Faculty of medicine

University of Dhaka

Assessing the Efficacy of Iliopsoas Stretching on Pain and Disability Among the Patients with Knee Osteoarthritis

Mohammad Kaochhar Hossain

B.Sc. Physiotherapy

Roll: 1403

Registration No: 10481

Session: 2018-2019

Saic College of Medical Science and Technology

Department of Physiotherapy

Mirpur-14, Dhaka-1216

Bangladesh

August, 2024

We, the undersigned, certify that we have carefully read and recommended to the Faculty of Medicine, University of Dhaka, for acceptance of this dissertation entitled. **"Assessing the Efficacy of Iliopsoas Stretching on Pain and Disability Among the Patient with Knee Osteoarthritis"** Submitted by **Mohammad Kaochhar Hossain** for partial fulfillment of the requirements for the degree of Bachelor of Science in Physiotherapy.

…………………………..

Zahid Bin Sultan Nahid

Assistant Professor and Head

Department of Physiotherapy

SCMST, Mirpur-14, Dhaka.

Supervisor

…………………………….

Dr. Mohammad Sohrab Hossain, PhD

Professor

Department of Physiotherapy, BHPI, CRP

Executive Director,

Center for the Rehabilitation of the Paralysed (CRP)

CRP Savar, Chapain, Savar, Dhaka- 1343

…………………………….

Dr. Abul Kasem Mohammad Enamul Haque

Principal

SCMST, Mirpur-14, Dhaka.

DECLARATION

This work has not been previously approved in content for any degree and is not simultaneously submitted for any degree candidacy. This dissertation is presented in partial completion of the requirements for the Bachelor of Science degree in Physiotherapy.

I acknowledge that if any instances of plagiarism or cheating are discovered in my work, I will get a failing grade and be subject to disciplinary procedures by the authorities. I affirm that the electronic version is identical to the printed edition of the thesis.

Should the findings of this study be disseminated for future publication, the research supervisor will be significantly concerned; it will be appropriately recognized as a graduate thesis, and approval will be obtained from the physiotherapy department of Saic College of Medical Science and Technology (SCMST).

Signature: **Date:** August, 2024

Mohammad Kaochhar Hossain

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

DU Roll no: 1403

Reg. no: 10481

Session: 2018-2019

CONTENTS

ACKNOWLEDGEMENT

First of all, I would like to pay my gratitude to **Almighty Allah** who has given me the ability to complete this project in time with success. The second acknowledgement must go to my parents who have always inspired me for preparing the project properly. I am extremely grateful to my honorable and praiseworthy Supervisor **Zahid Bin Sultan Nahid**, Assistant professor and Head, department of Physiotherapy Saic College of Medical Science and Technology (SCMST) for giving me his valuable time, his keen supervision and excellent guidance without which I could not be able to complete this project.

I am also very thankful to **Dr. Abul Kasem Mohammad Enamul Haque**, Principal, SCMST; **Md. Shahidul Islam**, Assistant Professor and Clinical Head Department of Physiotherapy, SCMST; **Asma Arzo**, Lecturer, Department of Physiotherapy. **Md. Furatul Haque**, Lecturer Department of Physiotherapy, **Md. Billal Hossain,** Lecturer, Department of Physiotherapy, Saic College of Medical Science and Technology (SCMST); **Md. Forhad Hosen**, Lecturer, Department of Physiotherapy, **Shahid Afridi,** Lecturer, Department of Physiotherapy SCMST and also all of my respected teachers for helping me in this study.

I wish to thanks to all respectable Physiotherapy staff working at Unique Pain and Paralysis Centre, Center for Physiotherapy and Mobility, Bangladesh Spine and Orthopaedic Hospital and Saic Physiotherapy Outdoor for helping me in collection of my data.

I am grateful to the intern physiotherapists, Department of Physiotherapy, SCMST, Mirpur-14, Dhaka for their support throughout the period of this study. I wish to thank the Librarian of SCMST and his associates for their kind support to find out related books, journals and also access to internet.

Finally, I would like to thanks all the participants who willingly participated as the study population during the conduction of my study and the entire individual who were directly or indirectly involved with this study.

LIST OF TABLES

ACRONYMS

AAOS	American Academy of Orthopedic Surgeons
ACL	Anterior Cruciate Ligament
ACR	American College of Rheumatology
BMAS	British Medical Acupuncture Society
BMRC	Bangladesh Medical Research Council
IPMU	Iliopsoas musculotendinous Unit
LCL	Lateral Collateral Ligament
MCL	Medial Collateral Ligament
MRI	Magnetic Resonance Imaging
NHANES	National Health and Nutrition Examination Survey
NPRS	Numeric Pain Rating Scale
NSAIDs	Nonsteroidal anti-inflammatory drugs
OA	Osteoarthritis
OARSI	Osteoarthritis Research Society International
OARSI	Osteoarthritis Research Society International
PCL	Posterior Cruciate Ligament
PF	Patellofemoral
RCT	Randomized Controlled Trial
TF	Tibiofemoral
UK	United Kingdom
US	Ultrasonography
WHO	World Health Organization
WOMAC	Western Ontario McMaster University osteoarthritis index
YLDs	Years Lived with Disability

