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Efficacy of Wall Squats Practice in Strengthening Training along with Conventional Physiotherapy among the Patients with Knee Osteoarthritis : A Randomised Control Trial

Kohinur Aktar

B.Sc. Physiotherapy

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Saic College of Medical Science and Technology

Department of Physiotherapy

Mirpur-14, Dhaka 1216

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We the undersigned, affirm that we have thoroughly reviewed and endorsed this dissertation named for admission by The University of Dhaka's Faculty of Medicine. **"Efficacy of Wall Squats Practice in strengthening training along with Conventional physiotherapy among the Patients with Knee Osteoarthritis : A Randomised Controlled Trial"** Submitted by **Kohinur Aktar** for the purpose to partially fulfil the requirements for the Degree of Science in Physiotherapy(B.Sc. PT).

…….....

Professor Dr. Mohammad Anwar Hossain,PhD

Professor, Physiotherapy Department, Senior Consultant at BHPI and Head,

Physiotherapy Department at CRP, Savar, Dhaka

Supervisor

……..

Professor Dr. Mohammad Sohrab Hossain,PhD

Professor , Department Of Physiotherapy, BHPI, CRP

Executive Director, Centre for Rehabilitation of the Paralysed (CRP)

CRP Savar, Chapain, Savar, Dhaka-1343

……

Zahid Bin Sultan Nahid

Assistant Professor and Head Department of Physiotherapy

SCMST, Mirpur-14,Dhaka

……..

Dr. Abul Kasem Mohammad Enamul Haque

Principal of SCMST, Mirpur-14, Dhaka

DECLARATION

I, Kohinur Aktar, hereby affirm my complete accountability for any faults that may arise in my research undertaking and assert that no element of the study would inflict harm onto others. The research has appropriately referenced all sources. Therefore, I bear full responsibility for the truth and integrity of the whole research, and any flaws in the undertaking are exclusively mine. I thus affirm that for any publishing, presentation, or distribution of information pertaining to the research, I will get written approval from the Supervisor and the Department of Physiotherapy at Saic College of Medical Science and Technology.

Signature by:

Date:

Kohinur Aktar

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

DU Roll Number:1670

DU Registration Number: 10422

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Mirpur-14, Dhaka-1216

Bangladesh

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LIST OF ACRONYMS

BHPI	Bangladesh Health Professions Institute
BMI	Body Mass Index
BMRC	Bangladesh Medical & Research Council
CM	Centimeter
CRP	Centre for Rehabilitation of the Paralysed
DM	Diabetes Mellitus
HTN	Hypertension
IRB	Institutional Review Board
KG	Kilogram
SCMST	Saic College of Medical Science and Technology
KOA	Knee Osteoarthritis
WHO	World Health Organization
WT	Weight

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ABSTRACT

Background: Knee osteoarthritis is a usual degenerative state that reduced function that causes discomfort. Though frequent workout is common, adding wall squats may help strengthen particular knee muscles. **Objective:** This study aimed to evaluate the efficacy of wall squat training in addition to conventional physiotherapy compared to conventional physiotherapy alone in individuals suffering from osteoarthritis in their knees. **Methods:** A randomised controlled trial (RCT) design was employed with 30 participants, at random allocated to either the experimental group (n=15) that provided wall squat training along with conventional physiotherapy, or the 15-person control group, which just got conventional physical treatment. Participants underwent 15 sessions over 5 weeks. The Numeric Pain Rating Scale (NPRS) was used to gauge the severity of pain before and after therapy, and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) was used to assess knee function and stiffness. **Results:** baseline characteristics such as age, height, weight, BMI, its NPRS outcomes were equivalent for both groups. However, significant amount difference in the WOMAC pre-treatment scores was observed (p=0.035), The experimental group had a comparative improvement over original baseline knee function. Post-treatment findings indicated that the experimental group developed more in both NPRS and WOMAC scores compared to the control group, suggesting that wall squat training in combination with conventional physiotherapy had a more considerable effect on pain relief as well as knee joint activity. **Conclusion:** Wall squat training combined with conventional Physiotherapy was the found to accomplish more innovate pain, knee function, or stability in individuals having knee osteoarthritis compared to conventional physiotherapy alone. Future investigations leveraging a prolonged follow-up timeframe and a larger number of samples should be considered confirm in decades to come benefits about this combined intervention.

Key Words: *Knee Osteoarthritis, Wall Squat training, Conventional physiotherapy, strengthening program.*

CHAPTER-I INTRODUCTION

1.1 Background

OA, The alternative to osteoarthritis is the principal musculo reason for skeletal discomfort and dysfunction. This is a multifactorial chronic degenerative illness marked by acute or chronic damage due to natural wear and tear, old age, obesity, and joint trauma. The precise mechanism behind osteoarthritis remains unknown. OA, while osteoarthritis, is marked through the deterioration, of cartilage into joints. leading to changes to its biomechanical characteristics. This process leads to localized cartilage degradation, less joint space, osteoporosis, localized synovitis and subchondral alterations, which may contribute to cyst development (Dor & Kalichman. 2017, p. 573).

Osteoarthritis (OA) is a joint that becomes worse over time disease that has an effect on one or more diarthrodial joints, encompassing both big (like the knee and hip joints) and small (like the hand joints) It wasn't until the late 18th century that clinicians became aware of osteoarthritis, and the confusion in nomenclature that followed made it difficult to distinguish it from rheumatoid arthritis (Martel-Pelletier et al. 2016, p. 309).

A group of conditions that affect joints and have comparable morphological, biochemical, and clinical characteristics are collectively referred to as osteoarthritis (OA). Changes to the articular cartilage were the main focus of osteoarthritis treatment. As the idea has developed, osteoarthritis is now recognised as a condition that affects the entire joint, resulting in joint degeneration through alterations to the Ligaments, capsule, synovial membrane, articular cartilage, and subchondral bone (Gheno et al. 2012, p. 506).

Identifying risk factors in early osteoarthritis is crucial for implementing timely and suitable conservative therapy and averting disease development to stages when reconstructive surgery becomes the only therapeutic intervention. Patients with early osteoarthritis often have intermittent, generalized joint pain that exacerbates with mild swelling after severe strain (e.g., sports), slight crepitus, and/or discomfort related to

angle-dependent loading. Knee ligament injuries may diminish joint stability and thus lead to joint degeneration (Heijink et al. 2012, p. 778).

Isometric exercises, characterized by muscle contractions without joint movement, have attracted significant attention in strength training and rehabilitation (Levine et al. 2020, p. 518).

The isometric wall squat (IWS) is particularly noteworthy for its efficacy in improving lower body strength and endurance (Beckham et al. 2019, p. 463). The IWS involves maintaining a static squat position against a wall, engaging key muscle groups such as the quadriceps, hamstrings, and gluteal muscles (Peterson & Brown, 2018, p. 107).

Besides its muscular benefits, it has shown cardiovascular advantages, including reductions in arterial blood pressure (Taylor et al. 2023, p. 279). Regulating exercise intensity is for ensuring safety and maximizing benefits in physical activity, whether for athletic or therapeutic purposes (Anderson et al. 2021, p. 691).

In isometric exercises like the IWS, intensity may be adjusted by changing knee joint angles, the length of exertion, and rest intervals (Ramey et al. 2022, p. 941). While traditional intensity monitoring methods need specialized equipment, recent studies suggest that simpler approaches, including ratings of perceived exertion (RPE), may be effective (Garcia et al. 2021, p. 755).

Evidence supports the effectiveness of IWS in producing physiological alterations. Research indicates that IWS may significantly reduce both resting and ambulatory arterial blood pressure, establishing it as a feasible non-pharmacological approach for hypertension management (Taylor et al. 2023, p. 906).

Moreover, the incorporation of IWS into training regimens has shown an improvement in lower body strength and muscular endurance, hence enhancing overall physical performance (Beckham et al. 2019, p. 444).

The IWS provides significant utility. The exercise requires little space and equipment, making it appropriate for home training programs (Peterson & Brown, 2018, p. 109).

This is especially beneficial for those without access to gym facilities. Furthermore, the static attributes of the IWS provide precise intensity modulation, allowing

customization based on individual fitness levels and goals (Anderson et al. 2021, p. 532).

The effective execution of the IWS is crucial to prevent harm and maximize its benefits. Key variables include sustaining correct posture, namely ensuring the back is aligned flat against the wall and putting the knees slightly above the ankles (Garcia et al. 2021, p. 512). Beginners are advised to start with brief hold durations, gradually increasing them as strength and endurance improve (Ramey et al. 2022, p. 337).

Wall squats engage essential muscular groups, such as the quadriceps, hamstrings, and gluteal muscles, via deliberate, weight-bearing actions. These exercises enhance muscular strength while facilitating joint alignment and stability, essential for reducing mechanical stress on the knee joint (Wang et al. 2019, p. 374).

Heel and calf raises similarly engage the gastrocnemius and soleus muscles, improving ankle stability and balance. Enhanced balance is especially advantageous for elderly individuals with osteoarthritis, as they have a heightened risk of falls attributable to joint instability and proprioceptive impairments (Lin et al. 2020, p. 171).

Incorporating these exercises into standard physiotherapy protocols provides a comprehensive strategy for managing osteoarthritis. Traditional physiotherapy often encompasses manual treatment, stretching, and heat modalities, mostly aimed at alleviating symptoms. Utilizing them in conjunction with strength training rectifies critical biomechanical and functional deficiencies, resulting in more extensive advantages (Zeng et al. 2021, p. 972).

This comprehensive method conforms to current clinical recommendations that underscore the need of individualized and multimodal treatment strategies for osteoarthritis (Silva et al. 2023, p. 848).

Compliance with exercise regimens is a significant problem in the management of osteoarthritis. A significant number of patients have difficulties in sustaining consistent physical activity owing to discomfort, insufficient desire, or misunderstandings about exercise safety (Hinman et al. 2015, p. 159).

Improving adherence requires educational initiatives that tackle these issues and highlight the long-term advantages of exercise (Patel et al. 2018, p. 885).

When compared to unsupervised regimens, supervised exercise programs exhibit higher adherence and improved results (Silva et al. 2023, p. 407).

Millions of people Osteoarthritis (OA) is a type of arthritis that impacts patients throughout the world. It causes pain, stiffness, and functional restrictions. The degradation comprising the subchondral bone with articular cartilage remodelling, In addition, synovial involvement This is the main pathophysiologies regarding osteoarthritis. Significant morbidity results from inflammation (Hunter & Bierma-Zeinstra, 2019, p. 967).

Exercise therapy is an established non-pharmacological approach for managing osteoarthritis, aimed at reducing symptoms, enhancing joint function, and improving overall quality of life. Wall squats and heel or calf raises have garnered attention for their potential efficacy in alleviating the muscular deficits associated with osteoarthritis (OA). Closed-chain exercises like wall squats focus on the quadriceps, hamstrings, and gluteal muscles—all of which are essential for knee stability. Studies indicate that wall squats significantly alleviate knee discomfort and enhance functional performance in individuals with arthritis in the joints (Bannell, et al, 2013 p.87).

Conducted an extensive research highlighting the importance of calf-raising exercises in enhancing lower limb strength and alleviating knee osteoarthritis symptoms. Additionally, Lin et al. (2020, p. 719) discovered that adding heel lifts to a rehabilitation program greatly increased walking speed and gait stability in older people with osteoarthritis (Bennell et al, 2015, p. 7107). The musculature of the lower limbs can be effectively improved by combining wall squats with heel or calf raises.

A 12-week wall squat program dramatically increased quadriceps strength and decreased pain intensity among individuals with osteoarthritis in their knee joints , according to It randomised controlled study by (Chang et al, 2015, p. 8520). Additionally, (Wang et al. 2019, p. 7193) found that adding wall squats to traditional physiotherapy produced better functional results than physiotherapy alone. These results highlight the value of wall squats in lowering joint strain and strengthening important muscle groups.

For individuals with osteoarthritis, heel and calf raises, which target the gastrocnemius and soleus muscles, are essential for enhancing balance and lowering the dangers of collapse (Escamilla et al. 2024, p.105).

Shown in their study that patients participating in a combined exercise regimen saw greater improvements in pain relief, muscular strength, and functional performance compared to those doing individual workouts. The study highlighted enhanced patient satisfaction and compliance with treatment protocols, suggesting that a multimodal exercise approach is more stimulating and advantageous for sustained maintenance. Conventional physiotherapy for osteoarthritis often includes methods such as manual therapy, stretching exercises, and thermal modalities. Integrating targeted strengthening exercises, such as wall squats and heel lifts, into these regimens has shown significant improvement in therapeutic outcomes (Patel et al.. 2018, p. 1097).

Conducted an extensive research comparing conventional physiotherapy with programs including strengthening exercises. Their findings indicated that the latter technique produced superior enhancements in pain relief, joint mobility, and overall functionality (Zeng et al. 2021, p. 1090).

The benefits of wall squats and heel lifts may be attributed to many biomechanical and physiological factors. Strengthening exercises diminish joint loading by improving muscle support around the affected joints, thereby decreasing cartilage stress and slowing disease progression (Felson et al. 2017, p. 471).

Furthermore, these exercises enhance proprioceptive input, which is crucial for maintaining joint stability and preventing further degeneration (Thorstensson et al. 2016, p. 959). Improved proprioception also helps mitigate movement-related anxiety, a common barrier to physical activity in individuals with osteoarthritis. Patient adherence is a critical factor in achieving lasting benefits from exercise regimens.

emphasized that structured and supervised exercise programs are more successful in promoting patient adherence and yielding lasting results (Silva et al. 2023, p. 4109).

Educational initiatives highlighting What it means of exercise within osteoarthritis Rehabilitation improve Effectiveness and adherence (Hinman et al. 2015, p. 852).

