PT

MD. ZAHID HOSSAIN
30/05/2019
Lecturer
Department of Physiotherapy
BHPI, CRP, Savar, Dhaka-1343

Approved

30/05/19
Mohammad Anwar Hossain
Associate Professor & Head
Physiotherapy Dept., CRP
CRP-Chapain, Savar, Dhaka-1343

Recommended

30.05.19
Prof. Md. Obaidur Haque
Head, Department of Physiotherapy
Bangladesh Health Professions Institute (BHPI)
CRP, Savar, Dhaka-1343

APPENDIX- C

Informed Consent

Assalamu Alaikum,

I am Farzana Sharmin, 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 degree, I have to conduct a research project and it is a part of my study. My Research title is "**Therapeutic Efficacy of Myofascial Release for patients with 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 with me or my supervisor Md. Zahid Hossain, Lecturer**,** Department of Physiotherapy, BHPI, CRP, Savar, Dhaka-1343.

Signature of the participant……..Date…..……..……

Signature of the witness…….....Date…...……..……

Signature of the researcher……...Date.……..……..……...…

এপেন্ডিক্স-সি

সম্মতি পত্র (বাংলা)

আসসালামু আলাইকুম,

আমি ফারজানা শারমিন, ঢাকা বিশ্ববিদ্যালয়ের চিকিৎসা অনুষদের অধীনে বাংলাদেশ হেলথ প্রফেশনস ইন্সিটিটিউট এর বি.এস.সি ইন ফিজিওথেরাপি কোর্সের ৪র্থ (চূড়ান্ত) বর্ষের একজন শিক্ষার্থী। অধ্যয়নের অংশ হিসেবে আমাকে একটি গবেষণা সম্পাদন করতে হবে এবং এটা আমার প্রাতিষ্ঠানিক কাজের একটা অংশ। আমার গবেষণার বিষয় হল **"হাঁটুর অস্টিওআর্থ্রাইটিস রোগীদের মধ্যে মায়োফেসিয়াল রিলিজের এর চিকিৎসাবিদ্যাগত কাযর্কারিতা"**

এখন আমি আপনাকে কিছু প্রশ্ন করতে চাচ্ছি যা এই ফর্ম এ 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 অধ্যয়নের 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 আপনি আমাকে অথবা আমার সুপারভাইজার মোঃ জাহিদ হোসেন, অধ্যাপক ও বিভাগীয় প্রধান, ফিজিওথেরাপি বিভাগ, বি.এইচ.পি.আই, সিআরপি, সাভার, ঢাকা -১৩৪৩ তে যোগাযোগ করতে পারেন।

১। অংশগ্রণকারীর স্বাক্ষর..... তারিখ.....

২। স্বাক্ষীর স্বাক্ষর..... তারিখ.....

৩। গবেষকের স্বাক্ষর..... তারিখ.....

APPENDIX-D

Research Title: Therapeutic Efficacy of Myofascial Release for patients with Knee Osteoarthritis

Questionnaire (English)

Part-I: Socio-demographic information

Code no:

Patient ID no:

Name of the participant:	
Age:	
Sex:	
Address:	Village/Area: P/O: P/S: District:
Contact No:	
Education:	
Start Date of intervention:	
End Date of intervention:	

Pre-Test Data

Part-II: Physical disability questionnaire

This questionnaire is developed according to, "The Western Ontario and MacMaster Universities Osteoarthritis Index (WOMAC SCORE)" for measuring the pain and disability of the patient with knee osteoarthritis.

Each question has 4 score. Total questions are 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. How much pain you feel during walking?	0	1	2	3	4
2. How much pain you feel during climbing on the stairs?	0	1	2	3	4
3. How much pain you feel during sleeping at night?	0	1	2	3	4
4. How much pain you feel while you taking rest?	0	1	2	3	4
5. How much pain you feel during weight bearing	0	1	2	3	4

B) Stiffness:

1. What type of stiffness you feel in your foot muscles during morning?	0	1	2	3	4
2. What type of stiffness you feel in your foot muscles during evening?	0	1	2	3	4

C) Physical Function:

1. What kind of problems you feel during getting down to the stairs?	0	1	2	3	4
2. What kind of problems you feel during climbing up to the stairs?	0	1	2	3	4
3. What kind of problems you feel during rising from sitting?	0	1	2	3	4
4. What kind of problems you feel during standing?	0	1	2	3	4
5. What kind of problems you feel during bending toward the floor?	0	1	2	3	4
6. What kind of problems you feel during walking on flat surface?	0	1	2	3	4
7. What kind of problems you feel during getting in or getting out from a car?	0	1	2	3	4
8. What kind of problems you feel when you going for shopping?	0	1	2	3	4
9. What kind of problems you feel during putting on socks?	0	1	2	3	4
10. What kind of problems you feel while you get out from bed?	0	1	2	3	4
11. What kind of problems you feel during taking off socks?	0	1	2	3	4