ABSTRACT

Introduction: Knee osteoarthritis (OA) is a prevalent condition characterized by pain and functional impairment, often requiring multifaceted physiotherapy approaches. Iliopsoas stretching, a less-explored intervention, may improve outcomes by addressing hip-knee biomechanical interplay. **Purpose:** This study investigates the effectiveness of adding iliopsoas stretching to conventional physiotherapy compared to conventional physiotherapy alone in managing pain and disability in knee OA patients. **Objectives:** The primary aim was to evaluate changes in pain using the Numeric Pain Rating Scale (NPRS) and disability using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). Secondary objectives included assessing the clinical relevance of iliopsoas stretching and exploring its potential role in comprehensive OA management. **Methodology:** A randomized controlled trial was conducted with 20 participants diagnosed with knee OA, divided into experimental (n = 10) and control (n = 10) groups. Both groups received conventional physiotherapy, with the experimental group additionally undergoing iliopsoas stretching. Pretest and posttest NPRS and WOMAC scores were recorded over 14 sessions. **Analysis of Data:** Within-group changes were analyzed using the Wilcoxon signed-rank test, while between-group differences were assessed with the Mann-Whitney U test. **Results:** Both groups showed significant reductions in NPRS and WOMAC scores. The experimental group demonstrated greater mean improvements in NPRS (-3.1) and WOMAC (-27.9) scores compared to the control group (-2.5 and -16.9, respectively). However, between-group differences were not statistically significant ($p > 0.05$). **Conclusion:** Iliopsoas stretching, when combined with conventional physiotherapy, resulted in clinically meaningful improvements in pain and disability but did not achieve statistically significant superiority over conventional physiotherapy alone. Further studies with larger sample sizes and extended durations are recommended to confirm its potential benefits.

Key Words: *Osteoarthritis, Knee osteoarthritis, Iliopsoas stretching.*

CHAPTER-I INTRODUCTION

1.1Background

The predominant kind of arthritis is osteoarthritis (OA), distinguished by joint inflammation and considerable structural changes that hinder joint function and induce discomfort. The primary symptoms are pain and stiffness, particularly after physical exertion, which considerably affect the capacity to do routine tasks. A difference exists between radiographic alterations and symptoms; for instance, several individuals have osteoarthritis abnormalities on X-rays but remain asymptomatic (Cross et al. 2014, p. 1323). Osteoarthritis (OA) of the knee is a chronic degenerative condition of the articular cartilage associated with varying degrees of inflammatory synovitis and deterioration of joint cartilage (Chen et al. 2017, p. 192). Osteoarthritis (OA) is a common chronic and degenerative cartilage disease that mostly impacts older persons, especially women (Bijlsma, Berenbaum and Lafeber 2011, p. 2115). A separate research indicates that osteoarthritis comprises a heterogeneous array of illnesses that result in joint symptoms and signs associated with articular cartilage abnormalities, along with concomitant changes in the underlying bone at the joint margins (Islam et al. 2015, p. 18).

Osteoarthritis (OA) is the most common skeletal ailment (Prieto-Alhambra et al. 2014, p. 1659). Osteoarthritis is often classified as primary or secondary and is associated with identifiable diseases. The condition is characterized by a loss of hyaline articular cartilage, occurring in a localized and initially non-uniform way. The disease is characterized by sclerosis, increased thickness of the subchondral bone plate, osteophyte formation at the joint margin, stretching of the articular capsule, mild synovitis in numerous affected joints, muscular weakness around the joint, and meniscal degeneration in the knee. (Islam et al. 2015, p. 18). The World Health Organization identifies osteoarthritis as a significant public health concern that diminishes quality of life and leads to functional impairment worldwide. Osteoarthritis induces many physical, emotional, and economical difficulties (Hafez et al. 2013, p. 1401). The iliopsoas is clinically relevant as diseases involving this muscle group may lead to issues with the knee, hip, and spine. Extra-articular anterior hip and groin pain, often associated with iliopsoas disease, may potentially originate from various tissues around the hip (Li et al. 2020, p. 235).

Osteoarthritis (OA) is one of the most prevalent joint disorders in the United States. The incidence of osteoarthritis is expected to rise because to demographic aging and obesity. Historically, it was thought that the "wear-and-tear" of articular cartilage was solely attributable to aging and unrelated to inflammation (Stubbs et al. 2016, p. 228). Extensive studies on the prevalence of osteoarthritis indicate that women, the elderly, individuals with obesity, and those with a history of knee injuries face a moderate to substantial elevation in the risk of developing knee issues, including both radiographic and symptomatic osteoarthritis (Murphy et al. 2016, p. 55). Nonmodifiable risk factors include congenital element (unchangeable risk factors) such as inherited deformities in the morphology of the knee joint, as well as hereditary factors (genetic variations that may predispose a person to osteoarthritis of the knee). Modifiable risk factors, such as obesity, are those that may be addressed via therapy and subsequently altered (Lespasio et al. 2017, p. 210).

The latest Osteoarthritis Research Society International (OARSI) white paper asserts that Osteoarthritis (OA) remains a significant worldwide public health issue. The survey indicates that osteoarthritis (OA) impacts 240 million individuals globally, representing around 10% of males and 18% of women aged over 60. It is linked to considerable morbidity, including reduced quality of life and impairment, and it significantly increases death rates. The absence of effective treatment options for this widespread chronic illness is also highlighted. This review summarizes the research on OA completed in the last year. The content encompasses treatment modalities, comprising non-pharmacologic strategies such as weight reduction and physical activity, alongside pharmacologic interventions administered topically, orally, and intraarticularly, along with their cost-effectiveness; and epidemiology, detailing the prevalence of osteoarthritis (OA) involvement, related comorbidities, mortality rates, and polyarticular engagement (Nelson 2018, p. 319).

The many categories of illnesses and the clinical variability of osteoarthritis significantly impact epidemiological data. The radiologic definition includes both symptomatic and asymptomatic osteoarthritis and is often based on characteristic elementary lesions seen in conventional radiography. The early detection of osteoarthritis (OA) continues to provide a clinical challenge, since advanced imaging techniques, such as Magnetic Resonance Imaging (MRI), may identify initial stages of cartilage deterioration, resulting in an excessive increase in sensitivity (Bortoluzzi

Furini and Scire 2018, p. 1097).