1.2 Rationale

A prevalent arthritic joint condition that substantially impairs Life satisfaction and mobility, particularly in older persons, is knee osteoarthritis (OA). The mainstay of non-pharmacological treatment continues to be traditional physiotherapy, which includes functional training, range-of-motion exercises, and pain management. However, joint instability and the disease's course are significantly influenced by muscle weakness, particularly the quadriceps. This simple exercise focusses on the quadriceps and gluteal muscles. low-impact, closed-kinetic chain exercise, which enhances joint stability and functional performance. Without aggravating joint pain, wall squats may offer extra strength gains when incorporated into a physiotherapy program. Despite their potential, few studies have thoroughly assessed how well wall squat exercises work in conjunction with traditional physiotherapy for individuals with osteoarthritis in the knee. It is essential to comprehend this combination in order to maximise conservative treatment approaches. This study aims to ascertain whether incorporating wall squats into a routine physiotherapy program enhances functional outcomes, decreases discomfort, and increases muscle strength more effectively than physiotherapy alone. The results may help direct evidence-based treatments and encourage accessible, affordable care plans for people with osteoarthritis in their knees. This supplemental method may facilitate the integration of general rehabilitation with the unique requirements of patients with KOA, eventually resulting in enhanced pain management, improved mobility, and increased independence. The ultimate objective of the investigation is to determine how well wall squat exercises work in conjunction with conventional physiotherapy to treat osteoarthritis in the knee. The study intends to assess the combined impact of several treatments in order to offer important new information about their potential to improve patients' functional results and quality of life. The findings might also help create more efficient, evidence-based guidelines for controlling KOA, guaranteeing that patients get optimum treatment customized to their specific requirements.

1.3 Aim:

The study's objective is to evaluate the efficacy of wall squats practice in strengthening training Along with conventional physiotherapy among the patient with knee osteoarthritis.

1.4 Objective:

- **General objective:**

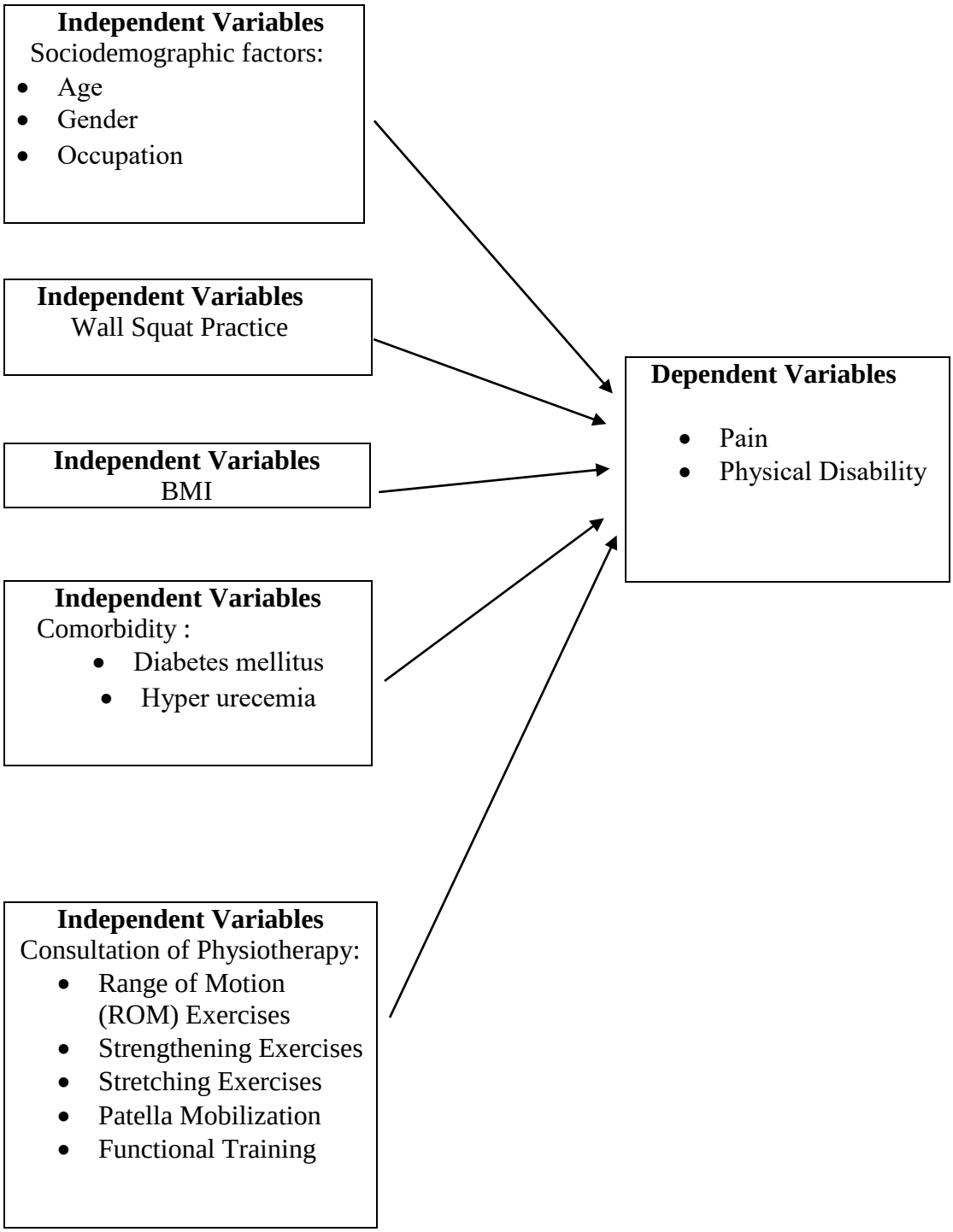
i. To evaluate the efficacy of wall squats practice in strengthening training along with conventional physiotherapy among patient with knee osteoarthritis .

- **Specific objectives:**

i. To explore The sociodemographic and baseline characteristics of the participants.
ii. To assess the level of pain among The control group and the experimental group of knee osteoarthritis patients by using the NPRS, or Numerical Pain Rating Scale before and after the intervention.
iii. To assess the level of disability among The control and experimental groups of knee osteoarthritis patients by using the Western Ontario and McMaster Universities (WOMAC) before and after the intervention.

1.5 Conceptual Framework

List of variables



1.6 Hypothesis

1.6.1: Hypothesis null (H0):

Wall Squats training along with usual physiotherapy is not effective than only usual physiotherapy for the treatment of individuals with Knee osteoarthritis. Here the initial and final mean differences between the experimental group and the control group are same.

$$Ho: \mu1-\mu2 = 0 \ \mu1 = \mu2$$

1.6.2: Alternative hypothesis(H_a):

Wall Squats training in along with usual Physiotherapy is more effective than only usua Physiotherapy for patients with osteoarthritis in the knee. Here The initial and final mean differences between the experimental and control groups are not same.

$$Ha: \mu1-\mu2 \neq \text{or } \mu1 \neq \mu2$$

Where,

Ho = null hypothesis
Ha stands for alternative hypothesis.
$\mu1$ is the mean difference in the initial evaluation.
$\mu2$ is the mean difference in the final evaluation.

1.7 Operational Definition

Knee Osteoarthritis, Wall Squat training, Conventional physiotherapy, strengthening program.

Knee Osteoarthritis

The degenerative joint disease known as knee osteoarthritis is typified through the progressive deterioration of the knee joint's articular cartilage and underlying bone, which results in pain, stiffness, swelling, and functional restrictions. In this research, KOA is defined by clinical symptoms and diagnostic criteria based on pain severity, reduced joint mobility, and imaging findings such as joint space narrowing or osteophyte formation.

Wall Squat Training

Wall squat training refers to a series of isometric exercises performed by maintaining a static squat position with the back supported against a wall. This exercise works the muscles in the lower limbs, especially the gluteal, hamstring, and quadriceps. For this study, wall squat training is defined as a structured exercise protocol involving specific durations, angles, and repetitions tailored to the individual's capacity to enhance muscle strength and joint stability in individuals with KOA.

Conventional Physiotherapy

Standard therapeutic techniques frequently used in the treatment of osteoarthritis in the knee are referred to as conventional physiotherapy. These consist of a mix of exercises (such as strengthening and range-of-motion exercises),manual therapy, electrotherapy (e.g., ultrasound or TENS), and education on activity modification. For this study, conventional physiotherapy is operationalized as a treatment plan prescribed by a qualified physiotherapist, implemented over a defined period, focusing on symptom alleviation and enhanced functionality in KOA patients.

Strengthening Program

An organised series of exercises intended to improve the strength and stamina of muscles, especially those supporting the knee joint, is called a strengthening program. A strengthening program is defined for the purposes of this study as a regimen that combines wall squat training with other strengthening exercises in traditional

physiotherapy with the goal of increasing lower limb strength, decreasing pain, and improving overall functional capacity in patients with osteoarthritis in the knee.

CHAPTER-II LITERATURE REVIEW

Osteoarthritis (OA) is a degenerative joint disease which affects millions of people worldwide and causes pain, stiffness, and functional limitations. The underlying pathophysiology of osteoarthritis includes synovial inflammation, subchondral bone alterations, and articular cartilage degradation, leading to considerable morbidity (Hunter & Bierma-Zeinstra, 2019, p. 1745).

Degeneration of cartilage in the sockets, a changeable reaction in subchondral bone, along with the contribution of auxiliary tissues throughout ligaments are the clinical hallmarks of osteoarthritis, menisci, capsules, and synovial membranes. Muscles around a joint (Cooper et al. 2013, p. 9135).

According to a separate study, osteoarthritis is the most frequent type of Localised articular cartilage is an indicator of arthritis degeneration in synovial joints, thickening of the joint capsule, and adjacent bone hypertrophy (osteophytes and subchondral bone sclerosis (Pas et al. 2013, p. 646).

Osteoarthritis, the predominant rheumatic inflammation typically weakens a synovial joint's articular cartilage and subchondral bone, that leads to in joint failure. Exercise therapy remainsa recognized non-pharmacological method for controlling osteoarthritis, designed contribute to better joint function, alleviate symptoms, and promote overall satisfaction of life. Wall squats and heel or calf raises are recognized for their effectiveness in mitigating the muscle linked to osteoarthritis (OA) (Fransen et al. 2015, p. 476).

Wall squats are a closed-chain exercise that mainly engages the quadriceps, hamstrings, and gluteal muscles, essential for knee joint stability. Wall squats have been shown to significantly lessen knee discomfort and enhance functional performance in people with osteoarthritis. A 12-week wall squat program effectively increased quadriceps strength and lessened levels of inflammation for people with osteoarthritis with their joints, consistent with a randomised controlled experiment conducted by (Chang et al. 2015, p. 1097).

Wall squats combined with traditional physiotherapy resulted in improved functional results compared to physiotherapy alone. These results highlight the significance of wall squats in fortifying essential muscle groups and alleviating joint stress (Wang et al. 2019, p. 8931).

The benefits of wall squats and heel lifts arise from many biomechanical and physiological mechanisms. Strengthening exercises diminish joint loading by improving muscle support around the affected joints, hence decreasing cartilage stress and slowing disease progression (Felson et al. 2017, p. 485).

Furthermore, these exercises enhance proprioceptive input, which is crucial for preserving joint stability and preventing future degeneration (Thorstensson et al. 2016, p. 818). Improved proprioception also alleviates movement-related anxiety, a typical obstacle to exercise for those with osteoarthritis. Maintaining fitness routines is essential to reaping long-term rewards.

Emphasized that structured and supervised exercise programs are more successful in promoting patient adherence and yielding lasting results (Silva et al. 2023, p. 3097).

By reducing physical function and mobility, knee osteoarthritis (KOA), an expanding degenerative disorder that primarily affects the elderly, severely lowers their quality of life. The degradation of articular cartilage, which causes joint discomfort, limited range of motion, fluid retention and stiffness occur hallmark of this condition (Hunter & Bierma-Zeinstra, 2019, p. 7496).

The need for improved treatment options is highlighted by the rising incidence of KOA, which is made worse by risk factors such age, obesity, and mechanical stress (Cui et al. 2020, p. 273).
Pharmacological approaches provide symptomatic relief; nevertheless, non-pharmacological interventions, including as physiotherapy and exercise programs, are acknowledged as essential therapies for managing KOA (Gly-Jones et al.2015, p. 1098).

This study evaluates the research looks at how wall squat training can be included into standard physiotherapy programs to help people with knee osteoarthritis (KOA) become stronger and function better.

Conventional physiotherapy is a widely recommended method for addressing knee osteoarthritis (KOA). It seeks to increase general mobility, relieve discomfort, and restore joint function. Physiotherapy treatments often include therapeutic exercises, manual medical care including electrotherapy. Exercises for rehabilitation are essential towards OA rehabilitation, since they emphasize muscular strengthening, range of motion augmentation, and balance improvement (Juhl et al. 2014, p. 986).

Manual treatment techniques, including joint mobilizations, seek to alleviate stiffness and restore normal joint mechanics, while electrotherapy methods, Transcutaneous electrical nerve stimulation (TENS), for example, helps control inflammation and pain (Bennell et al. 2015, p. 141).

Exercise therapy was found being especially advantageous in lowering discomfort and enhancing joint contribution to patients severe arthritis in the joint knee, underscoring its significance as a primary therapeutic strategy(Juhl et al. 2014 , p. 760). A key element in the treatment of KOA is muscle strengthening. One common feature of KOA is weakening in the quadriceps muscles, which increases the knee joint's wear and tear leading to discomfort in joint instability (Zhang et al. 2020, p. 727).

Strengthening exercises aim to improve muscle strength, reduce joint stress, and maximize functional outcomes. These exercises are quite effective in enhancing knee joint stability and reducing discomfort.

The results of a meta-analysis by (Goh et al. 2019, p. 1095), exercises for strengthening significantly improve physical function as well as decrease pain in individuals with osteoarthritis (KOA) of the knee. In rehabilitation procedures for knee osteoarthritis (KOA), the quadriceps muscles—which are essential for joint stability and stress absorption—are frequently the main focus.