12. What kind of problems you feel when you rising from bed?	0	1	2	3	4
13. What kind of problems you feel during getting in getting out of bath?	0	1	2	3	4
14. What kind of problems you feel when you sitting for a while?	0	1	2	3	4
15. What kind of problems you feel when you getting on/ off toilet?	0	1	2	3	4
16. What kind of problems you feel when doing your heavy domestic duties like moving furniture?	0	1	2	3	4
17. What kind of problems you feel when doing your light domestic duties like cooking, dusting?	0	1	2	3	4

Part-III: Pain Intensity

Please mark the scale below to show how intense your pain is.

Instructions:

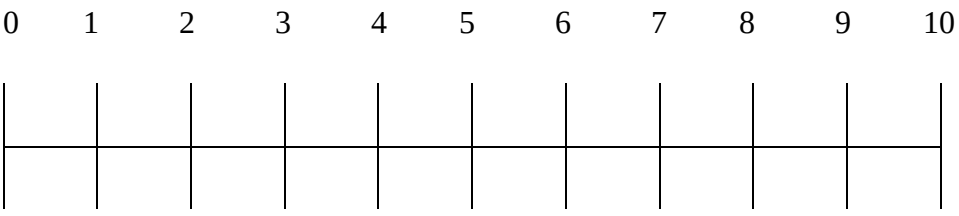
0 = No pain

1-3 = Mild pain

4-6 = Moderate pain

7-10 = Severe pain

How intense is your pain now?



No pain Extreme pain

Part-IV: Estimate the Range Of Motion

This part of questionnaire is designed for knee range of motion measurement.

Goniometer is used for taking measurement.

Instructions:

0= Normal

1= Mild loss

2= Moderate loss

3= Severe loss

Movement	Range of Motion
Knee Flexion (active)	
Knee Extension (active)	
Knee Flexion (Passive)	
Knee Extension (Passive)	

Part-V: Estimate Muscle Power

According to Manual Muscle Testing (MMT) Scale how much muscle power in knee will be measured

Instructions:

0 No visible or palpable muscle contraction

1 Visible or palpable contraction

2- Partial ROM, gravity eliminated

2 Full ROM, gravity eliminated

2+ Gravity eliminated /slight resistance or <1/2 range against gravity

3- >1/2 but <Full ROM, against gravity

3 Full ROM against gravity

3+ Full range of motion against gravity, slight resistance

4- Full ROM against gravity, mild resistance

4 Full ROM against gravity, moderate resistance

4+ Full ROM against gravity, almost full resistance

5 Normal, maximal resistance

Name of Muscles	Movement	Muscle power
Quadriceps	Knee extension	
Hamstring	Knee flexion	
Dorsiflexor muscle	Dorsi flexion of foot	
Planterflexor muscle	Planter flexion of foot	

Post-Test Data

Part-II: Physical disability questionnaire

This questionnaire is developed according to, "The Western Ontario and MacMaster Universities Osteoarthritis Index (WOMAC SCORE)" for measuring the pain and disability of the patient with knee osteoarthritis.

Each question has 4 score. Total questions are 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. How much pain you feel during walking?	0	1	2	3	4
2. How much pain you feel during climbing on the stairs?	0	1	2	3	4
3. How much pain you feel during sleeping at night?	0	1	2	3	4
4. How much pain you feel while you taking rest?	0	1	2	3	4
5. How much pain you feel during weight bearing	0	1	2	3	4

B) Stiffness:

1. What type of stiffness you feel in your foot muscles during morning?	0	1	2	3	4
2. What type of stiffness you feel in your foot muscles during evening?	0	1	2	3	4

C) Physical Function:

1. What kind of problems you feel during getting down to the stairs?	0	1	2	3	4
2. What kind of problems you feel during climbing up to the stairs?	0	1	2	3	4
3. What kind of problems you feel during rising from sitting?	0	1	2	3	4
4. What kind of problems you feel during standing?	0	1	2	3	4
5. What kind of problems you feel during bending toward the floor?	0	1	2	3	4
6. What kind of problems you feel during walking on flat surface?	0	1	2	3	4
7. What kind of problems you feel during getting in or getting out from a car?	0	1	2	3	4
8. What kind of problems you feel when you going for shopping?	0	1	2	3	4
9. What kind of problems you feel during putting on socks?	0	1	2	3	4
10. What kind of problems you feel while you get out from bed?	0	1	2	3	4
11. What kind of problems you feel during taking off socks?	0	1	2	3	4