Approximately 30% of visits to general practitioners are for osteoarthritis, the most common form of arthritis (Islam et al. 2015, p. 23). The incidence of symptomatic knee osteoarthritis in the United States among adults over 60 is 10% in men and 13% in women (Regnaux et al. 2012, p. 7). Numerous musculoskeletal disorders exist worldwide, although osteoarthritis is the most common. Osteoarthritis affects the functioning capabilities of millions of individuals (Krugerjakins et al. 2016, p. 1). Osteoarthritis is a degenerative condition that affects 10% of males and 13% of females in the general population. It is considered the fourth most prevalent cause of disability (Ahmed and Daud 2016, p. 159). Osteoarthritis may impact every joint, but the hip, knee, hand, foot, and spine are the most often affected. In the United States, around one in eight men and women, or 27–31 million individuals, are believed to have symptomatic osteoarthritis (OA). Furthermore, it is predicted that 250 million individuals worldwide are afflicted with knee osteoarthritis (O'Neill, McCabe and McBeth 2018, p. 312).

Research on the incidence and prevalence of knee osteoarthritis has surpassed those of other joints (Vina and Kwoh 2018, p. 160). According to the Korean National Health and Nutrition Examination Survey (NHANES), 35.1% of individuals over 50 exhibited a weighted prevalence of radiographic knee osteoarthritis (Hong, Noh, and Kim 2020, p. 0230613). The prevalence of knee osteoarthritis in China was 14.6% (Li et al. 2020, p. 304). The latest update from 2017 of the Global Burden of Disease studies reveals that musculoskeletal disorders are the leading cause of years lived with disability (YLDs) among 21 other cause categories, encompassing 354 diseases and injuries, thereby underscoring the substantial impact of musculoskeletal disorders on the global disease burden (Kloppenburg and Berenbaum 2020, p. 242).

Global stakeholders, including the public, policymakers, and healthcare professionals, must be apprised of the elevated prevalence of osteoarthritis and its modifiable risk factors, including as obesity, injury, and educational disparities. To formulate effective preventive therapies in the first phases of the illness, more research is required to explore the origins of the elevated prevalence and incidence of knee osteoarthritis in women and the elderly. The global prevalence of knee osteoarthritis was 22.9% in those over 40 years old and 16.0% in those over that age. In 2020, there will be 654.1 million individuals aged 40 and older with knee osteoarthritis worldwide. The worldwide incidence of knee osteoarthritis among those aged 20 years and older was found to be 203 per 10,000 person-years. In 2020, 86.7 million individuals aged 20 and older worldwide will have new cases of knee osteoarthritis. The incidence and prevalence rates for men and females were 1.39 and 1.69, respectively. We assessed risk variables, and the results showed that increased educational attainment was negatively connected with the prevalence of knee osteoarthritis (Cui et al. 2020, p. 218).

There were 9.3% of male participants and 28.5% of female participants had a diagnosis of osteoarthritis in at least one joint. In every age category, the frequency of females was much greater. The largest frequency was seen in those above 80 years of age (female: 63.3%, male: 33.5%). The incidence grew progressively with age. The definition of multijoint osteoarthritis (OA) is "OA in more than two joints accompanied by pain, including the hip, knee, and spine." Single-joint osteoarthritis (OA) was seen in 89.2% of male patients and 77.2% of female patients, whereas multiple joint disease was found in 10.8% of male patients and 22.8% of female patients (Park et al. 2017, p. 6372). Currently, OA has no identified cure. Exercise may enhance symptoms associated with illness, such as diminished fitness and impaired muscle function. International guidelines advocate for exercise and other nonpharmacological interventions as the primary therapy for persons with knee osteoarthritis (Fransen et al. 2015, p. 1554).

Physical activity is defined as "any movement generated by skeletal muscle that necessitates energy expenditure," according to a 2010 World Health Organization study. Osteoarthritis imposes physical, psychological, and financial consequences. Knee osteoarthritis leads to considerable limitations, including diminished mobility and reduced capacity for daily tasks. The primary factors are psychological stress, diminished self-worth, and feelings of loneliness. The widespread occurrence of osteoarthritis in the community imposes an economic cost (Litwic et al. 2013, p. 185).

1.2 Justification

The function of the iliopsoas muscle in hip and pelvic alignment is connected to the efficacy of iliopsoas stretching on pain and disability in individuals with osteoarthritis of the knee. The iliopsoas muscle can become taut, which can change knee joint strain and biomechanics as well as worsen pain and impairment. This muscle can be stretched to increase hip flexibility, lessen compensatory movement patterns, and relieve knee stress, all of which will enhance function and lessen pain.

A weak posture and changed biomechanics can be caused by tight iliopsoas muscles, which can put more strain on the knee joint. By improving alignment and posture, stretching these muscles helps to avoid putting undue load on the knee. The range of motion and flexibility of the hip joint are increased by stretching the iliopsoas. Improved movement patterns and fewer compensatory motions that strain the knee joint can result from increased hip mobility. Relieving tension in the iliopsoas improves the lower body's general biomechanics, which may lessen knee pain. A healthy hip can relieve pressure on the knee and possibly reduce pain. Patients with knee OA may have less disability when their pain decreases and their function improves. This also promotes knee health by enabling patients to participate more actively in physical therapy and other rehabilitation exercises.

Through this research, future treatment plans may improve, and it will give proper guidelines for knee osteoarthritis. This study was also helpful for the physiotherapy profession, and future researchers will get a good idea about this case. So, it will be helpful for delivering treatment to knee osteoarthritis patients.

1.3 Research Question

Is iliopsoas stretching effective in reducing pain and disability among the patient with knee osteoarthritis?

1.4 Aim of the study

This study aims to evaluate the efficacy of iliopsoas stretching exercises in reducing pain levels and improving functional disability among the patients with knee osteoarthritis.

1.5 Research Hypothesis:

1.5.1 Null Hypothesis:

Iliopsoas stretching along with conventional physiotherapy is not effective than only conventional physiotherapy for the treatment on pain and disability among the patients with knee osteoarthritis.