Wall squat training is an isometric exercise that offers specific benefits for those with knee osteoarthritis (KOA). This exercise involves maintaining a static squat position with the back supported against a wall, engaging the quadriceps, hamstrings, and gluteal muscles. The wall squat is particularly advantageous for KOA patients since it is low-impact, minimizing joint stress while improving muscle activation (Daskapan et al. 2013, p. 584).

Isometric exercises, like wall squats, successfully improve muscle endurance and strength while reducing stress on the knee joint, making them suitable for those with joint pain or limited mobility. Additionally, Wall squats strengthen the muscles in the lower limbs, which improves functional activities like walking and stair climbing (Perraton et al. 2017, p. 225).

Studies have demonstrated that wall squat training is effective in helping people with osteoarthritis (KOA) in their knees. Mini-squats were found to be more effective than straight leg lifts in enhancing Functional performance and muscle strength among those with osteoarthritis in knee joints (KOA) (Daskapan et al. 2013, p. 5219).

The study demonstrated how well squat workouts work to lessen muscle weakness, which is a key element in the beginnings of KOA (Perraton et al. 2017, p. 1972) said that isometric exercises, such wall squats, are particularly beneficial for elderly individuals with knee osteoarthritis, since they provide a safe and effective means of improving lower limb muscle strength without exacerbating joint pain. Incorporating wall squat training with conventional physiotherapy regimens offers a synergistic approach for addressing knee osteoarthritis (KOA).

Conventional physiotherapy provides a comprehensive method for addressing pain, stiffness, and mobility limitations, while wall squats specifically target the muscular strength deficits associated with knee osteoarthritis (KOA). This all-encompassing approach may improve treatment results by addressing the condition's functional and clinical components . Wall squats can improve joint stability and quadriceps activation, which can reduce discomfort and improve physical function (Goh et al. 2019, p. 475).

Moreover, the simplicity and availability of wall squats may improve patient adherence to exercise programs, a crucial factor for achieving lasting results. Exercises that are easy to do and need little equipment are more likely to be adopted by patients, particularly those with limited mobility or restricted access to physiotherapy resources. Wall squats are easily accessible, making them a practical element of KOA rehabilitation programs, allowing patients to continue their exercise routines at home (Perraton et al. 2017, p. 451).

Knee osteoarthritis is a complex and heterogeneous condition requiring a multifaceted treatment approach. Conventional physiotherapy, coupled with targeted strengthening

exercises such as wall squats, may improve outcomes in individuals with knee osteoarthritis (KOA). Wall squat training provides a low-impact, effective method for addressing muscular strength inadequacies, whilst conventional physiotherapy covers the broader aspects of KOA rehabilitation.

When combined, these treatments may restore the general level of life, minimise discomfort, while improving joint function for KOA patients. Further research is necessary to establish standardized protocols for integrating wall squats into physiotherapy regimens and to assess their long-term efficacy. Educational activities emphasizing the significance of exercise in osteoarthritis management enhance adherence and results (Hinman et al. 2015, p. 562).

Creating personalized exercise regimens that correspond with patient preferences and abilities is crucial for improving adherence and therapeutic outcomes. Despite the increasing evidence endorsing the effectiveness of wall squats and heel raises in osteoarthritis management, substantial gaps persist in the literature. Research has insufficiently explored the ideal frequency, intensity, and duration of these exercises across various stages of osteoarthritis.

The effect of integrating these activities with supplementary therapy, such as dietary supplements or psychiatric treatments, is little understood. Subsequent research must concentrate on rectifying these deficiencies to provide more thorough and customized treatment approaches. The precise interaction of osseous elements like the ligaments, tendons, muscles, and joint capsule comprising the femur, tibia, patella, and fibula, that attach towards the intricate anatomy and sophisticated The knee joint's operational function . One function remains attributed to a limited number of anatomical features. Each knee's function results from the intricate interplay of multiple anatomical systems (Hirschmann & Muller, 2015, p. 5497).

The patellofemoral, proximal. The knee joint consisted primarily of the medial and lateral tibiofemoral joints. As a trochoging lymus, A gliding hinge joint is the knee joint. There are six different ways that the joint with the knee can move. The joint located in the knee can rotate in three different ways: flexion-extension, internal-external rotation, and varus-valgus (Musumeci, 2017, p. 8197).

A 2010 study shown that, in knee osteoarthritis, exercise, especially dynamic strengthening activities, produces small-to-moderate improvements in pain and functionality. Moreover, exercise trials are often well-received by patients and provide reduced risk. In contrast, exercise seems to alleviate pain in individuals with hip osteoarthritis, but its effect on functioning remains ambiguous (Iversen, 2010, p. 1398).

Research suggests that 20% to 70% of persons with knee osteoarthritis have quadriceps weakness. The musculature of the lower limb functions as a natural support for the knee joint; hence, A relative insufficiency of the hamstrings relative to the quadriceps, as measured by the hamstrings: quadriceps (H: Q) ratio, or weakness of the quadriceps may cause substantial muscle dysfunction. The chance of developing osteoarthritis in the knee is increased by joint injury. In comparison to healthy controls, men had a five to six times heightened probability of knee osteoarthritis resulting from a knee injury, while women had a three times higher chance. Damage suffered by the anterior cruciate ligament is main concern indicator of osteoarthritis in the region of the knee. (15-20%) (Hafez et al. 2014, p. 113).

Enhancements in lower extremity muscular strength or peak power, together with decreased specific pain levels, may be significant and act as a robust predictor of functional capacity (Heijink et al. 2012, p. 300).

The Framingham Osteoarthritis Study revealed that 6.8% of patients had radiographic osteoarthritis in the hand, whereas 19% demonstrated it in the knee. The Johnston County Osteoarthritis Project indicated that 28% of African American and Caucasian men, as well as females, had both hip and knee osteoarthritis. This may have arisen from differences in genetics, anatomy, or occupation. The prevalence of symptomatic osteoarthritis has decreased, since it is defined by a constellation of symptoms including pain, soreness, and stiffness, by radiographic findings (Hafez et al. 2013, p-906).

According to Framingham, symptomatic hand osteoarthritis (OA) affects 26% of women and 13% of men, while knee OA affects 7% of people. In the Johnston County cohort, The rates estimated prevalence of symptomatic hip as well as knee osteoarthritis These numbers were 10% and 17%. However, not all patients with radiographic osteoarthritis have symptoms. Additionally, structural and clinical illness risk factors (Johnson et al. 2014, p. 968).

Despite the complexity of osteoarthritis (OA), genetic factors have been recognized as important predictors of the illness. Diverse data suggests a genetic influence for osteoarthritis, including epidemiological studies on familial history and clustering, twin studies, and research into rare genetic illnesses. In radiographic osteoarthritis (OA) of the hand and knee in women, hereditary variables contribute 39% to 65%, around 26% in hip OA, and nearly 70% in spinal OA, as shown by conventional twin studies. The statistics reveal that osteoarthritis (OA) has a heritability of 50% or higher, implying that biological variables contribute to half of the population's variance in disease susceptibility factors (Vaegter et al. 2019, p.129).

A chronic degenerative joint condition, knee osteoarthritis (KOA) significantly impairs mobility, autonomy, elevate life quality, notably for elderly people. Millions more people worldwide suffer from this type of arthritis, which is most prevalent in those 50 and older (Hunter & Bierma-Zeinstra, 2019, p. 3429).

The progressive deterioration KOA is marked as inflammation affecting the synovial membrane, subchondral bone remodelling, and articular cartilage, leading to in discomfort, rigidity, lower range of mobility, and diminished functionality. That worldwide rise in KOA incidence is mostly ascribed to an aging demographic, sedentary habits, and escalating obesity rates, all of which are established risk factors (Cui et al. 2020, p. 419).

This escalating health challenge requires efficient, evidence-supported treatment measures. Although pharmaceutical and surgical interventions are available, For the long-term treatment of KOA, non-pharmacological approaches—particularly physiotherapy and exercise-based programs are crucial (Gly-Jones et al.2015, p. 617).

One perhaps the finest important interventions for knee osteoarthritis (KOA) is traditional physiotherapy. To mitigate irritation, optimise joint activity, and promote mobility, it incorporates a variety of techniques, including manual treatment, electrotherapy, therapeutic exercises, and patient education. With systematic research highlighting It's effective in minimising inflammation along with improving functionality, the benefits during physical therapy for knee osteoarthritis (KOA) are well-established (Bennell et al. 2015, p. 919).

Therapeutic activities are essential in physiotherapy for knee osteoarthritis, addressing the underlying deficiencies that lead to pain and dysfunction. These workouts aim to enhance muscular strength, joint stability, and flexibility. Enhancing the quadriceps and other lower-limb musculature is crucial, since muscular weakness significantly contributes to the advancement of KOA (Goh et al. 2019, p. 608).

According to research, those who engage in regular therapeutic activities report far lower levels of pain as opposed to those who lack them and higher physical function (Juhl et al. 2014, p. 802).

To reduce joint stiffness and improve mechanical performance, physical procedures for therapy like joint and muscle manipulations mobilisations are frequently utilised in conjunction with exercises. To reduce pain and inflammation, electrotherapy methods including Transcutaneous electrical nerve stimulation (TENS) with ultrasound therapy are frequently employed (Perraton et al. 2017, p. 791).

These therapies are supplemented by patient education, which highlights activity moderation, weight control, and compliance with home exercise regimens. Collectively, these elements provide a holistic physiotherapy strategy that tackles the complex characteristics of KOA. Muscle strengthening is essential for managing KOA, since weakness in the quadriceps and other lower-limb muscles is closely linked to disease development and joint instability. The quadriceps are essential for absorbing mechanical stresses and supporting the knee joint during weight-bearing movements. Muscle weakness elevates joint tension and accelerates cartilage deterioration, resulting in intensified discomfort and functional impairments (Zhang et al. 2020, p. 309).

Strengthening exercises are designed to enhance muscular strength, alleviate joint tension, and optimize functional results. These workouts include both isometric and isotonic movements, which address distinct facets of muscular function. Isometric workouts include sustaining a static muscle contraction without joint movement, while isotonic exercises consist of dynamic muscle contractions over a range of motion.

Both training approaches have demonstrated effectiveness in improving muscle strength and reducing knee osteoarthritis (KOA) symptoms. Strengthening activities were demonstrated by (Goh et al. 2019, p. 154) to substantially diminish pain while

improving activity levels in those with arthritis in the knees (KOA). This underscores the importance of strengthening exercises in rehabilitation programs.

Wall squat training is an isometric exercise that offers a low-impact but extremely efficient approach to fortifying the quadriceps, hamstrings, and gluteal muscles. In contrast to dynamic workouts, wall squats require maintaining a static squat posture with the back braced against a wall. This configuration reduces joint stress while facilitating prolonged muscular contraction, rendering wall squats especially appropriate for those with knee osteoarthritis who may find high-impact movements challenging (Daskapan et al. 2013, p. 408).

Wall squats aim to engage the muscles that support the knee joint, enhancing joint functionality and alleviating discomfort. The isometric characteristics of the exercise improve muscular endurance and activation, while the wall support reduces axial stress on the knee, hence reducing the likelihood of discomfort or damage. These attributes provide wall squats an optimal workout for persons with diverse pain levels and mobility constraints. Moreover, wall squats may be readily adjusted to accommodate the specific requirements of individual patients, guaranteeing their accessibility and efficacy during all phases of KOA. The benefits of wall squat training for people with knee osteoarthritis (KOA) have been demonstrated in numerous research (Siva et al.,2023, p.34).

Daskapan et al. (2013, p. 2087) compared straight leg lifts and wall squats, to individuals whose knees have osteoarthritis (KOA)concluding that wall squats were superior in enhancing muscular strength and functional results.

Indicated that isometric workouts, such as wall squats, were especially advantageous for older persons with knee osteoarthritis (KOA), offering a secure and efficient method for developing lower limb muscles without worsening joint discomfort (Perraton et al. 2017, p. 1985).

The use of wall squat training into standard physiotherapy programs provides a synergistic method for treating knee osteoarthritis (KOA). Traditional physiotherapy offers a comprehensive approach to managing pain, stiffness, and mobility restrictions, while wall squats especially focus on the muscular strength deficiencies pertinent to knee osteoarthritis (KOA). This integrated method targets both the symptomatic and

functional dimensions of the illness, improving overall therapy results. A physiotherapy program using wall squats, manual treatment, and electrotherapy may enhance quadriceps strength, improve joint stability, and significantly decrease pain and impairment. This multimodal strategy corresponds with contemporary findings indicating that integrated therapies are more efficacious than singular modalities in controlling KOA (Zeng et al. 2021, p. 289).

A comprehensive pointed out the worth of using several therapy modalities to get best results in KOA rehabilitation. The ease and availability of wall squats make them a desirable component of physiotherapy treatments. Patients may execute wall squats at home with minimum equipment, facilitating adherence to exercise protocols and providing continuity of treatment (Juhl et al. 2014, p. 4135).

Enhanced adherence is especially crucial in the realm of chronic illnesses such as KOA, where enduring dedication to rehabilitation is essential for prolonged effects (Perraton et al. 2017, p. 518).

Wall squats, or wall sits, are a prevalent workout used in rehabilitation programs to fortify the lower extremities, particularly the quadriceps. Wall squats are an isometric workout whereby the user descends against a wall into a squat until the knees make a 90-degree angle, sustaining the posture for an extended duration. The wall offers support to the back, alleviating axial strain on the knee joints while facilitating the engagement of essential muscle groups, including the quadriceps, hamstrings, and gluteals.The advantages of wall squats are mainly due to isometric muscular contractions, which enhance muscle endurance and strength (Daskapan et al. 2013, p. 135).