12. What kind of problems you feel when you rising from bed?	0	1	2	3	4
13. What kind of problems you feel during getting in getting out of bath?	0	1	2	3	4
14. What kind of problems you feel when you sitting for a while?	0	1	2	3	4
15. What kind of problems you feel when you getting on/ off toilet?	0	1	2	3	4
16. What kind of problems you feel when doing your heavy domestic duties like moving furniture?	0	1	2	3	4
17. What kind of problems you feel when doing your light domestic duties like cooking, dusting?	0	1	2	3	4

Part-III: Pain Intensity

Please mark the scale below to show how intense your pain is.

Instructions:

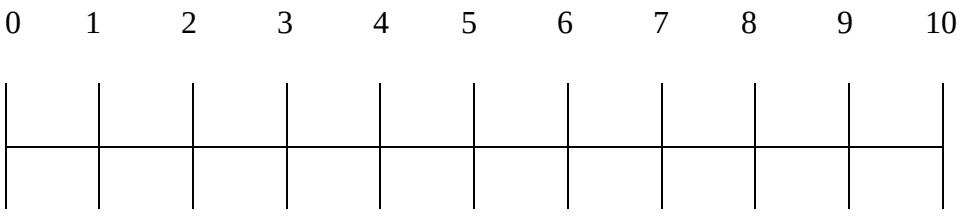
0 = No pain

1-3 = Mild pain

4-6 = Moderate pain

7-10 = Severe pain

How intense is your pain now?



No pain Extreme pain

Part-IV: Estimate the Range Of Motion

This part of questionnaire is designed for knee range of motion measurement.

Goniometer is used for taking measurement.

Instructions:

0= Normal

1= Mild loss

2= Moderate loss

3= Severe loss

Movement	Range of Motion
Knee Flexion (active)	
Knee Extension (active)	
Knee Flexion (Passive)	
Knee Extension (Passive)	

Part-V: Estimate Muscle Power

According to Manual Muscle Testing (MMT) Scale how much muscle power in knee will be measured

Instructions:

0 No visible or palpable muscle contraction

1 Visible or palpable contraction

2- Partial ROM, gravity eliminated

2 Full ROM, gravity eliminated

2+ Gravity eliminated /slight resistance or <1/2 range against gravity

3- >1/2 but <Full ROM, against gravity

3 Full ROM against gravity

3+ Full range of motion against gravity, slight resistance

4- Full ROM against gravity, mild resistance

4 Full ROM against gravity, moderate resistance

4+ Full ROM against gravity, almost full resistance

5 Normal, maximal resistance

Name of Muscles	Movement	Muscle power
Quadriceps	Knee extension	
Hamstring	Knee flexion	
Dorsiflexor muscle	Dorsi flexion of foot	
Planterflexor muscle	Planter flexion of foot	

এপেন্ডিক্স-ডি

গবেষণার বিষয়ঃ হাঁটুর অস্টিওআর্থ্রাইটিস রোগীদের মধ্যে মায়োফেসিয়াল রিলিজের এর চিকিৎসাবিদ্যাগত কাযর্কারিতা

প্রশ্নপত্র (বাংলা)

অংশ-১: সামাজিক প্রেক্ষাপটের তথ্যাবলী

কোড নং:

রোগীর আইডি নাম্বার:

অংশগ্রহনকারীর নাম :	
বয়স :	
লিঙ্গ :	
ঠিকানা :	গ্রাম/এলাকাঃ ডাকঘরঃ থানাঃ জেলাঃ
ফোন নাম্বার :	
শিক্ষাগত যোগ্যতা:	
চিকিৎসা শুরুর তারিখ:	
চিকিৎসা শেষ হওয়ার তারিখ:	

চিকিৎসার পূর্ব্বর্তী তথ্য

এই প্রশ্নপত্রটি তৈরি করা হয়েছে ওয়েস্টার্ন অন্টারিও ও ম্যাকমাস্টার ইউনিভার্সিটি অস্টিওআর্থ্রাইটিস ইনডেক্স (ওম্যাক স্কোর) অনুযায়ী অস্টিওআর্থ্রাইটিস রোগীদের হাঁটুর ব্যথা ও অক্ষমতাজনিত তথ্যাবলী পরিমাপের জন্য।