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

1.5.2 Alternative Hypothesis:

Iliopsoas stretching along with conventional physiotherapy is effective than only conventional physiotherapy for the treatment on pain and disability among the patients with knee osteoarthritis.

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

1.6 Objectives of the study

1.6.1 General objective

To compare the efficacy of iliopsoas stretching versus conventional physiotherapy treatment in reducing pain and disability among the patient with knee osteoarthritis.

1.6.2 Specific objective

1. To describe the socio-demographic and baseline characteristics of the participants.

2. To assess the level of pain of both groups (experimental and control) by using Numeric pain rating scale before and after intervention.

3. To assess the disability of both groups (experimental and control) by using WOMAC scale before and after intervention.

1.7 Operational Definition:

Osteoarthritis: Osteoarthritis (OA), well-known as degenerative joint disease, is a common form of arthritis that damages the tissue surrounding the joint. This condition, commonly characterised by joint pain and stiffness, is triggered due to ageing and joint wear and tear.

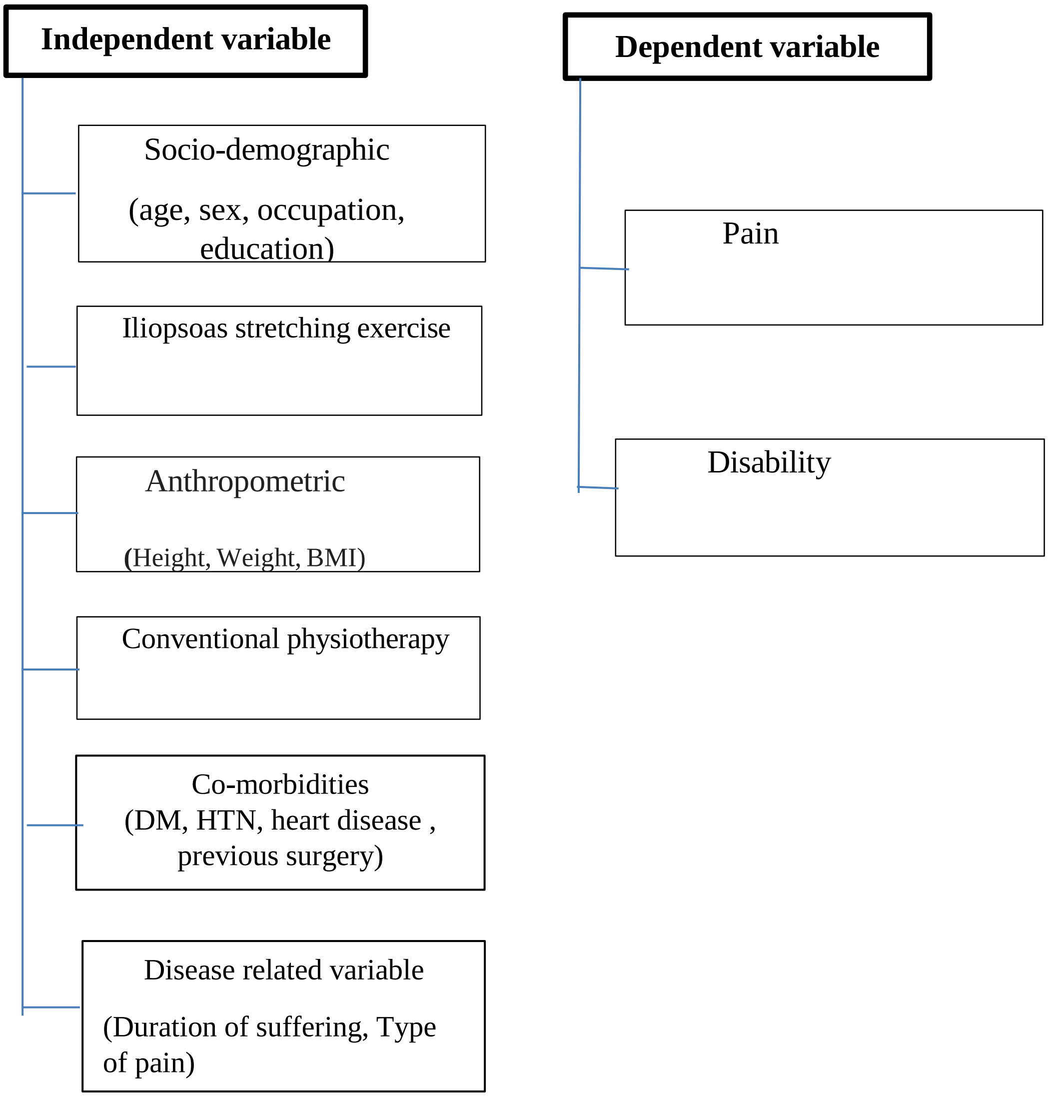
Knee osteoarthritis: The knee is the largest synovial joint in humans, it is composed by osseous structures (distal femur, proximal tibia, and patella), cartilage (meniscus and hyaline cartilage), ligaments and a synovial membrane. The latter is in charge of the production of the synovial fluid, which provides lubrication and nutrients to the avascular cartilage.

Iliopsoas Stretching: The iliopsoas muscle is in charge of flexing and laterally rotating the thigh at the hip joint. It also assists in flexion and stabilization of the trunk and helps with good posture. The iliopsoas includes the iliacus, psoas major, and psoas minor muscles, which combine together and form the iliopsoas muscle.

Pain: The pain is derived from the Latin word poena, for the study of pain defines pain is an unpleasant sensory and emotional experience associated with acute or potential tissue damage or describe in terms of such damage.

Disability: A physical, mental, cognitive, or developmental condition that impairs, interferes with, or limits a person's ability to engage in certain tasks or actions or participate in typical daily activities and interactions.