CHAPTER-III METHODOLOGY

3.1 Study Design

The outcomes of wall squat training combined with conventional physiotherapy on Throughout the present study, individuals with arthritis in their knees (KOA) were assessed utilising a Randomised Controlled Trial (RCT) approach. The study group, which underwent conventional physiotherapy in addition to wall squat training, included another control group, which received only traditional physiotherapy, were assigned at random to the participants. To ensure that neither participants nor assessors were aware of group allocations, a blind assessment approach was employed, potentially minimising bias. 15 therapy sessions were included in the study, and The Numeric Pain Rating Scale (NPRS) and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) established used for pre- and post-test assessments. These instruments evaluated changes in pain, knee stability, and functionality before to and after to the intervention. This technique enabled a direct comparison of the effects of wall squat training to conventional physiotherapy, guaranteeing valid and generalizable findings about the usefulness of integrating wall squat exercises with traditional physiotherapy towards the cure of osteoarthritis of the knee.

3.2 Study Place

The research was carried out in SCMST stands for Saic College of Medical Science and Technology.

3.3 Study Site

This research was conducted at the IBN Sina Diagnostic and Consultation Center, Uttara Branch, Dhaka, Bangladesh.

3.4 Study period

The trial lasted for 1 year. This research was carried out between September 2023 and August 2024.

3.5 Study Population

The hospital patient received treatment in the physiotherapy department's IBN Sina Hospital & Diagnostic Center, Uttara Branch, Dhaka. The patient received a Osteoarthritis diagnosis.

3.6 Sampling Technique

The research used a hospital-based random sampling technique to enlist subjects from the Physiotherapy Unit at IBN Sina Hospital & Diagnostic Center, Uttara Branch, Dhaka. Qualified participants were selected from the unit's patient register. To reduce selection bias and improve sample representativeness To make certain every single capable applicant received a similar likelihood to become selected, random sampling was employed The following approach contributed to a more accurate and generalizable study population, providing reliable data for evaluating the effect of wall squat training combined with conventional physiotherapy on knee osteoarthritis patients.

3.7 Sample size

Based on the expected minimal clinically significant differences (MCID) in pain using the NPRS scale (22.15 ± 0.99), The sample size under the study included 38 participants was determined (Ben Darlow, 2020, p. 8730). Due to the study's 1:1 enrolment ratio, 90% statistical power, 0.05 type I and 0.9 type II inaccuracy frequencies (alpha value), 19 volunteers with osteoarthritis in their knees were divided into each of the study's 38 groups 30 individuals were selected due to time constraints. ClinCalc software was used to do a power analysis that concentrated on the main finding of the osteoarthritis evaluation.

$$k = \frac{n_2}{n_1} = 1$$

$$n_1 = \frac{(\sigma_1^2 + \sigma_2^2/K)(z_{1-\alpha/2} + z_{1-\beta})^2}{\Delta^2}$$

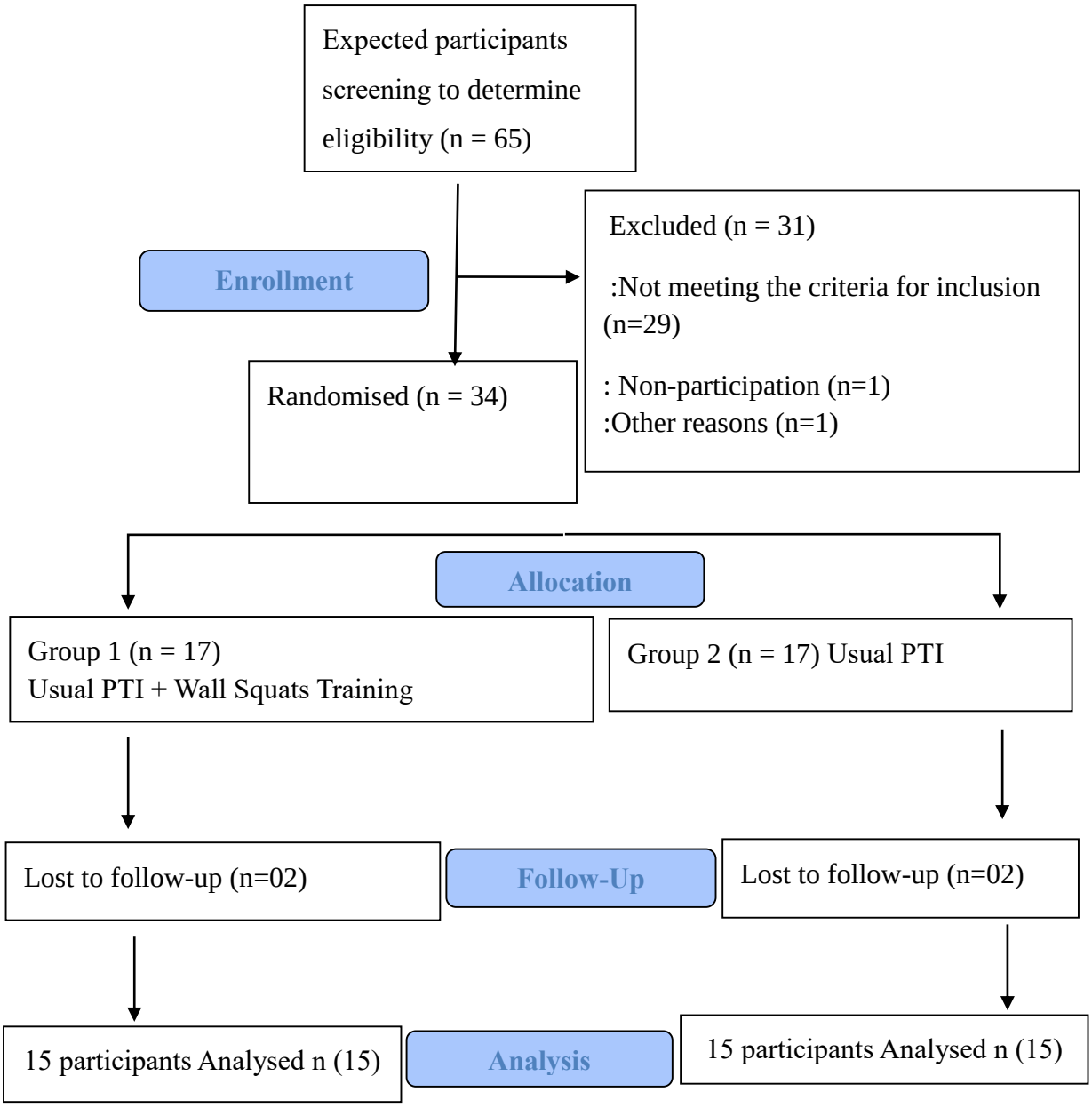
$$n_1 = \frac{(0.99^2 + 0.99^2/1)(1.96 + 1.28)^2}{1.03^2}$$

$$n_1 = 19$$

$$n_2 = K * n_1 = 19$$

$\Delta = |\mu_2 - \mu_1|$ = absolute difference between two means
σ_1, σ_2 = variance of mean #1 and #2
n_1 = sample size for group #1
n_2 = sample size for group #2
α = probability of type I error (usually 0.05)
β = probability of type II error (usually 0.2)
z = critical Z value for a given α or β
k = ratio of sample size for group #2 to group #1

Figure 1: CONSORT Frame work of Randomized Controlled Trial



3.8 Eligibility criteria:

3.8.1 Requirements for inclusion:

- A patient suffering osteoarthritis in their knees.
- Both men and women are present.
- The age range is 40–75 years old
- Pain in either of the two of the knee joints.
- Patient with heart disease and diabetic mellitus
- Subjects who are open to participating part.

3.8.2 **Requirements for exclusion**:

- Any previous or most recent foot, tibia, fibula, or femur fractures or surgeries.
- A diagnosis of any medical condition, such as carcinoma, etc.
- All previous or current The past that is of psychiatric or psychological treatment.
- Severe disability such as walking disability with or without crutches, contraindications for physical modalities.
- Subjects with neurological impairments.

3.9 Data collection tools

The information gathering equipment included a form used to gather data, updated permission type, organised open and closed sessions ended questionnaire.

3.10 Measurement tools

Numerical Pain Rating Scale

The NPRS, or Numerical Pain Rating Scale, is a commonly applied instrument for evaluating the level of pain reported by patients. This is a subjective self-report instrument in which participants evaluate their pain on a scale between 0 and 10. A score of 0 signifies that there is no irritation, but a score regarding 10 indicates the most excruciating suffering conceivable. The NPRS is often used in clinical environments to evaluate pain intensity before to and during an intervention, offering a simple but efficient method for quantifying pain. It is an efficient and dependable instrument, making it suitable for routine clinical assessments in individuals suffering from conditions such as osteoarthritis in the knee. The NPRS monitors variations in pain intensity over time, making it a crucial metric for assessing therapy efficacy.

Western Ontario McMaster University and Osteoarthritis Index (WOMAC)

An accurate assessment procedure designed specifically for people with osteoarthritis is the Western Ontario and and McMaster University Osteoarthritis Index (WOMAC). The WOMAC's 24 categories are separated out into three levels: pain, stiffness, and physical function. That pain subscale evaluates how much pain is experienced during different activities, while the stiffness subscale gauges the degree of joint stiffness. The physical function subscale evaluates the challenges encountered in executing everyday tasks as a result of osteoarthritis. A 5-point scale, ranging from 0 (none) to 4 (severe), is used to evaluate each item. The sum of the scores for each individual item is used to determine the overall score; a larger number indicates more severe symptoms. In clinical trials and research, the WOMAC scale is widely used to evaluate how well treatments work to reduce aggravate brittleness, and better bodily functioning in individuals developing osteoarthritis in the knees. It provides a thorough understanding

of how osteoarthritis affects day-to-day functioning, which makes it a crucial tool for evaluating treatment outcomes.

3.11 Questionnaire

The questionnaire was created with the supervisor's guidance and approval, according to certain requirements. NPRS & WOMAC Scale were included.

3.12 Data Collection Procedure

The information collecting process for this investigation was contained many systematic steps: patient assessment, initial documentation, therapeutic implementation, and concluding documentation. Thirty volunteers who met the requirements for inclusion were gathered and divided into two groups of fifteen each at random. While regular physical treatment was given to the control group alone, while the experimental group got standard physiotherapy combined with wall squat training. Each patient received 15 sessions of treatment. Prior to starting treatment, a pre-test was conducted utilising The Numerical Pain Rating Scale (NPRS) and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) to assess baseline pain, stiffness, and functional ability. These criteria have been utilised to determine the state of knee discomfort in the joint or functional ability. After that 15 sessions, a post-test was administered using the same metrics to assess pain and functional changes.

3.13 Data analysis

Inferential and descriptive analyses were carried out utilising SPSS 25.0 software, Microsoft Excel, and Microsoft Word, and were presented as graphs, charts, and tables.

3.13.1 Statistical test

In order to arrive at significant conclusions, statistical analysis entails the methodical arrangement and assessment of data using mathematical techniques (DePoy & Gitlin, 2015). The experimental and control groups' trunk results, physical impairment, and pain were analysed using The assessment of Mann-Whitney U was used statistic between-group inspection. When evaluating non-parametric data discrepancies between independent groups, this test works especially well. The Evaluation with Wilcoxon signed-rank was used to testing among the team to assess how All of them group's pain and disability levels changed from before to after the intervention.

3.13.2 Significant level

The "p" value was calculated to assess the research's relevance. The probability of the experimental investigation's results is shown by the value of p. The proposed precision of outcomes is indicated by A likelihood value 95% was set as the significance level. p is less than A significance level of 0.05 is acceptable indicates the experiment's rating magnitude; in health care research, A fewer than 0.05 p-value indicates a significant outcome. The results are actually deemed significant while the p-value is less than or equal to the significance criterion (DePoy and Gitlin, 2015).

3.14 Interventions:

Dosage: The experimental group's participants had one hour of wall squat training in addition to standard physical therapy At least three times each week lasting five weeks, for A number of fifteen sessions. For that same amount during time and at the same frequency, the control group only received standard physical therapy (Bennell et al. 2013, p. 1028; Fransen et al. 2015, p. 1897).

Experimental Group: Treatment of exercises are –

1.Wall Squat Training:

Participants performed 3 sets of 10-15 repetitions of wall squats to strengthen the quadriceps, hamstrings, and gluteal muscles, crucial for knee stability (Adediran et al. 2021, p. 1287).

A fantastic isometric lower-body workout that tones your quadriceps, hamstrings, glutes, and calves is the wall squat, sometimes referred to as the wall sit. They also aid in enhancing core stability and muscle endurance.

How to Squat on a Wall : a)Initial Position: Place your feet about two feet from a wall and place your back against it. Toes should point slightly outward, and feet should be hip-width apart. b)Bring Yourself Down: To sit like you're on an invisible chair, Down the wall, move along the back once your thighs contact parallel to the floor. Instead of being past your toes, your knees should be just above your ankles. Maintain a flat back on the wall and an active core. c)Maintain the Role: Depending on your level of fitness, hold for 15–60 seconds. Maintain a steady breathing pattern and relaxed shoulders. d)Get Back to Standing: Return to a standing position by slowly sliding up the wall. For two or three sets, rest and repeat.

2.Conventional Physiotherapy

Fig : 1 Wall squats Practice

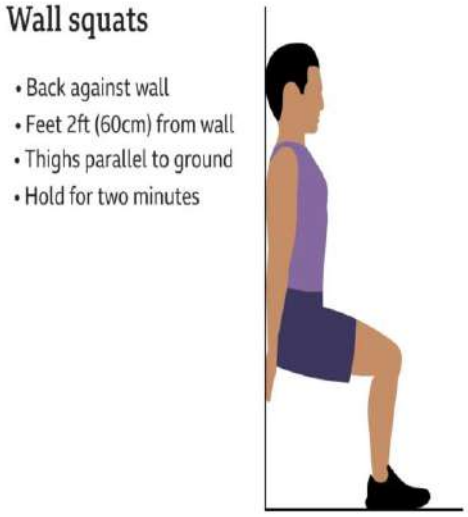


Fig: 2 Wall squats Practice

Conventional physiotherapy:

Intervention	Description	Repetitions	Frequency
Exercises to Range of Motion (ROM)	Gentle knee movements To boost your mobility or reduce stiffness	10-15 reps per exercise	3 times per session
Strengthening Exercises	Exercises like leg lifts and quadriceps sets to strengthen knee muscles	10-15 reps per exercise	3 times per session
Stretching Exercises	Stretching of quadriceps, hamstrings, and calves to enhance flexibility	20-30 seconds per stretch	2-3 times per session
Patella Mobilization	Techniques to improve patellar movement and reduce pain	5-10 repetitions per technique	1-2 times per session
Functional Training	Exercises like partial squats and gait training to improve daily function	10-15 reps per exercise	2-3 times per session

3.15 Ethical Consideration

The Bangladesh Health Professions Institute's (BHPI) Institutional Review Board (IRB) received the study proposal and approved it. The project was approved by the IRB following a defence. Prior to data collection, all Both verbally and in writing consent with knowledge were provided by the subjects. In order ensure ethical conformity, the study followed with the guidelines set by the World Health Organisation (WHO) and the Bangladesh Medical Research Council (BMRC).