প্রতিটি প্রশ্নের চারটি স্কোর আছে, সর্বমোট প্রশ্ন ২৪ এবং সর্বমোট ফলাফল ৯৬

চিকিৎসার পুর্ব্বর্তী রোগীর প্রাপ্ত নাম্বার_____ / ৯৬

নির্দেশাবলীঃ দয়া করে প্রত্যেক ধরনের কাজকে নিচের কাঠিন্যের মাপকাঠি অনুযায়ী নির্ধারণ করুন

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

প্রতিটি কাজের জন্য একটা সংখ্যায় গোল দাগ দিন

ক) ব্যথা

১ । হাটাহাটি করার সময় আপনার ব্যথার মাত্রা কেমন থাকে?	০	১	২	৩	৪
২ । সিড়ি দিয়ে ওঠানামা করার সময় আপনার ব্যথার মাত্রা কেমন থাকে?	০	১	২	৩	৪
৩ । রাতে ঘুমানোর সময় আপনার ব্যথার মাত্রা কেমন থাকে?	০	১	২	৩	৪
৪ । বিশ্রামের সময় আপনার ব্যথার মাত্রা কেমন থাকে?	০	১	২	৩	৪
৫। যখন ওজন বহনের সময় আপনার ব্যথার মাত্রা কেমন থাকে?	০	১	২	৩	৪

খ) শক্ত হয়ে যায়

১ । দিনের বেলায় আপনার পায়ের মাংসপেশী শক্ত হয়ে যাওয়ার ধরন কেমন হয়?	০	১	২	৩	৪
২ । রাতের বেলায় আপনার পায়ের মাংসপেশী শক্ত হয়ে যাওয়ার ধরন কেমন হয়?	০	১	২	৩	৪

গ) শারীরিক কাজ

১ । সিড়ি দিয়ে নামার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
২ । সিড়ি দিয়ে ওঠার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
৩ । বসা থেকে উঠার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
৪ । কিছুক্ষণ দাড়িয়ে থাকলে আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
৫ । আসন দিয়ে বসার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
৬ । সমতল মেঝেতে কিছুক্ষণ হাটলে আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
৭। যানবাহনে উঠার সময় বা যানবাহন থেকে নামার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪

৮ । কেনাকাটা করার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
৯ । মোজা পরার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
১০ । বিছানায় শুয়ে থাকার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
১১ । মোজা খোলার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
১২ । শোয়া থেকে ওঠার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
১৩ । গোসলে যাওয়ার সময়/ বের হওয়ার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
১৪ । বসে থাকা অবস্থায় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
১৫ । টয়লেটে যাওয়া বা আসার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
১৬ । ভারী গৃহস্থালি কাজের সময় (আসবাবপত্র নাড়াচাড়া) আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
১৭ । হালকা গৃহস্থালি কাজের সময় (রান্না, ঝাড়ামোছা) আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪

অংশ ৩: ব্যথার তীব্রতা

নীচের স্কেলে দাগ দিয়ে বুঝিয়ে দিন আপনার ব্যথা কতটা তীব্র।

নির্দেশনাবলীঃ

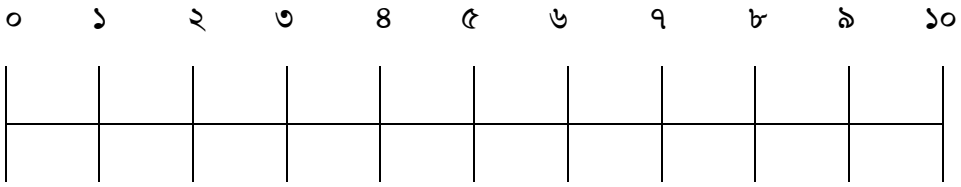
০ = কোন ব্যথা নেই

১-৩ = অল্প ব্যথা

৪-৬ = মাঝারি ব্যথা

৭-১০ = তীব্র ব্যথা

আপনার ব্যথা এখন কতটা তীব্র?



কোনো ব্যথা নাই তীব্র ব্যথা

অংশ-৪: গতির পরিসীমা নির্ণয়

তথ্য সংগ্রহ পত্রের এই অংশটি হাঁটুর গতির পরিসীমা নির্ণয় করার জন্য তৈরী করা হয়েছে।

পরিমাপক যন্ত্র হিসেবে গোনিওমিটার ব্যাবহার করা হয়েছে ।

নির্দেশনাবলীঃ

০= স্বাভাবিক

১= অল্প হ্রাস পেয়েছে

২= মাঝারি হ্রাস পেয়েছে

৩= অনেক খানি হ্রাস পেয়েছে

নড়াচড়া	**গতির পরিসীমা**
হাটু সংকোচন(সক্রিয়)	
হাটু প্রসারণ(সক্রিয়)	
হাটু সংকোচন(পরোক্ষ)	
হাটু প্রসারণ(পরোক্ষ)	