1.8 List of variables



CHAPTER-II LITERATURE REVIEW

Osteoarthritis (OA) of the knee mostly affects the elderly, leading to significant discomfort and functional limitations (Rooij Van and Leeden 2016, p. 3). The Greek phrases "Osteo," meaning "Bone," "Arthro," meaning "Joint," and "itis," meaning "Inflammation," are amalgamated to create the term osteoarthritis (Deshpande et al. 2015, p. 1743). Engagement of other tissues including the meniscus, ligaments, capsule, synovial membrane, and periarticular muscles (Cooper et al. 2013, p. 719). Osteoarthritis mostly affects the hip and knee joints and is among the leading causes of disability globally, particularly in the older population (Nam et al. 2013, p. 1137). It also influences an individual's functioning, quality of life, employment, relationships, mood, and recreational activities (Marmon et al. 2013, p. 406). The predominant symptoms of osteoarthritis (OA) include joint soreness, stiffness, restricted mobility, motor and sensory function abnormalities, and functional impairments, which hinder individuals from participating in regular physical activity (Harish and Kashif 2013, p. 181). Research indicates that osteoarthritis (OA) is the predominant source of musculoskeletal pain and dysfunction, with the knee being the most often impacted region (Dor and Kalichman 2017, p. 642).

Osteoarthritis, the most common form of arthritis among the elderly, is an inflammatory condition affecting the bone and joint cartilage, whereby all joint components often undergo pathological alterations concurrently. Osteoarthritis is recognized to diminish quality of life as assessed by disability metrics. There are two types of osteoarthritis: primary and secondary osteoarthritis. Secondary osteoarthritis (OA) is induced by injuries sustained while squatting or kneeling, whereas initial OA lacks a recognized cause and is often attributed to the aging process. The most often impacted joints are the knees, hips, lower spine, and fingers, however the hands and feet may also be afflicted. Age, female gender, obesity, sedentary lifestyle, little physical exercise, and bad food habits are all contributing factors to osteoarthritis. Frequent grievances consist of limited mobility, inflamed and painful joints, and audible grinding sounds during joint movement (Bala et al. 2020, p. 5282). Osteoarthritis is a chronic condition characterized by arthritic bone hyperplasia, subchondral bone sclerosis, and cartilage degeneration in many regions of the body. OA is now exerting a significant influence on society. Knee osteoarthritis has a lifetime risk of 13.83 percent, resulting in considerable losses in quality-adjusted life years for persons residing in New Zealand. Radiographic, self-reported, and symptomatic osteoarthritis are the most often used case definitions (Li et al. 2020, p. 304). More than 80% of all osteoarthritis cases are attributed to knee osteoarthritis, which affects at least 19% of Americans aged 45 and older. However, two contemporary advances in public health are often recognized as major contributions. Knee osteoarthritis (OA) is prevalent in older persons, and it is posited that the rise in life expectancy in the United States from the early 1900s has led to elevated incidences of knee OA in the elderly demographic. Obesity is a recognized risk factor for knee osteoarthritis and has been more prevalent in the United States in recent decades (Wallace et al. 2017, p. 9332).

The only constant in the diverse architecture of the knee joint is its complex function, resulting from the optimal interplay among the femur, tibia, patella, fibula, ligaments, tendons, muscles, and joint capsule. A solitary function is executed by a limited number of anatomical structures. Typically, the functionality of the knee arises from the complex interplay of several anatomical systems (Hirschmann and Muller 2015, p. 2780). The knee joint comprises the patellofemoral, proximal tibiofemoral, medial tibiofemoral, and lateral tibiofemoral joints. The knee joint is classified as a gliding hinge joint, sometimes known as a trochoginglymus. The knee joint is capable of movement in six distinct directions. The knee joint exhibits rotational motions such as flexion-extension, internal-external rotation, and varus-valgus alignment (Musumeci 2017, p. 8).

The primary thigh flexor capable of enhancing and externally rotating the hip joint is the iliopsoas musculotendinous unit (IPMU). When the latter is stabilized, the trunk flexes and inclines towards the side of contraction during the contraction of the iliopsoas muscle (Anderson 2016, p. 419). Muscles can operate autonomously. The psoas major muscle stabilizes the lumbar spine when sitting and facilitates thigh flexion when standing or supine. The iliacus muscle stabilizes the pelvis and facilitates appropriate hip flexion while running (Anderson 2016, p. 419). Knee soreness may arise from compression of the femoral nerve by the iliopsoas muscle. The patient should acquire stretching strategies to mitigate the tension induced by the muscle prior to opting for surgical release of the femoral nerve. In many instances, if the patient complies with the PT directives, surgical intervention may be avoided. The British Medical Acupuncture Society (BMAS) indicates that acupuncture is an effective alternative therapy for the iliopsoas muscle. In the post-operative phase, the osteopathic manual technique may assist physiotherapy by alleviating pain or addressing deep musculoskeletal regions with mild methods that do not induce adverse consequences (Racca et al. 2017, p. 1). Individual risk factors include socio-demographic characteristics, genetic predispositions, obesity, dietary choices, and increased bone mass and density. Individual joint risk factors include individual joint and bone morphology, weakness in the thigh flexor musculature, joint misalignments, engagement in certain occupations or sports, and joint trauma (Vina and Kwoh 2018, p. 160). Women are predisposed to osteoarthritis in the hands and knees, while males are more prone to its occurrence in the spine (Cho et al. 2015, p. 192). Genetic predisposition: A favorable familial history of osteoarthritis elevates the likelihood of manifesting the ailment. Venkatachalam et al. (2017). Diabetes: Research indicates a correlation between knee osteoarthritis and diabetes (Zhang et al. 2016, p. 781). Osteoporosis is also associated with osteoarthritis. Lee et al. (2015, p. 124).