Permission from details appropriate authorities was acquired prior to data collection in order to ensure participant safety during the study. People were allowed to continue receiving their regular treatment for any additional ailments as needed in order to avoid moral conundrums. Before participating, each subject received a thorough explanation of the experiment and submitted an authorisation statement.

CHAPTER-IV RESULTS

In this study the researcher used comparison of baseline characteristics, frequency table and description of the variables to present the result of the study.

4.1: Baseline Characteristics

Table 1: Comparison of the participants' baseline characteristics

variable	Experimental group	Control group	P
Age	59.07± 16.68	53.40± 8.95	.093
BMI(score)	25.11± 3.69	26.03± 4.09	.520
NPRS PRE score	7.678.13±1.63	8.137.67± 1.302	.408
WOMAC PRE score	69±3.25	71.3369±1.98	.035

In this study, the control and experimental groups were similar in most baseline characteristics, including age (53.40 ± 8.95 vs. 59.07 ± 16.68 years, p = 0.093), BMI (26.03 ± 4.09 vs. 25.11 ± 3.69, p = 0.520). Pain levels (NPRS pre-treatment) were also similar (8.13 ± 1.302 vs. 7.67 ± 1.63, p is a value of 0.408). Although there was a remarkable variation on WOMAC pre-treatment scores (71.33 ± 1.98 vs. 69.00 ± 3.25, p = 0.035), indicating better baseline knee function in the experimental group.

4.2 Socio-demographic information Of the participants :

4.2.1 Gender of the participant based on males and females

The study's participant gender distribution shows that most of the participants were female.with 21 participants (70%), while 9 participants (30%) were male. This indicates a higher representation of females compared to males in the study sample.

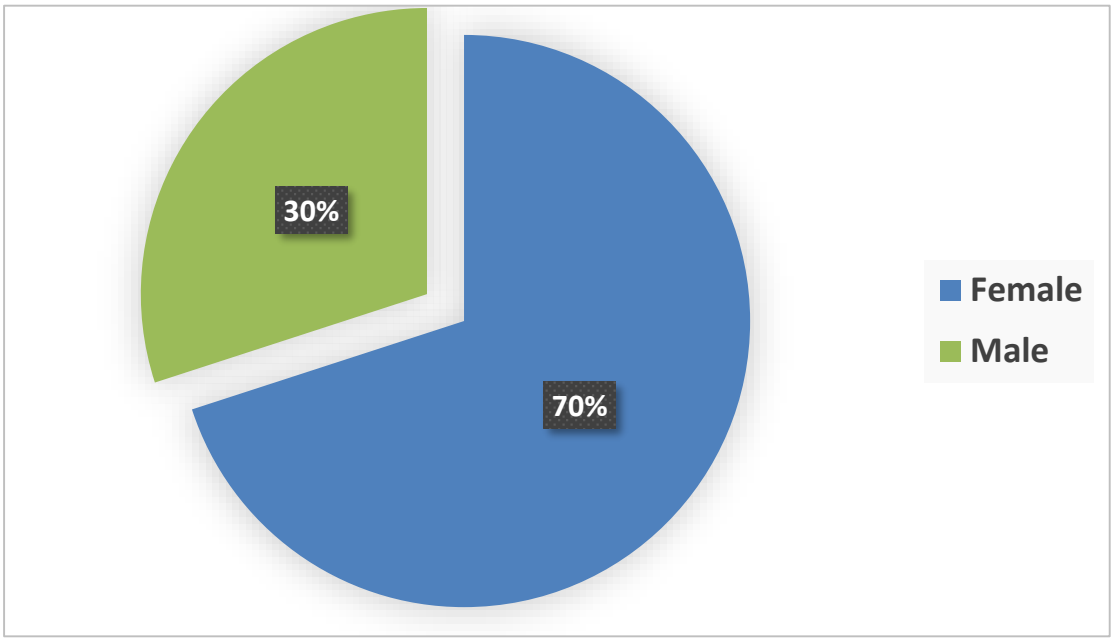


Figure 2: Participants' genders according to male and female

4.2.2 Marital status of participants based on married and unmarried:

The marital status distribution of the participants indicates that the majority were married, with 28 participants, while only 2 participants were unmarried. This highlights a significant predominance of married individuals in the study sample.

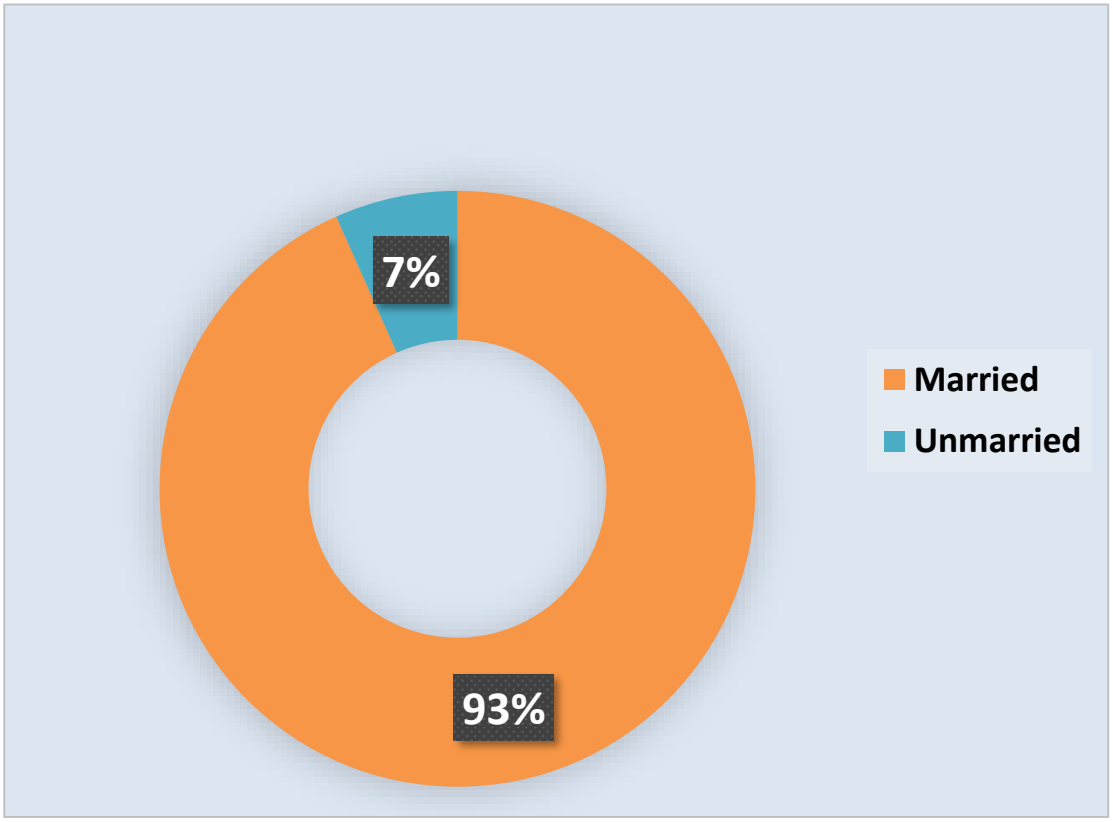


Figure 3: Marital status of participants based on married and Unmarried

4.2.3 Living area of participants based on urban and rural:

The regarding living area distribution of the participants shows that the majority, 29 participants, were from urban areas**,** while only 1 participant was from a rural area**.** This indicates a significant predominance of urban residents in the study sample.

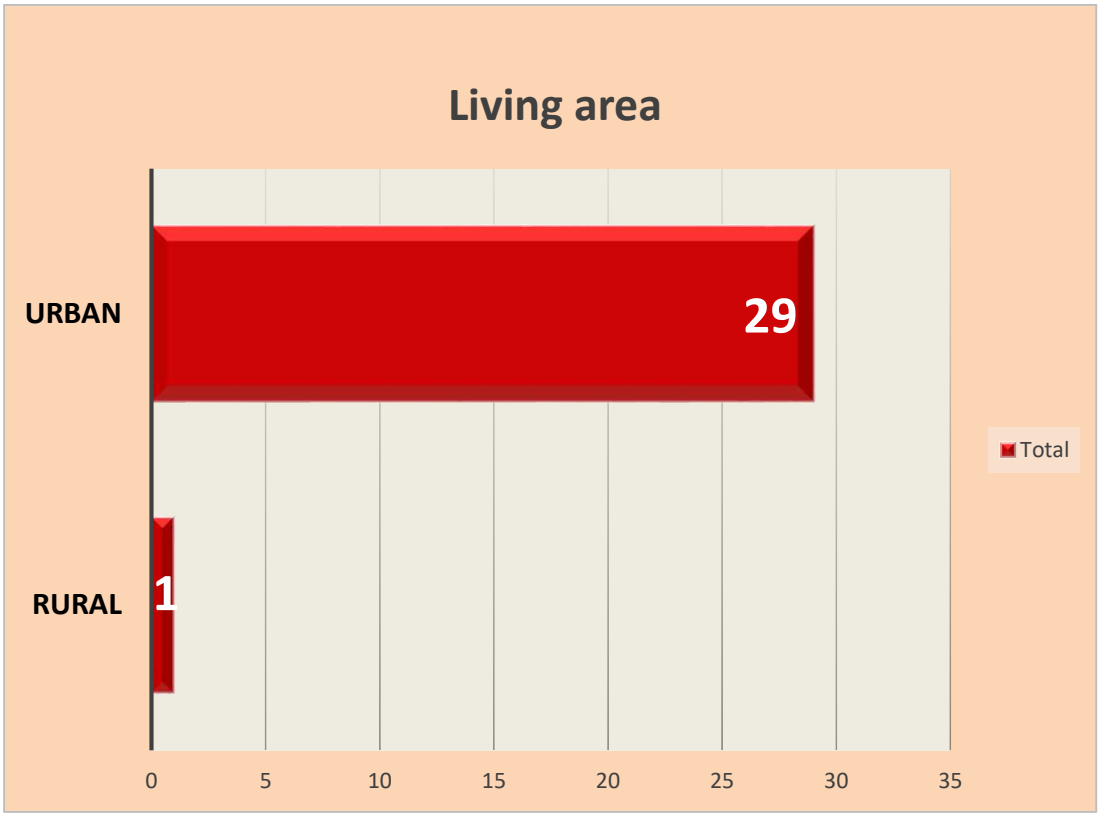


Figure 4: Participants' living areas by urban and rural

4.2.4 Living space of participants according to one or both knee joints:

The distribution of affected legs among the participants shows that 18 participants had both legs affected, while 12 participants had only one leg (a foot) affected**.** This indicates that the majority of the participants experienced bilateral leg involvement.

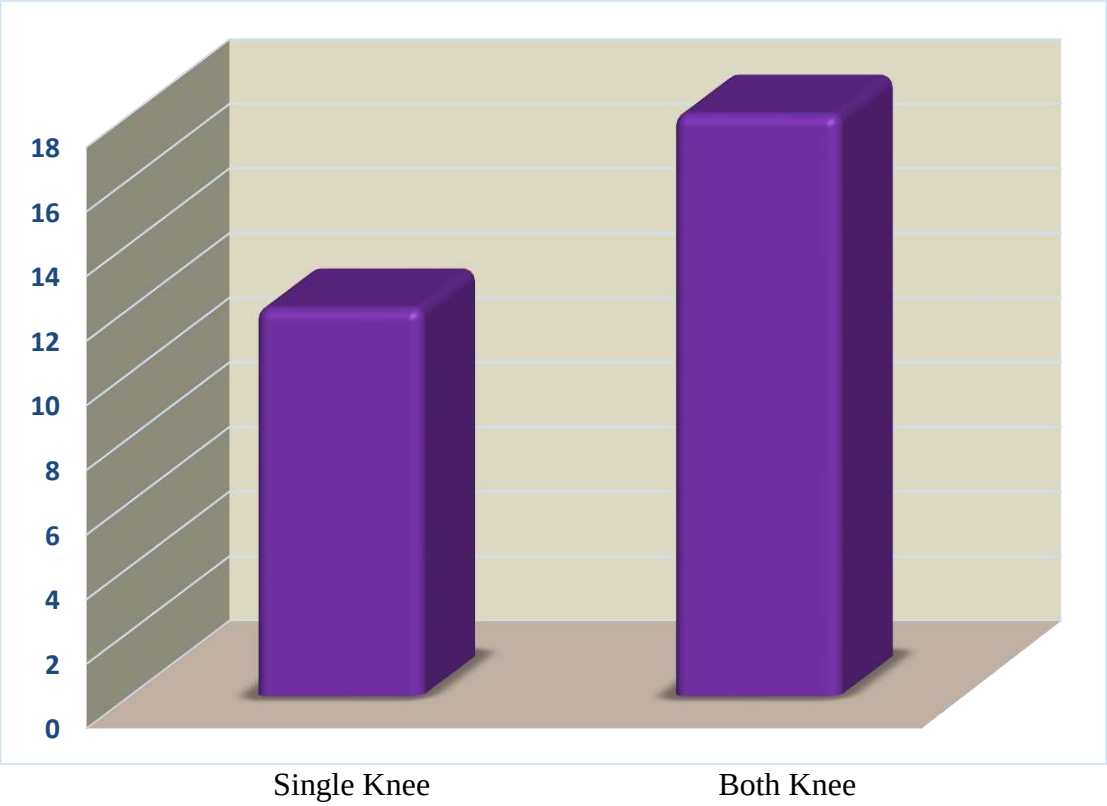


Figure 5: Affected knee of participants based on Single knee and Both Knee

4.2.5 Occupation of participants based on students, service holder housewifes, doctors, businessman or others :

The occupational distribution of the participants indicates that the majority were housewives**,** with 14 participants**.** This was followed by service holders (6 participants) and businessmen (5 participants). Additionally, 3 participants were categorized under "others," while 1 participant each was a doctor and a student**.** This highlights that housewives constituted the largest occupational group in the study sample.