অংশ-৫: মাংসপেশীর শক্তির পরিমাপ

ম্যানুয়াল মাসল টেস্টিং অনুযায়ী হাঁটুর মাংসপেশীতে কতখানি শক্তি আছে তা পরিমাপ করা হবে। নির্দেশনাবলীঃ

০ মাংসপেশীতে কোন দৃশ্যমান বা অনুধাবনযোগ্য সংকোচন নেই

১ দৃশ্যমান বা অনুধাবনযোগ্য সংকোচন বিদ্যমান

২- মধ্যাকর্ষন এর সাথে অল্প গতিসীমা বিদ্যমান

২ মধ্যাকর্ষন এর সাথে সম্পূর্ণ গতিসীমা বিদ্যমান

২+ মধ্যাকর্ষন এর সাথে অল্প বাধাতে সম্পূর্ণ অথবা মধ্যাকর্ষন এর বিপরীতে <১/২ গতিসীমা বিদ্যমান

৩- মধ্যাকর্ষন এর বিপরীতে অর্ধেক এর বেশী অথবা সম্পূর্ণ এর কম গতিসীমা বিদ্যমান

৩ মধ্যাকর্ষন এর বিপরীতে সম্পূর্ণ গতিসীমা বিদ্যমান

৩+ মধ্যাকর্ষন এর বিপরীতে হালকা বাধাতে সম্পূর্ণ গতিসীমা বিদ্যমান

৪- মধ্যাকর্ষন এর বিপরীতে অল্প বাধাতে সম্পূর্ণ গতিসীমা বিদ্যমান

৪ মধ্যাকর্ষন এর বিপরীতে মাঝারি বাধাতে সম্পূর্ণ গতিসীমা বিদ্যমান

৪+ মধ্যাকর্ষন এর বিপরীতে প্রায় পূর্ণ বাধাতে সম্পূর্ণ গতিসীমা বিদ্যমান

৫ স্বাভাবিক, সর্বোচ্চ বাধাতে সম্পূর্ণ গতিসীমা বিদ্যমান

মাংসপেশীর নাম	কাজ/নড়াচড়া	মাংসপেশীর শক্তি
কোয়াড্রিসেন্স	হাটু প্রসারণ	
হ্যামস্ট্রিং	হাটু সংকোচন	
ডরসিফ্লেক্সর	পায়ের ডরসিফ্লেক্সন	
প্ল্যান্টারফ্লেক্সর	পায়ের প্ল্যান্টারফ্লেক্সন	

চিকিৎসার পরবর্তী তথ্য

অংশ-২: শারীরিক অক্ষমতার প্রশ্নাবলী

এই প্রশ্নপত্রটি তৈরি করা হয়েছে ওয়েস্টার্ন অন্টারিও ও ম্যাকমাস্টার ইউনিভার্সিটি অস্টিওআর্থ্রাইটিস ইনডেক্স (ওম্যাক স্কোর) অনুযায়ী অস্টিওআর্থ্রাইটিস রোগীদের হাঁটুর ব্যথা ও অক্ষমতাজনিত তথ্যাবলী পরিমাপের জন্য।

প্রতিটি প্রশ্নের চারটি স্কোর আছে, সর্বমোট প্রশ্ন ২৪ এবং সর্বমোট ফলাফল ৯৬

চিকিৎসার পরবর্তী রোগীর প্রাপ্ত নাম্বার_____ / ৯৬

নির্দেশাবলীঃ দয়া করে প্রত্যেক ধরনের কাজকে নিচের কাঠিন্যের মাপকাঠি অনুযায়ী নির্ধারণ করুন

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

প্রতিটি কাজের জন্য একটা সংখ্যায় গোল দাগ দিন

ক) ব্যথা

১ । হাটাহাটি করার সময় আপনার ব্যথার মাত্রা কেমন থাকে?	০	১	২	৩	৪
২ । সিড়ি দিয়ে ওঠানামা করার সময় আপনার ব্যথার মাত্রা কেমন থাকে?	০	১	২	৩	৪
৩ । রাতে ঘুমানোর সময় আপনার ব্যথার মাত্রা কেমন থাকে?	০	১	২	৩	৪
৪ । বিশ্রামের সময় আপনার ব্যথার মাত্রা কেমন থাকে?	০	১	২	৩	৪
৫। যখন ওজন বহনের সময় আপনার ব্যথার মাত্রা কেমন থাকে?	০	১	২	৩	৪