The structure consists of two osseous connections that confer stability under diverse loading conditions: the femorotibial joint, linking the femur to the tibia, bears the majority of body weight, and the patella-femur joint, which facilitates a low-friction modification of the forces generated by the contraction of the quadriceps femoris muscle (Hirschmann and Muller 2015, p. 2780). The knee joint has three bones: the femur (thigh bone), the tibia (shin bone), and the patella (knee cap). The fibula, a smaller bone, is located next to the tibia (Madeti and Rao 2018, p. 113). The femur is the biggest, longest, and strongest bone in the human body (Maharaj, Maheswaran and Vasanthanathan 2013, p. 1242). The patella, the biggest flat triangular sesamoid bone in the body, safeguards the front aspect of the knee joint and serves as a ligament connecting the fibula to the lateral side of the femur. The patella is the third longest bone in the knee joint, extending from the knee to the ankle joint along the lateral aspect of the tibia. Furthermore, the patella has a crucial function in elevating the lever arm of the quadriceps femoris muscle complex (Madeti and Rao, 2018, p. 113). The patellofemoral (PF) joint, the connection between the patella and the femur, and the tibiofemoral (TF) joint, the connection between the femur and the tibia, constitute the knee joint. The quadriceps, the most powerful muscles, operate across the knee joint, which serves as a fulcrum between the two longest bones in the human body. The knee provides exceptional weight support and stability when completely extended

(Masouros, Bull, and Amis 2010, p. 84).

The tibia, commonly referred to as the shin bone, connects the knee and ankle joint and comprises a plateau and the tibial tubercle in its proximal region. It is the second largest bone in the knee, to which three ligaments the anterior cruciate ligament (ACL), posterior cruciate ligament (PCL), and medial collateral ligament (MCL) are proximally attached (Shapiro 2019, p. 1). The fibula is the third long bone in the knee joint, extending from the knee to the ankle along the lateral aspect of the tibia. The lateral collateral ligament (LCL) connects the fibula to the lateral side of the femur. Additionally, the patella, the largest flat and triangular sesamoid bone in the body, safeguards the anterior aspect of the knee joint and serves a crucial role in enhancing the lever arm of the quadriceps femoris muscle complex (Madeti and Rao 2018, p. 113).

The smooth joint layer encasing the proximal tibia and distal femur is a cartilage type that diminishes articular cartilage, which facilitates joint lubrication (Greene 2011, p. 607). The medial and lateral meniscus, known as shock absorbers, are situated between the articular cartilages of the femur and tibia, which function as load bearers and stabilizers for the knee joint (Fox, Bedi and Rodeo 2012, p. 340). The knee joint has different muscles and ligaments that regulate mobility and safeguard against damage (Halewood and Amis 2015, p. 4). The knee joint comprises four principal ligaments: the lateral collateral ligament (LCL) and the medial collateral ligament (MCL) located on either side, and the anterior cruciate ligament (ACL) and posterior cruciate ligament (PCL) positioned centrally, crossing each other to stabilize the knee in both anteroposterior and axial directions (Bronstein and Schaffer 2017, p. 21).

The primary muscular groups of the lower extremities that facilitate knee flexion and extension are the quadriceps and hamstrings, the latter including the Semimembranosus, Biceps Femoris, and Semitendinosus muscles. These muscles extend down the posterior aspect of the femur and connect to the tibia and fibula (Vandermade et al. 2015, p. 2125). Conversely, the quadriceps consist of four muscles situated on the anterior and lateral aspects of the femur, largely responsible for knee extension from a flexed posture. The muscles include the Rectus Femoris, Vastus Lateralis, Vastus Medialis, and Vastus Intermedius (Abulhasan and Grey 2017, p. 34).

Weakness in the quadriceps muscle may elevate the stress on the passive elements that contribute to joint stiffness, hence increasing the risk of knee joint injury, since the quadriceps muscle plays an active role in joint stiffness. Research indicates that women's quadriceps muscle strength is 60% inferior to that of males, despite no observable difference in their BMIs. The knee joints of women exhibit more laxity due to the relative weakness of their quadriceps muscles (Segal and Glass 2011, p. 44). The American Academy of Orthopedic Surgeons (AAOS) has recognized quadriceps weakness as a risk factor for structural knee joint damage. Patients exhibit instability due to muscular weakening that compromises the anteroposterior stability of the knee joint. This results in knee OA patients losing confidence, becoming less autonomous, and performing poorly in everyday duties, ultimately leading to impairment and dysfunction (Olagbegi, Adegoke and Odole 2017, p. 1).

In the knee, osteoarthritis modulates synthetic activity or elevates the synthesis of inflammatory cytokines. The anatomical advancement of osteoarthritis induces structural alterations in the articular cartilage, often leading to the reduction of the joint space. Conversely, the processes of bone remodeling are disrupted, resulting in sclerosis of the subchondral bone, along with the formation of osteophytes and chondrocytes (Sharma et al. 2013, p. 135). A correlation exists between alterations in subchondral bone and the deterioration of articular cartilage; nevertheless, bone density and trabecular thickness are significantly elevated in instances of heightened cartilage degeneration (Man and Mologhianu 2014, p. 37). Recent experimental data suggests that subchondral bone plays a crucial role in the osteoarthritis (OA) process via mechanical effects, as a source of inflammatory mediators associated with OA pain, and as a contributor to the degradation of the deep cartilage layer. Therefore, although osteoarthritis was first seen as a cartilage-centric disorder, it is, in fact, a far more intricate illness involving the release of inflammatory mediators by the synovium, bone, and cartilage. This article discusses emerging reasons supporting the inflammatory hypothesis of osteoarthritis, including inflammation, innate immunity, and low-grade inflammation induced by metabolic syndrome (Bijlsma, Berenbaum, and Lafeber 2013, p. 2115).