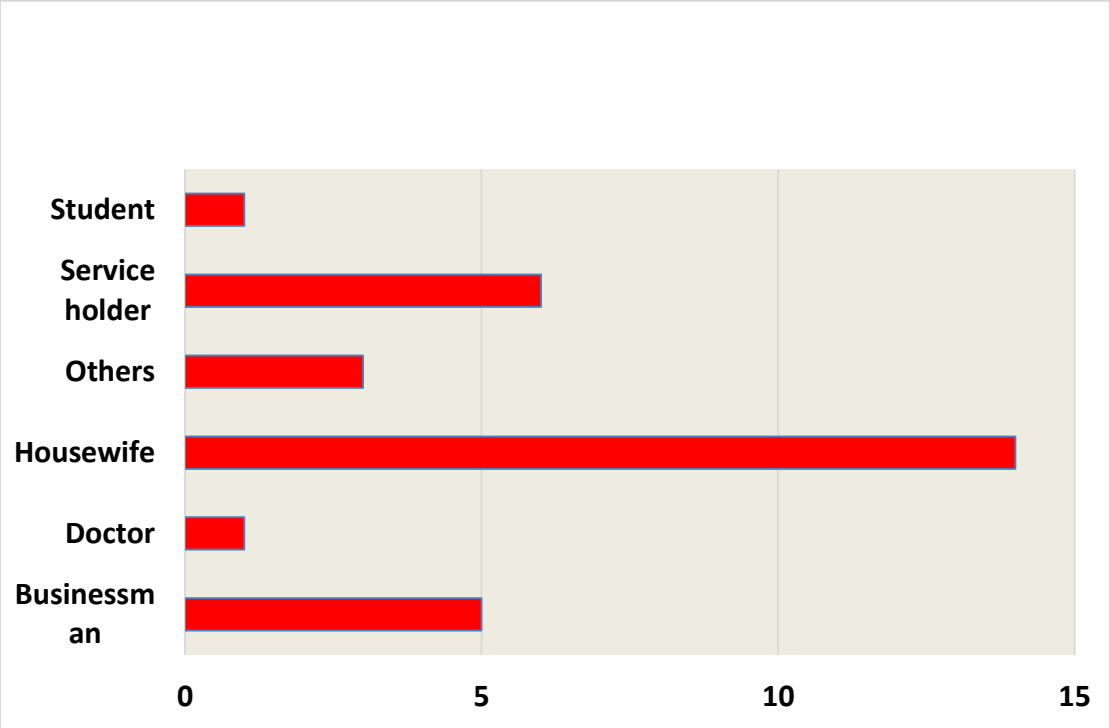


Figure 6: Occupation of participants based on students, service holder, housewifes, doctors, businessman or others.

4.2.6 Associated disease:

The distribution of comorbidity associated diseases among the participants shows that 13 participants had multiple associated diseases, making it the most prevalent category. 8 participants reported having no associated disease, while 5 participants had diabetes mellitus (DM)**,** and 3 participants had hyper eurectomy. Additionally, 1 participant reported having an other condition. This highlights that multiple diseases were common among the participants, followed by a notable portion without any associated conditions.

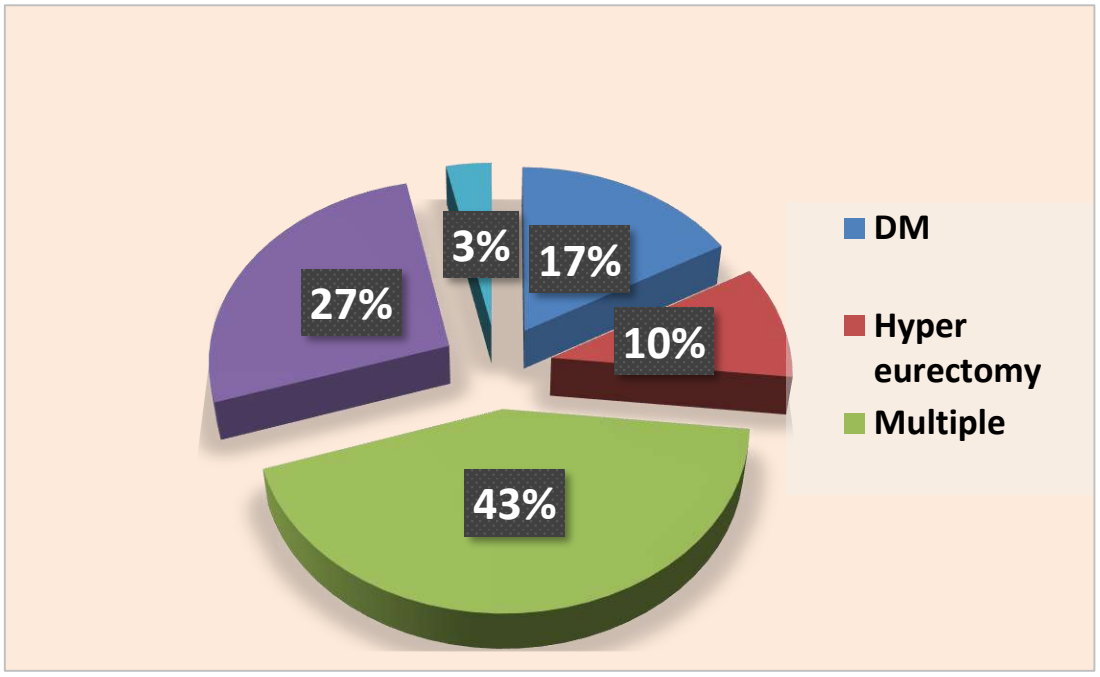


Figure 7: Associated disease based on DM, Hyper eurectomy, Multiple, Others and None.

4.3 Pain and Disability Related Information

4.3.1 Mann Whitney U test:

Table 2: Between group Difference of pain level experimental and control group of NPRS Scale after treatment

	Category of participants	N	Mean rank	Mann Whitney U score	P
Difference between NPRS	**Experimental**	15	14.63	99.50	.539
	Control	15	16.37		
	Total	30			

The test uses Mann-Whitney U Test was used in this study towards evaluate The variations within the Control and Experimental groups. Each group included 15 those who participated among sample. The groups that were experimental and control had mean rankings from 14.63 and 16.37, respectively. The computed p-value was 0.539 while 99.50 constituted the Mann-Whitney U grade. The obtained p-value shows that there is not a statistically significant variance among each of the groups. which has become higher compared with each other generally accepted 0.05 being a significant value. Thus, we draw that conclusion that The analysed outcomes among the Trial and Control groups did not differ considerably because of various results.

4.3.2 Mann Whitney U test:

Table 3: Between group Difference of disability levels experimental and control group of WOMAC Scale after treatment

	Category of participants	N	Mean rank	Mann Whitney U score	P
Difference between WOMAC	**Experimental**	15	8	120.00	.0011
	Control	15	23		
	Total	30			

It made use of the Mann-Whitney U test in this study with examine the variations within the Control and Experimental groups concerning WOMAC scale. Each group included 15 participants in the sample. The groups composed of experimental and control had mean rankings on 8 and 23, respectively. A p-value of 0.000 and a Mann-Whitney U score of 120.00 were determined. The outcome is below the 0.05 standard deviation, demonstrating whether the finding is statistically important. cutoff. With details Control group displaying higher mean ranks than the Experimental group, this suggests a considerable difference between the two different groups according to the WOMAC scale.

4.3.3 Wilcoxon signed rank test

Table 4: Between within group difference of pain in NPRS Scale pre and post treatment of experimental group after the intervention

Pretest-Posttest NPRS scores	N	Means Rank	Sum of Ranks	Wilcoxon signed rank test based on Z rank	P-Value
Negative Ranks	15	8.00	120	-3.530	.0011
Positive Ranks	0[c]	0.00	0.00		
Ties	0[d]				
Total	15				

The signed-rank Wilcoxon test was implemented in this study to examine how That NPRS (Numerical Pain Rating Scale The pre test and post test scores were different). There were fifteen people in the sample. With a mean rank of 8.00 and a total of 120 ranks, the study showed that there were 15 negative ranks. The data showed no positive ranks or ties. The p-value was 0.00 and The assessment statistic (Z-rank) was -3.530. There's a statistically Significant distinction within the NPRS outcomes between the pre test and post test, as indicated by This p-value being less than 0.05. In particular, the negative rankings imply that participants' pain levels considerably dropped from the pre test to the post test.

Table 5: Between within group difference of pain in NPRS Scale Before and after the control group's therapy after the intervention

Pretest-Posttest NPRS scores	N	Means Rank	Sum of Ranks	Wilcoxon signed rank test based on Z rank	P-Value
Negative ranks	15[b]	8:00	120.00	-3.447	.001
Positive Ranks	0[c]	.00	.00		
Ties	0[d]				
Total	15				

The change in NPRS (Numerical Pain Rating Scale) ratings between the pre test and post test measurements was evaluated in this study using the Wilcoxon signed-rank test. There were fifteen people in the sample. There were 15 negative ranks, according to the data, with a mean rank of 8.00 and a total rank of 120.00. The data did not show any positive ranks or ties. The determined p-value was 0.001 and the Z-rank statistic was -3.447. The result is statistically significant, showing a significant drop in pain levels from the pre test to the post test, because Their p-value is below 0.05. The significant p-value as well as the existence of negative ranks indicate that the intervention successfully decreased the participants' pain levels.

Table 6: Between within group difference of disability levels in WOMAC Scale pre and post treatment of experimental group after the intervention

Pretest-Posttest WOMAC scores	N	Means Rank	Sum of Ranks	Wilcoxon signed rank test based on Z rank	P -Value
Negative Ranks	15[e]	8.00	120.00	-3.469	.001
Positive Ranks	0[f]	.00	.00		
Ties	0[g]				
Total	15				

In this study, The signed-rank Wilcoxon test was applied to evaluate The variation between McMaster University's and Western Ontario's WOMAC (Western Ontario) osteoarthritis index scores between pretest and posttest assessments. The sample consisted of 15 participants. The analysis showed that there were 15 negative ranks, with a mean rank of 8.00 and a sum of ranks of 120.00. The statistics showed no positive ranks or ties. The p-value was 0.001 and the Z-rank statistic was determined to be -3.469. This result is statistically significant because The p-value is lower than the 0.05 level of significance, suggesting a substantial decline in WOMAC results between the pre test and the post test. That significant p-value and the existence of negative ranks indicate that the intervention was successful in improving the participants' WOMAC index-measured conditions.

Table 7: Between within group difference of disability levels before and after the control group's therapy after the intervention

Pretest-Posttest WOMAC scores	N	Means Rank	Sum of Ranks	Wilcoxon signed rank test based on Z rank	P-Value
Negative Ranks	15[e]	8.00	120.00	-3.482	.0011
Positive Ranks	0[f]	.00	.00		
Ties	0[g]				
Total	15				

To investigate the variations average ratings for the Western Ontario and McMaster Universities Osteoarthritis Index between pre test and post test measurements, the In this case, the Wilcoxon signed-rank test was applied. There were fifteen people in the sample. The results showed 15 negative ranks, with a mean rank of 8.00 and a sum of ranks of 120.00. The statistics showed no positive ranks or ties. The p-value was 0.000 and the Z-rank statistic was -3.482. The outcome is With statistical significance since The p-value is significantly less than the 0.05 value of significance. This suggests that The WOMAC scores significantly reduced throughout the pretest and the posttest. The negative ranks imply that following the intervention, all individuals' WOMAC ratings improved, confirming the treatment's efficacy in symptom reduction.

CHAPTER-V DISCUSSION & LIMITATIONS

Members in both the control and experimental teams as this study had similar baseline characteristics, except for Age, BMI, NPRS pre treatment scores and WOMAC pre-treatment scores, where the experimental group showed better knee function ($p = 0.035$). This difference underscores the importance of accounting for baseline disparities when interpreting post-intervention outcomes. Similar baseline comparability has been emphasized in studies like those by Esculier et al. (2014, p. 259), which controlled for pre-treatment variables to ensure robust conclusions regarding exercise efficacy.

The Numerical Pain Rating Scale (NPRS) indicated a statistically significant decrease in suffering for each group. Nevertheless, There did not include discernible distinction between the groups ($p = 0.539$). Isometric exercises, such wall squats, cause hypoalgesia by decreasing pain sensitivity in both Between functional and not developing muscles, according to Vaegter et al. (2019, p. 487), which supports their inclusion in pain management programs. The results of this study were further validated by meta-analysis Bartholdy et al. (2019, p. 203), which showed that quadriceps strengthening activities successfully lessen knee discomfort in patients with osteoarthritis.

Contrasting these findings, Sakai et al. (2020, p. 12) reported that certain variations of wall squats could exacerbate pain due to increased patellofemoral joint stress, emphasizing the importance of exercise modifications based on individual joint biomechanics

Functional findings gathered by the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) demonstrated substantial variances between the groups with the experimental group demonstrating better improvements ($p = 0.001$). Similar functional improvements were noted by Escamilla et al. (2024, p. 526) in patients who performed wall squats, especially those who concentrated on controlled knee flexion angles, which maximise quadriceps activation without overtaxing the joint located in the patellafemur.