খ) শক্ত হয়ে যায়

১ । দিনের বেলায় আপনার পায়ের মাংসপেশী শক্ত হয়ে যাওয়ার ধরন কেমন হয়?	০	১	২	৩	৪
২ । রাতের বেলায় আপনার পায়ের মাংসপেশী শক্ত হয়ে যাওয়ার ধরন কেমন হয়?	০	১	২	৩	৪

গ) শারীরিক কাজ

১ । সিড়ি দিয়ে নামার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
২ । সিড়ি দিয়ে ওঠার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
৩ । বসা থেকে উঠার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
৪ । কিছুক্ষণ দাড়িয়ে থাকলে আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
৫ । আসন দিয়ে বসার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
৬ । সমতল মেঝেতে কিছুক্ষণ হাটলে আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
৭। যানবাহনে উঠার সময় বা যানবাহন থেকে নামার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪

৮ । কেনাকাটা করার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
৯ । মোজা পরার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
১০ । বিছানায় শুয়ে থাকার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
১১ । মোজা খোলার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
১২ । শোয়া থেকে ওঠার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
১৩ । গোসলে যাওয়ার সময়/ বের হওয়ার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
১৪ । বসে থাকা অবস্থায় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
১৫ । টয়লেটে যাওয়া বা আসার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
১৬ । ভারী গৃহস্থালি কাজের সময় (আসবাবপত্র নাড়াচাড়া) আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
১৭ । হালকা গৃহস্থালি কাজের সময় (রান্না, ঝাড়ামোছা) আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪

অংশ ৩: ব্যথার তীব্রতা

নীচের স্কেলে দাগ দিয়ে বুঝিয়ে দিন আপনার ব্যথা কতটা তীব্র।

নির্দেশনাবলীঃ

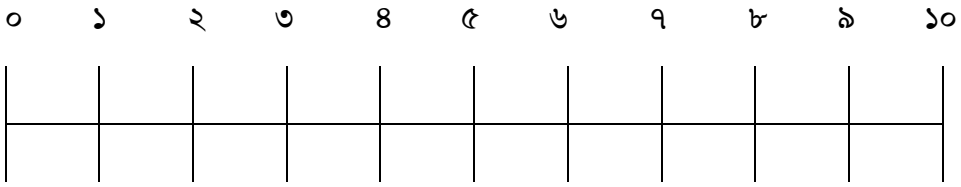
০ = কোন ব্যথা নেই

১-৩ = অল্প ব্যথা

৪-৬ = মাঝারি ব্যথা

৭-১০ = তীব্র ব্যথা

আপনার ব্যথা এখন কতটা তীব্র?



কোনো ব্যথা নাই তীব্র ব্যথা

অংশ-৪: গতির পরিসীমা নির্ণয়

তথ্য সংগ্রহ পত্রের এই অংশটি হাঁটুর গতির পরিসীমা নির্ণয় করার জন্য তৈরী করা হয়েছে।

পরিমাপক যন্ত্র হিসেবে গোনিওমিটার ব্যাবহার করা হয়েছে ।

নির্দেশনাবলীঃ

০= স্বাভাবিক

১= অল্প হ্রাস পেয়েছে

২= মাঝারি হ্রাস পেয়েছে

৩= অনেক খানি হ্রাস পেয়েছে

নড়াচড়া	**গতির পরিসীমা**
হাটু সংকোচন(সক্রিয়)	
হাটু প্রসারণ(সক্রিয়)	
হাটু সংকোচন(পরোক্ষ)	
হাটু প্রসারণ(পরোক্ষ)	

অংশ-৫: মাংসপেশীর শক্তির পরিমাপ

ম্যানুয়াল মাসল টেস্টিং অনুযায়ী হাঁটুর মাংসপেশীতে কতখানি শক্তি আছে তা পরিমাপ করা হবে। নির্দেশনাবলীঃ

০ মাংসপেশীতে কোন দৃশ্যমান বা অনুধাবনযোগ্য সংকোচন নেই

১ দৃশ্যমান বা অনুধাবনযোগ্য সংকোচন বিদ্যমান

২- মধ্যাকর্ষন এর সাথে অল্প গতিসীমা বিদ্যমান

২ মধ্যাকর্ষন এর সাথে সম্পূর্ণ গতিসীমা বিদ্যমান

২+ মধ্যাকর্ষন এর সাথে অল্প বাধাতে সম্পূর্ণ অথবা মধ্যাকর্ষন এর বিপরীতে <১/২ গতিসীমা বিদ্যমান