Individuals with knee osteoarthritis seek medical treatment for various reasons; nonetheless, radiographs remain the gold standard for clinical imaging in osteoarthritis. In some knee osteoarthritis joints, clinical effusions and capsular thickening are evident, but they are less prevalent and pronounced than the inflammation linked to rheumatoid arthritis. They are more often seen with the use of sensitive techniques such as MRI tests and ultrasonography (US). Some assert that synovial alterations in osteoarthritis

(OA) are a response to cartilage degradation, while others argue that these changes are a primary contributor to OA and may influence pain genesis and the progression of the illness (Hall 2014, p. 15). The physician will assess for joint edema and pain. There is evident joint degeneration and limited range of motion due to osteophyte formation. Imaging studies often use X-rays to validate the diagnosis of osteoarthritis. X-rays may reveal subchondral bone sclerosis, joint space constriction, and osteophytes at the margins of joints. The bone layer situated immediately under the cartilage is referred to as subchondral bone. Although magnetic resonance imaging (MRI) is a more sensitive imaging modality, it is not often used (Silverwood et al. 2015, p. 507).

Osteoarthritis accounts for 47.4% of all arthritis-related hospitalizations. The incidence of knee osteoarthritis differs by country globally (Pas et al. 2013, p. 1). Another research indicates that the Netherlands has 9.2% prevalence of knee osteoarthritis (OA) and 7.2% prevalence of hip OA; the UK has 32.6% knee OA and 19.2% hip OA; Italy has 29.8% knee OA, 7.7% hip OA, and 14.9% hand OA; and Spain has 29.2% knee OA and 18.5% hand OA (Pas et al. 2013, p. 1). Osteoarthritis, irrespective of its definition, is infrequent in persons under 40 and very prevalent in those over 60. The condition is notably more prevalent in women than in males, particularly among middle-aged and older persons, with the disparity in frequency increasing with age (Islam et al. 2015, p. 18). In the United States, 13.7 million individuals had symptomatic knee osteoarthritis in 2007 to 2008, with 7.7 million exhibiting advanced symptomatic knee osteoarthritis. In 2011 to 12, there were 15.1 million individuals with symptomatic knee osteoarthritis, and 8.6 million with advanced symptomatic knee osteoarthritis. The research indicated that the yearly prevalence of knee osteoarthritis was greatest among those aged 55–64 (Deshpande et al. 2016, p. 1743). In the United Kingdom, 2.36 million adults of working age and 1.75 million individuals aged 75 or older are receiving treatment for osteoarthritis, out of a total of 4.11 million individuals diagnosed with the ailment. Osteoarthritis constitutes 97% of first knee replacement surgeries, with 85,920 operations documented in England, Wales, and Northern Ireland in 2013. The incidence of osteoarthritis in India is increasing everyday. In 2013, over 10% of the population had knee osteoarthritis, with a higher prevalence seen in elderly and obese individuals (King, March, and Anandacoomarasamy 2013, p. 185).

Many countries have conducted population-based research on the incidence and prevalence of osteoarthritis. Approximately fifty percent of respondents in a comprehensive survey of individuals over 50 in England indicated the presence of osteoarthritis in at least one joint, including the hand, hip, knee, or foot (Thomas, Peat and Croft 2014, p. 338). A recent survey indicated that 29% of individuals aged 20 and above in Spain exhibited osteoarthritis (OA) in one or more locations, including the spine, hand, hip, or knee, based on screening questions aligned with the clinical criteria of the American College of Rheumatology (ACR) (Blanco et al. 2021, p. 461). A research using a large nationally representative primary care database in the United Kingdom (UK) revealed that from 1997 to 2017, there were 494,716 new cases of clinical osteoarthritis (OA), equating to 6.8 per 1000 person-years (age and sex standardized) (Swain et al. 2020, p. 792).

Research indicates that the primary objective of therapy for knee osteoarthritis is to alleviate pain and impairment. Experts focus on various behavioral recommendations and specialized panels designed to educate patients and encourage self-management behaviors, which are crucial for controlling knee osteoarthritis (Nelson et al. 2014, p. 701). The importance of research on the prevention, treatment, and management of osteoarthritis has escalated due to the rising incidence of the ailment. on 2013, the American Academy of Orthopaedic Surgeons (AAOS) established a guideline for knee osteoarthritis therapy to provide recommendations grounded on evidence-based medicine. In 2012, the OA Research Society International (OARSI) updated its evidence-based consensus recommendations for the management of osteoarthritis in the hip and knee joints (Sun et al. 2019, p. 4701).

They are used to alleviate pain and enhance the quality of life for osteoarthritis patients in the early to moderate stages of the condition (McAlindon et al. 2014, p. 363). Pharmacological interventions encompass opioids, corticosteroid injections, paracetamol, oral and topical nonsteroidal anti-inflammatory drugs (NSAIDs), and acupuncture; non-pharmacological interventions comprise physiotherapy, exercise, acupuncture, utilization of a knee brace or walking aid, a valgus brace for medial compartment knee osteoarthritis deformity, self-management, education, and the adoption of a healthy lifestyle (Conaghan 2012, p. 1491). The primary reason knee osteoarthritis patients seek medical care is pain, which, if unaddressed, may lead to diminished physical ability and autonomy (Ayanniyi, Egwu and Adeniyi 2017, p. 1). The research indicated that a standardized regimen of stretching, ultrasound, pulsed electromagnetic field therapy, and strengthening exercises resulted in significant enhancements in knee range of motion, isometric quadriceps strength, and functional improvement, with the moderate pain cohort exhibiting more pronounced changes compared to the mild and severe pain cohorts (Abdel-aziem et al. 2018, p. 307).

Individuals with osteoarthritis (OA) have a higher prevalence of concomitant chronic conditions compared to the general population, complicating patient treatment and professional practice. The prevalence of OA adversely impacts individuals and healthcare systems, diminishing quality of life and escalating medical expenses. Research indicates that patients with osteoarthritis incur yearly healthcare expenses that are two to three times more per capita and have a worse quality of life compared to the general population (Li et al. 2020, p. 235).