A research effort with Kim et al. (2016, p. 201), however, issued a warning that poor alignment during wall squats may restrict functional gains and raise the risk of injury. This is consistent with the current study's focus on using the right technique to optimise benefits.

Wall squats are widely recognized for their efficacy in strengthening the quadriceps femoris and other lower-extremity muscles. Kim et al. (2019, p. 217) demonstrated a strong correlation between wall squat performance and quadriceps strength, normalized by body weight, supporting the present study's findings. This knowledge was expanded by Baldon et al. (2014, p. 416), who demonstrated that adding hip and core strengthening activities to knee-focused training produced more favourable results related to skeletal muscle endurance or functional performance. Important information about the effectiveness and safety of wall squats is provided by biomechanical research.

Escamilla et al. (2009, p. 1239) found that wall squats performed at greater knee flexion angles (60°–90°) produced higher patellofemoral compressive forces, which could limit their suitability for patients with severe joint degeneration. Conversely, the current study's emphasis on controlled and moderate flexion angles mitigates such risks, aligning with best practices recommended by Sakai et al. (2020, p. 5264)

The safety of wall squats largely depends on proper technique and alignment. Lee et al. (2021, p. 149) observed that adjusting foot positions during wall squats optimizes muscle activation while minimizing joint stress, highlighting the need for individualized exercise prescriptions. Similarly, Hartmann et al. (2024, p. 109) demonstrated that deep squats, when performed with proper technique, are safe for knee joint health, reinforcing the role of supervision in exercise-based rehabilitation.

When compared to other rehabilitation approaches, wall squats offer distinct advantages in terms of muscle activation and functional gains. However, studies like Goh et al. (2023, p. 109) suggest that combining wall squats with dynamic exercises, such as step-ups or resistance band training, may yield greater improvements in functional outcome. This comprehensive approach aligns with findings from Baldon et al. (2014, p. 4128), which advocate for multi-faceted training programs.

The current study has several drawbacks despite its positives. The small number of respondents (N = 30) might restrict the findings' ability for generalisation. Furthermore,

the brief intervention period did not take into consideration the wall squats' long-term implications on knee health. To independently verify this information or investigate in the course of time effectiveness about wall squats Outside variety of populations, future research should concentrate on bigger, longitudinal investigations.

Future investigations should also examine the impact of wall squat variations, such as the addition of resistance bands or weighted vests, on muscle activation and functional outcomes. Exploring the role of wall squats in preventing knee injuries in at-risk populations, such as athletes, could further expand their application in clinical practice.

The current study demonstrates how wall squats, when combined with traditional physiotherapy for knee diseases, can effectively minimise irritation while boosting practical achievements. These results are Keeping up with the law larger body of research that emphasises the advantages of isometric workouts for rehabilitation. However, attention to proper technique, alignment, and individualized exercise prescriptions remains crucial to maximize benefits and minimize risks. Future research should build on these findings to optimize the use of wall squats in clinical and athletic settings.

Limitation:

Consider those primary The examination's inadequate number of subjects is one of its shortcomings of only30 people, which prohibits delivery generalisability Regarding the results. A greater number of specimens could yield higher levels of confidence yet statistically meaningful results. Additionally, the 15 therapy sessions during the 5-week intervention period might not have been enough to properly capture the long-term benefits of wall squat training in conjunction with conventional physiotherapy. With a longer intervention time, more data regarding the sustainability of the observed changes may become available.

The fact that this study was carried out at Ibne Sina Hospital & Diagnostic Centre, Uttara Branch, in a single-center environment is another drawback. The study's external validity would be improved and participant diversity would be increased by conducting it across several centres. Additionally, participants were not masked to their group assignment even though the assessor-blind protocol was used, which would have added bias in how they reported outcomes like knee function or pain levels. Their answers may have been affected by the lack of participant blinding, particularly when it came to subjective assessments like pain and functional capacity.

Finally, the exclusion of comorbidities from the study might be seen as a limitation, as knee osteoarthritis often coexists with other health conditions. The absence of participants with comorbidities may have restricted the findings' applicability to individuals with multiple health concerns that could affect the outcomes of the interventions.

CHAPTER VI CONCLUSION & RECOMMENDATION

Conclusion:

One important, research-based strategy for treating osteoarthritis (OA) in the knee is physiotherapy. With growing awareness of effective treatments, task-specific physiotherapy, particularly wall squatting, has gained prominence for improving strength, stability, and mobility.

Wall squatting is a targeted exercise that enhances quadriceps strength, joint stability, and postural control, promoting better functional outcomes. In comparison to conventional physiotherapy alone, this study demonstrated that adding wall squats to traditional physiotherapy over a five-week period (three sessions 15 sessions total, each every week) produced better improvements through knee function, mobility, and pain alleviation.

The findings highlight the significant benefits of task-specific training, demonstrating enhanced compliance, better engagement, and superior recovery in knee OA patients. Integrating such exercises into rehabilitation programs can optimize treatment outcomes and improve overall joint function.

Recommendation:

It is advised to use a bigger sample size in future studies to increase their validity and applicability. A larger sample size would contribute to a more reliable study and assist validate the results. Furthermore, evaluating the long-term impacts of wall squat training in conjunction with traditional physiotherapy might benefit from a longer treatment duration. A longer follow-up period than five weeks might shed light on how long the noted gains in knee function and some pain alleviation will last.

By guaranteeing a more varied participant pool, multi-center studies would further improve the results' external validity. This would allow for a more generalizable conclusion that can apply to broader populations. Additionally, it is crucial to implement participant blinding in future studies to minimize bias. Fully blinding participants and assessors would ensure that outcomes are reported without influence, providing more reliable data.

Future studies should also consider participants with comorbidities, as knee osteoarthritis is often accompanied by other medical conditions that may affect treatment outcomes. Including individuals with additional health challenges would help determine how these factors impact the effectiveness of wall squat training and physiotherapy for knee osteoarthritis. Last but not least, adding objective outcome measures like muscle strength tests or gait analysis could enhance the subjective ones like NPRS and WOMAC and offer a more thorough picture of the effects of the therapies.

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Appendix – A

Institutional review Board permission letter

SCMST-BPT/IRB...06-23/049
To
Kohinur Aktar
4th Year Student of B.Sc in Physiotherapy
Session:2018-2019, Reg No:10422
SAIC College of Medical Science and Technology(SCMST)
Mirpur-14,Dhaka-1216,Bangladesh
Subject- Approval of the thesis proposal **"Efficacy of Wall Squats Practice in strengthening training along with Conventional physiotherapy among the Patients with Knee Osteoarthritis: A Randomized Controlled Trial"** by ethics committee.

Dear Kohinur Aktar,

Congratulations,

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

Sl. no.	Name of Discussion
1	Discussion to oral
2	Semi- structured questioner English version and Bangla version
3	Information sheet and consent form

The purpose often study to determine the Efficacy of Wall Squats Practice in strengthening training along with Conventional physiotherapy among the Patients with Knee Osteoarthritis: A Randomized Controlled Trial in Dhaka city. The study involves face to face interview by using semi- structured questionnaire to determine the Efficacy of wall squats practice in strengthening training along with conventional physiotherapy among the patients with knee osteoarthritis in Dhaka city that may take 30-40 minutes to fulfil in the questionnaire and there is no likelihood of any harm to participants The members of the ethics committee have approved the study to be conducted in the present form at the meeting held at 9.00 AM on 28th September 2023 at SCMST.

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

Best regards,

12.08.24

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

Appendix – B

Data Collection Permission letter

Permission letter

6th November, 2024

The Head of the Physiotherapy Department,
Uttara IBN SINA Diagnostic and Consultation Centre, Uttara
Sector #13,Uttara,Dhaka-1230
Through :Department Of Physiotherapy , B.Sc, SCMST.

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

Dear Sir,

With due respect and humble submission to state that I am Kohinur Aktar, Student of 4th Professional B.Sc in Physiotherapy at SAIC College of Medical Science and Technology (SCMST). According to course curriculum , I have to conduct a research for the partial fulfilment of our degree .My research project entitled on **"Efficacy of Wall Squats Practice in strengthening training along with Conventional physiotherapy among the Patients with Knee Osteoarthritis: A Randomized Controlled Trial".** Under the Supervision of Dr. Mohammad Anwar Hossain PhD, Associate professor of Physiotherapy , BHPI and Head of Physiotherapy Department ,CRP, Savar ,Dhaka. To conduct this research , I want collect data from the patients of Musculoskeletal Pain unit, Physiotherapy Department of the Ibn Sina Uttara Dhaka. So , I need permission for data collection .I would like to assure that anything of my study will not harmful for the participants.

I therefore, pray and hope that you would be kind enough to give me the permission to make this research project successful .

Sincerely yours

Kohinur Aktar
4th Professional B.Sc. In Physiotherapy
Class Roll : 12, Session : 2018 –2019
Saic College Of Medical Science and Technology (SCMST)
(B.Sc in Physiotherapy Department), Mirpur –14, Dhaka-1216, Bangladesh

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

APPENDIX-C

CONSENT FORM (Bangla and English)

সম্মতি পত্র (বাংলা)

আসসালামু আলাইকুম,

আমি কোহিনুর আক্তার,ঢাকা বিশ্ববিদ্যালয়ের চিকিৎসা অনুষদের অধীনে সাইক কলেজ অব মেডিকেল সাইন্স এন্ড টেকনোলজি এর বি.এস.সি ৪র্থ(চুড়ান্ত)বর্ষের শিক্ষার্থী !অধ্যয়নের অংশ হিসেবে আমাকে একটি গবেষণা সম্পাদন করতে হবে এবং এটা আমার প্রাতিষ্ঠানিক কাজের একটাঅংশ!আমার গবেষণার বিষয় হলো হাঁটু অস্টিও আথ্রাইটিস রোগিদের মধ্যে প্রচলিত ফিজিথেরাপির সাথে ওয়াল স্কয়াট প্রাকটিসএর স্ট্রেইনদেনিং ট্রেনিং এর কার্য়কারিতা।

এখন আমি আপনাকে কিছু প্রশ্ন করতে চাচ্ছি যা এই ফর্মে আছে । এতে আনুমানিক ২০- ৩০ মিনিট সময় নিবো!আমি আপনাকে অবগত করছি যে, এটা আমার অধ্যয়নের অংশ এবং যা অন্য কোনো উদ্দেশ্য ব্যবহৃত হবেনা!আপনি যে সব তথ্য প্রদান করবেন তার গোপনীয়তা বজায় রাখা হবে এবং এটা নিশ্চিত যে আপনি যে সকল তথ্য প্রদান করবেন তা অপ্রকাশিত থাকবে! এই অধ্যয়নে আপনার ইচ্চা স্বেচ্ছা প্রনোদিত এবং আপনি যে কোনো নিদিষ্ট প্রশ্ন অপছন্দ হলে উত্তর না দেওয়ায় এবং সাক্ষাৎকারের সময় কোনো উত্তর না দিতে চাওয়ার অধিকার আছে।

এই অধ্যয়নের অংশ গ্রহণ কারী হিসেবে যদি আপনার কোনো প্রশ্ন থাকে তাহলে আমার সুপারভাইজার প্রফেসর মোঃ আনোয়ার হোসেন,পিএইচডি, এসোসিয়েট প্রফেসর ফিজিওথেরাপি, বিএইচপিআই,হেড অব ফিজিওথেরাপি ডিপার্টমেন্ট, সিআরপি, সাভার, ঢাকা- ১৩৪৩ তে যোগাযোগ করতে পারেন।

সাক্ষাৎকার শুরু করার আগে কি আপনার কোনো প্রশ্ন আছে?

হ্যাঁ ..... না.....

সুতরাং আমি আপনার অনুমতিতে এই সাক্ষাৎ শুরু করতে পারি?

১. অংশ গ্রহণ কারীর স্বাক্ষর ও তারিখ.....

২. সাক্ষীর স্বাক্ষর ও তারিখ.....

৩. গবেষকের স্বাক্ষর ও তারিখ .....

CONSENT FORM (English)

Assalamualaikum,

I am Kohinur Aktar student of 4th Professional (final year) B.Sc. in Physiotherapy from Saic College of Medical Science and Technology (SCMST), Under the University of Dhaka medicine faculty. For the partial fulfilment of my bachelor's degree An aspect of my curriculum is a research paper that I have to accomplish. The title of my research is "**Efficacy of Wall Squats practice in strengthening training along with Conventional Physioherapy among the patients with knee osteoarthritis".**

I actually want to ask you some of those questions the fact that are presented on this form.That will be a 20–30 minute discussion.

I simply want to inform you realise that this is purely an academic study and is unlikely to be applied for additional purposes I ensure that anything you share will be kept hidden. Your role will be completely voluntary. You could be allowed to shift your opinion and withdraw from taking part in the research program likewise, you are entitled to select whether or not to address any of the other statements on that questionnaire that you consider unacceptable.

You may get in connect with my supervisor and my own if you have any enquiries regarding the study. Prof. Dr.Muhammad Anwar Hossain, Phd. Professor, Physiotherapy Department BHPI. Head and Senior Consultant, Physiotherapy Department CRP Associate Professor and Physiotherapy Department Head , CRP, Savar, Dhaka-1343.

Before the session gets started, do you have any questions?
Can I also continue the interview?

Yes:..... No:……

The participant's signature and the date.....
The witness's signature and the date.....
The researcher's signature and the date...…….