৩- মধ্যাকর্ষন এর বিপরীতে অর্ধেক এর বেশী অথবা সম্পূর্ণ এর কম গতিসীমা বিদ্যমান

৩ মধ্যাকর্ষন এর বিপরীতে সম্পূর্ণ গতিসীমা বিদ্যমান

৩+ মধ্যাকর্ষন এর বিপরীতে হালকা বাধাতে সম্পূর্ণ গতিসীমা বিদ্যমান

৪- মধ্যাকর্ষন এর বিপরীতে অল্প বাধাতে সম্পূর্ণ গতিসীমা বিদ্যমান

৪ মধ্যাকর্ষন এর বিপরীতে মাঝারি বাধাতে সম্পূর্ণ গতিসীমা বিদ্যমান

৪+ মধ্যাকর্ষন এর বিপরীতে প্রায় পূর্ণ বাধাতে সম্পূর্ণ গতিসীমা বিদ্যমান

৫ স্বাভাবিক, সর্বোচ্চ বাধাতে সম্পূর্ণ গতিসীমা বিদ্যমান

মাংসপেশীর নাম	কাজ/নড়াচড়া	মাংসপেশীর শক্তি
কোয়াড্রিসেন্স	হাটু প্রসারণ	
হ্যামস্ট্রিং	হাটু সংকোচন	
ডরসিফ্লেক্সর	পায়ের ডরসিফ্লেক্সন	
প্ল্যান্টারফ্লেক্সর	পায়ের প্ল্যান্টারফ্লেক্সন	

APPENDIX-E

Rehabilitation Protocol for Knee Osteoarthritis patient

For Control Group

Conventional physiotherapy for knee Osteoarthritis patients.

A) Stretching:	Sustained manual stretches of 15–35s duration repeated 3-5 times to reduce muscle tightness.
B)Muscle strengthening such as static quad sets in knee extension:	Hold each contraction for 10sec with 2sec rest between repetitions. Repeat 10 times.
C) Manual therapy technique:	Mobilization grades I, II for 10 repetitions in each set, and total three sets to reduce pain and III and IV to III + + and IV+ + 2–6 bouts of 30s per manual technique to improve ROM of the knee. Soft tissue mobilization in Suprapatellar and peripatellar regions, Medial and lateral joint capsule by Circular fingertip and palm pressure mobilization at the depth of the capsule or retinaculum for 1–3 bouts of 30 s per area to reduce soft tissue tightness.
D) Cryotherapy:	Applying ice for 5-10 minutes, 5 days a week for 2 weeks to reduce the pain and swelling of the knee.
E) Patients education and home advice:	Education programs aim to improve outcomes for patients by supporting and all home exercise programs were performed at least 3-4 times per week.

APPENDIX-F

For experimental Group

Apply the above mentioned conventional physiotherapy along with below mentioned myofasial release tecniques.

Myofascial Release therapy

Apply myofascial release on the following muscles:

Vastus medialis, Vastus lateralis, Iliotibial band & Gastrocnemius

Intervention:

Duration: 4 weeks, 3-4 sessions per week, 30 minutes per session

MFR has added between 5-20 min to the session duration depending on the targeted number of MTrPs.

Vastus medialis release

Starting position:

Patient in supine lying

Therapist stand by the affected side

Steps:

1. Therapist places both of his thumbs 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 fiber for 5 minutes or more.

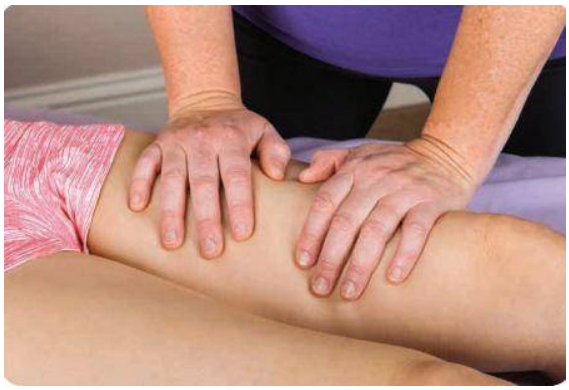


Figure 12: Vastus medialis release

Vastus lateralis release

Starting position:

Patient is in supine lying

Therapist stand by the affected side

Steps:

1. Therapist places both of his thumbs in between ITB and vastus lateralis muscle of the patient.

2. Give a firm pressure based on patient's tolerance and continue massage from down ward to upward in between ITB and VL for 5 minutes or more.