প্রশ্নপত্র (বাংলা)

এই প্রশ্নপত্রটি তৈরী করা হয়েছে অস্টিওআর্থ্রাইটিস রোগীদের হাটু ব্যথার পরিমাপ এবং

অক্ষমতাজনিত তথ্যাবলী জানার জন্য

এই অংশটি ফিজিওথেরাপিস্ট কলম/পেন্সিল দ্বারা পুরন করবেন

অনুগ্রহ পূর্বক নিচের প্রশ্ন গুলোর মধ্যে সঠিক উত্তরের বাম পাশে টিক (√) চিহ্ন দিন

রোগীর তথ্যাবলি

রোগীর আইডি	
মূল্যয়নের তারিখ	
অংশগ্রহণকারীর নাম	
কোড	
ঠিকানা	গ্রাম পোষ্ট অফিস উপজেলা জেলা
ফোন নাম্বার	

অংশ-১: সামাজিক-প্রেক্ষাপটের তথ্যাবলী(বাংলা)

সঠিক উত্তর চিহ্নিত করতে টিকা (√)ব্যবহার করুন

নং	প্রশ্ন	উত্তর
১.১	বয়স	..... বছর
১.২	লিঙ্গ	০= পুরুষ ১=মহিলা

১.৩	বৈবাহিক অবস্থা	০=অবিবাহিত ১=বিবাহিত ৩=তালাকপ্রাপ্ত ৪= বিধবা
১.৪	শিক্ষাগত যোগ্যতা	০= নিরক্ষর ১=প্রাথমিক ২= এসএসসি ৩=এইচএসসি ৪= স্নাতক ৫=মাস্টার্স বা উচ্চতর
১.৫	পেশা	০= সার্ভিস হোল্ডার ১=ব্যবসায়ী ২= গৃহিণী ৩= ছাত্র ৪=শিক্ষক ৫= শ্রমিক ৬= কৃষক ৭=অন্যান্য
১.৬	বাসস্থানের ধরন	০= গ্রামীন ১= শহুরে
১.৭	পরিবারের উপার্জনক্ষম ব্যাক্তির সংখ্যা	.....
১.৮	মাসিক আয়	....

১.৯	পরিবারের সদস্য সংখ্যা	....

অংশ-২ : নৃতাত্ত্বিক তথ্য

নং	প্রশ্ন	উত্তর
২.১	উচ্চতা	.....
২.২	ওজন	..... কেজি
২.৩	বিএমআই	.....

অংশ-৩ : অস্টিওআর্থ্রাইটিস এর জন্য দায়ী কারনসমূহ

নং	প্রশ্ন	উত্তর
৩.১	এই সমস্যার জন্য আপনি এখানে আসার আগ পর্যন্ত কতবার ফিজিওথেরাপি নিয়েছেন?	১)প্রথম বার ২)২-৪ বার ৩)৫ বার ৪)৫ বারের বেশি
৩.২	ফিজিওথেরাপি নেওয়ার আগে কি ধরনের চিকিৎসা নিয়েছেন?	১) ঔষধ বা ফিজিশিয়ান প্রদত্ত চিকিৎসা (গত মাস) ২) ফিজিওথেরাপি চিকিৎসা(গতমাস) ৩) পল্লী চিকিৎসকের চিকিৎসা (গত মাস) ৪)কবিরাজী বা হোমিওপ্যাথিক চিকিৎসা (গত মাস) ৫) হাতুড়ে যে কোনো চিকিৎসা (গত মাস) ৬) কোনো চিকিৎসাই নেন নাই
৩.৩	পরিবারের আাকার	১) ছোট পরিবার ২) বড় পরিবার
৩.৪	সাধারণত আপনি দিনের কত ভাগ সময় রেস্ট করেন?	.....
৩.৫	আপনার অন্য কোনো রোগ আছে কি	১) ডায়াবেটিস ২) হৃদরোগ

		৩) হাইপার ইউরেকেমিয়া ৪) অন্যান্য
৩.৬	ব্যথা আপনার মানসিক অবস্থাকে প্রভাবিত করে	১)হ্যা ২)না
৩.৭	প্রতিদিন কত ঘন্টা কাজ করেন?	১) চাকুরী / জীবিকার কাজ ২) গৃহস্থালির কাজ ৩) চাকরি ও গৃহস্থালি উভয় মিলিয়ে কাজ
৩.৯	আপনার কয়টি পা আক্রান্ত	১) একটি পা ২) দুইটি পা
৩.১০	আপনার ব্যথার কারনে সামাজিক কর্ম অংসগ্রহনে কোনো সমস্যা হয়?	১) হ্যা ২)না

চিকিৎসার পূর্ববর্তী তথ্য

অংশ -৪ : ব্যথার পরিমান

নীচের স্কেলে দাগ দিয়ে বুঝিয়ে দিন আপনার ব্যথা কতটা তীব্র।

নিদেশনাবলীঃ

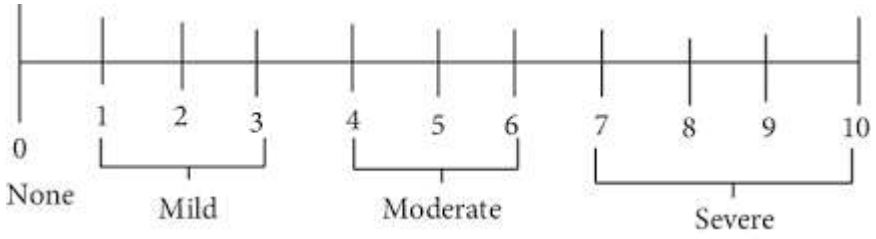
০ = কোন ব্যথা নেই

১-৩ = অল্প ব্যাথা

৪-৬ = মাঝারি ব্যথা

৭-১০ = তীব্র ব্যথা

আপনার ব্যথা এখন কতটা তীব্র?



অংশ-৫: শারীরিক অক্ষমতার প্রশ্নাবলী

এই প্রশ্নপত্রটি তৈরি করা হয়েছে ওয়েস্টান অন্টারিও ও ম্যাকমাস্টার ইউনিভারসিটি অস্টিওআর্থাইটিস ইনডেক্স ওম্যাক স্কোর অনুযায়ী অস্টিওআর্থাইটিস রোগীদের হাটুর ব্যাথা ও অক্ষতা জনিত তথ্যাবলী পরিমাপের জন্য ।

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

রোগীর প্রাপ্ত নাম্বার --------/৯৬

নির্দেশনাবলীঃ দয়া করে প্রত্যেক ধরণের 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) ব্যথাঃ

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 যায়ঃ

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। সিঁড়ি দিয়ে নামার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
২। সিঁড়ি দিয়ে ওঠার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
৩। বসা থেকে ওঠার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
৪। কিছুক্ষণ দাঁড়িয়ে 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। যানবাহনের 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 হয়ার 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 (আসবাব পত্র 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

চিকিৎসার পরবর্তী তথ্য

অংশ -৬: ব্যথার পরিমান

নীচের স্কেলে দাগ দিয়ে বুঝিয়ে দিন আপনার ব্যথা কতটা তীব্র।

নিদেশনাবলীঃ

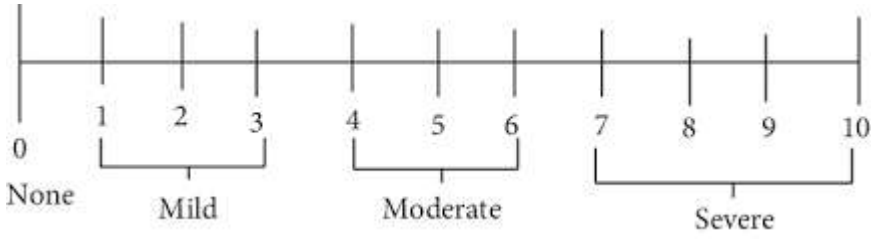
০ = কোন ব্যথা নেই

১-৩ = অল্প ব্যাথা

৪-৬ = মাঝারি ব্যথা

৭-১০ = তীব্র ব্যথা

আপনার ব্যথা এখন কতটা তীব্র?



অংশ-৭: শারীরিক অক্ষমতার প্রশ্নাবলী

এই প্রশ্নপত্রটি তৈরি করা হয়েছে ওয়েস্টান অন্টারিও ও ম্যাকমাস্টার ইউনিভারসিটি অস্টিওআর্থাইটিস ইনডেক্স ওম্যাক স্কোর অনুযায়ী অস্টিওআর্থাইটিস রোগীদের হাটুর ব্যাথা ও অক্ষতা জনিত তথ্যাবলী পরিমাপের জন্য ।

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

রোগীর প্রাপ্ত নাম্বার --------/৯৬

নির্দেশনাবলীঃ দয়া করে প্রত্যেক ধরণের 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) ব্যথাঃ

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 যায়ঃ

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। সিঁড়ি দিয়ে নামার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
২। সিঁড়ি দিয়ে ওঠার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
৩। বসা থেকে ওঠার সময় আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
৪। কিছুক্ষণ দাঁড়িয়ে 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। যানবাহনের 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 হয়ার 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 (আসবাব পত্র 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

Questionnaire (English)

Title: "Efficacy of wall squats practice in strengthening training along with conventional physiotherapy among patients with knee osteoarthritis"

Patient Information

The main objective of this questionnaire is to assess the level of pain and physical disability for a patient that has knee osteoarthritis and a physiotherapist can utilise a pen to draw up this area with information.

Patient's ID:	
Date of test:	
Name of participants:	
Code:	
Address:	**Village:** **Post-Office:** **Upazila:** **District:**
Phone:	

PART-1: Sociodemographic Information

[Please provide a Place a tick (√) in the box on the left of the best appropriate option]

Question No	Questions and information on	The participant's response
1.1	Age	……Year
1.2	Gender	0= Male 1= Female
1.3	Marriage status	0 = Unmarried 1 = Married

1.4	Educational Qualification	0 = Illiterate 1 = Primary 2= SSC 3= HSC 4 = Graduation 5 = Masters or higher
1.5	Occupation	0 = Service holder 1 = Businessman 2 = Housewife 3 = Student 4= Teacher 5= Labor 6= Farmer 7= Other.....
1.6	Living area	0 = Rural 1 = Urban
1.7	Number of earning persons in the family	……..
1.8	Monthly Income	…….
1.9	Number of family members	…….

PART-2: Anthropometric Information

[Tick the part that can be applied to patient]

Question No	Questions	Response of the participants
2.1	Height	……
2.2	Weight	……..
2.3	BMI	……..

Part 3: Osteoarthritis related Information

No.	Question	Answer
3.1	How many times you received physiotherapy treatments for this problem before coming here?	1 The first time 2 2–4 times 3. 5 times 4. More than 5 times
3.2	What kind of treatment you received before arrived in the Physiotherapy?	1 Medicines or Physician Treatments (Last Month) 2 Physiotherapy treatment (last month) 3 Treatment from rural doctor (last month) 4 Unani or Homeopathic Medicine (last month) 5 Any medical treatment (last month) 6 No treatment at the hospital
3.3	Household size	1. A small family 2. Joint Family
3.4	How much time do you walk per day	1. More than 1 Hour 2. 30 minutes to 1hour 3. Less than 30 minutes 4. Not the hawk
3.5	How much time do you Rest per day	
3.6	Have you any associate disease?	1. Diabetes 2. Heart disease

		3. Hyper eurectomy 4. Other
3.7	Does pain affect your mental health?	1.Yes 2.No
3.8	How many hours per day you work?	1. Job or livelihood work 2. Housekeeping 3.Work in both jobs and households
3.9	How many legs are affected?	1. Single knee 2. Both knee
3.10	Is there any problem you faced with social interactions?	1.Yes 2.No
3.11	How long you suffered?	……(Days) …….(year)

Pre-Test

Part 4: Pain Intensity

Please make the scale below to show how intense your pain is.
Instructions:

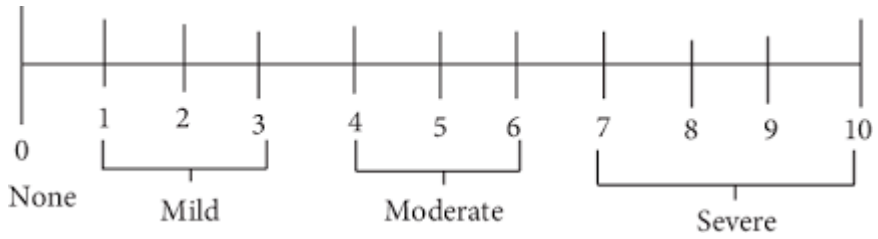
0 = No pain

1–3 = mild pain

4-6 = Moderate

7-10 = Severe

How Intense is your pain now?



Part-5: 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 carries a score of 4. A total of 24 questions overall. The number is 96 in total. The patient's score is /96.

Instructions: Please adhere to the following difficulty scale for evaluating the activities in each category:

0 = None

1 = Slight

2 = Moderate

3= Severe

4= Extreme

Circle one number for every task.

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 a 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 hard duties at home like removing furniture?	0	1	2	3	4
17. What kind of problems you feel when doing your routine household duties like dusting and cooking?	0	1	2	3	4

Post-Test

Part 6: Pain Intenity

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

Instructions:

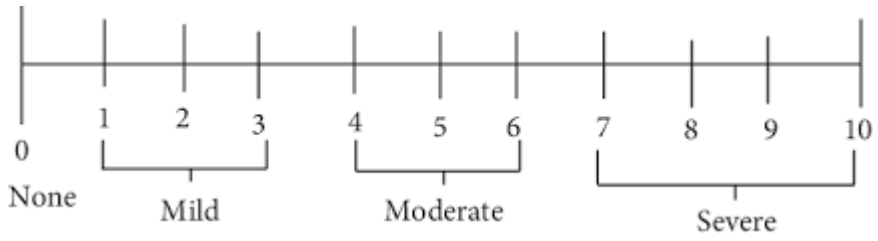
0 = No pain

1-3 = Mild pain

4-6 = Moderate

7–10= Severe

How intensity is your pain now?



Part-7: 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 carries a score of 4. A total of 24 questions overall. The number is 96 in total. The patient's score is /96.

Instructions: Please adhere to the following difficulty scale for evaluating the activities in each category:

0 = None

1 = Mild

2 = Moderate

3= Severe

4= Extreme

Circle one number for every task.

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 bearing weight?	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 a 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 routine household duties like dusting and cooking?	0	1	2	3	4

Gant Chart

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