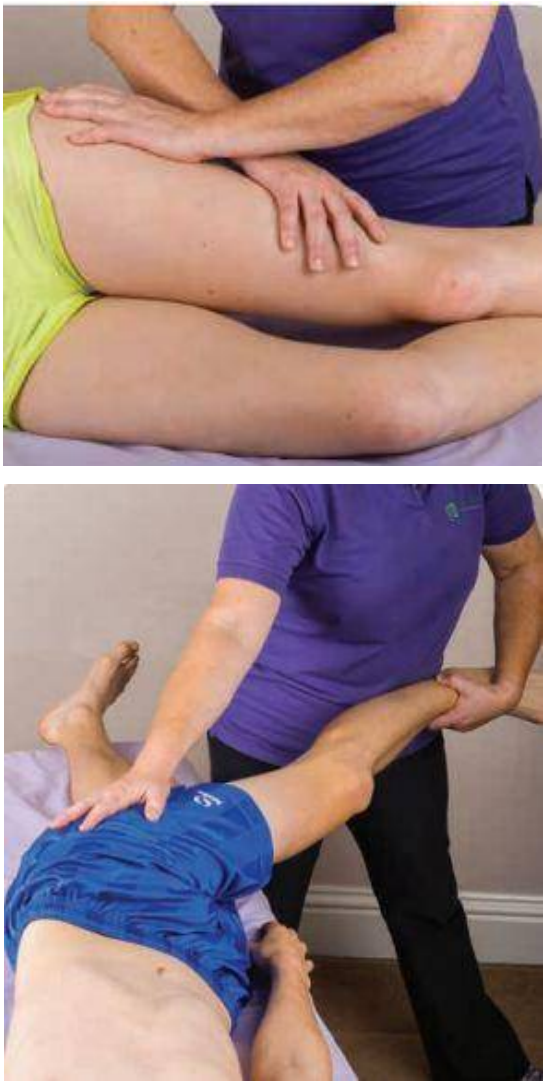


Figure 13: Vastus lateralis release

Iliotibial band release

Starting position:

The patient is on side lying position to treat the superior limb which was slightly flexed at both hip and knee to be advanced forward and completely supported on the bed to gain maximum relaxation for effective release.

Therapist stand by the affected side

Steps:

1) The thumb of the therapist was placed over the taut band and longitudinal strokes were applied slowly with moderate pressure.

2) The therapist's thumb remained in contact with the skin overlying the myofascial trigger points for the entire procedure to ensure accurate re-location of pressure for MFR.

3) The total time of successive pressures was for five minutes or more (upon each MTrPs) until the release is felt by the therapist's thumb.

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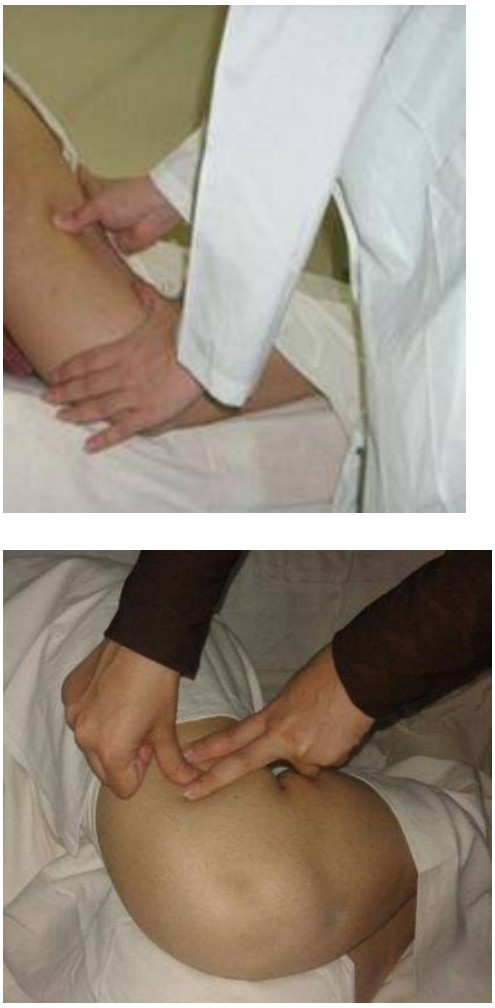

Figure 14: Illiotibial band release

Gastrocnemius release

Starting position:

Patient is in prone lying position

Therapist stand by the affected side

Steps:

1) Instruct the patient to lie in a prone position on the bed.

2) Carefully bend the patient's leg at the knee to a 90-degree angle.

3) Place each hand on either side of the calf muscles.

4) Locate the tender point/adhesion on the calf muscles. Check with the patient until the tender point is located.

5) Apply compression to the point and hold for 5 minutes or more, until the pain is reduced by at least 70% from the original severity or until the tightness is released.

Figure 15: Gastrocnemius release