CHAPTER III METHODOLOGY

3.1 Study design:

The study design was a Randomized Controlled Trial (RCT). RCT was appropriate for the comparison to the efficacy of iliopsoas stretching on pain and disability and other conventional physiotherapy for the patients with knee OA.

3.2 Study area:

Data were collected from the outpatient services of physiotherapy unit of the Unique Pain and Paralysis Centre-Mirpur11, Center for Physiotherapy and Mobility - Malibagh, Saic Physiotherapy and Rehabilitation Services - Mirpur 14, and Bangladesh Spine and Orthopaedic Hospital- Kallyanpur.

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

3.4 Study period:

The duration of the study was twelve's months from (Sep 2023 to Aug 2024).

3.5 Study population:

The patients with knee osteoarthritis attended in different physiotherapy center constituted in the study population for the present study.

3.6 Sample size:

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

$$n_1 = \frac{\left(\sigma_1^2 + \sigma_2^2/K\right)\left(Z_1 - \frac{a}{2} + Z_1 - \beta\right)2}{\Delta^2}$$

$$n_1 = \frac{(0.98^2 + 0.98^2/1)\,(1.96+1.04)^2}{1.06^2}$$

$$n_1 = 15$$

$$n_2 = k \times n_1 = 15$$

$\Delta = |\mu_2 - \mu_1|$ = 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

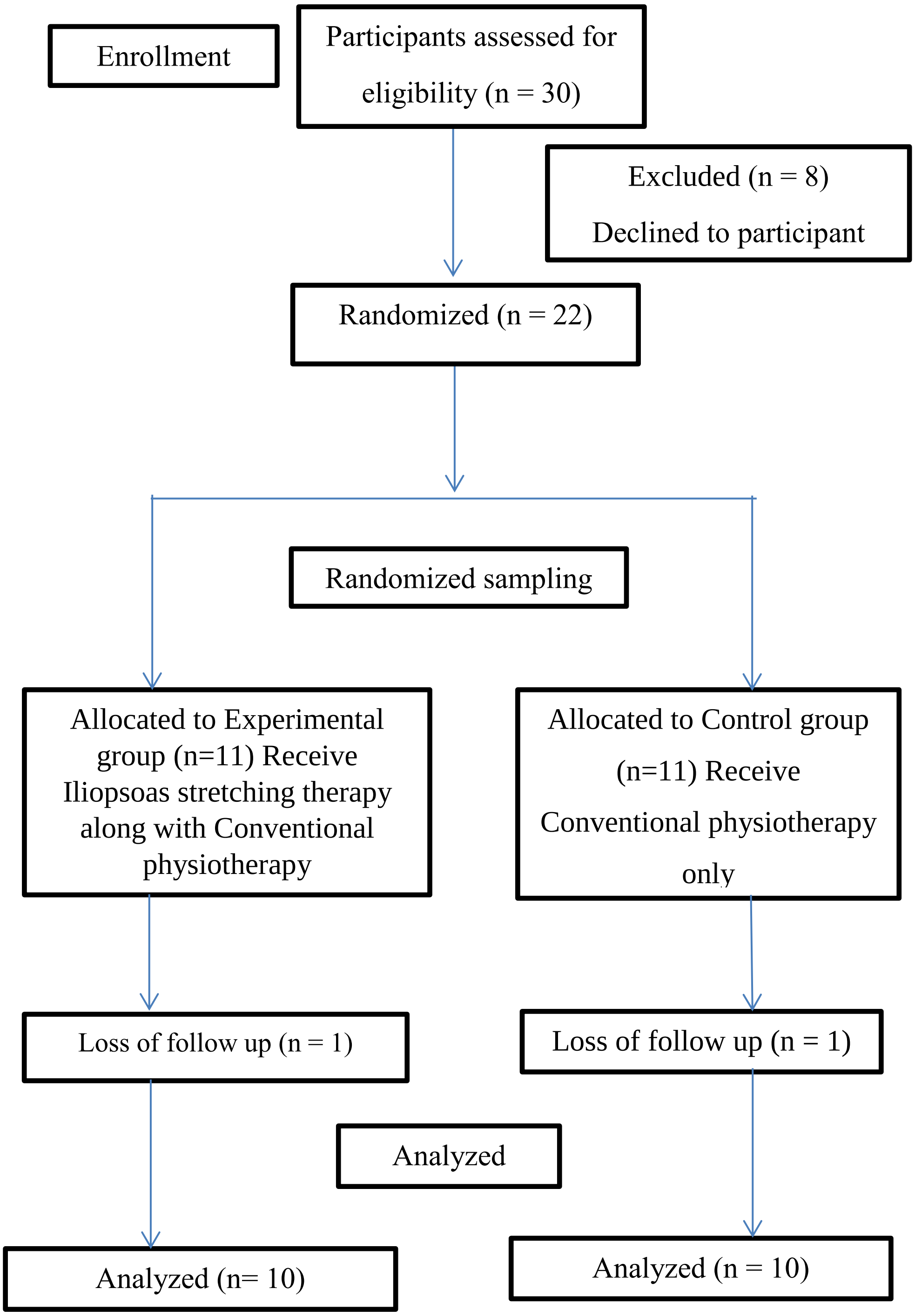
α = probability of type I error (usually 0.05)

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

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



3.8 Sampling technique:

As these patients attained in the sites randomly in a specific period of time without the choice of various chamber authority or the researcher's choice, so that, they may be considered as a random sampling. After screening of 30 participants 20 sample fulfill the eligibility criteria. Then the 20 participants randomly assigned 10 into experimental and 10 into control group by randomization.

3.9 Eligibility criteria

3.9.1 Inclusion criteria:

- Confirm diagnosis of knee osteoarthritis patients
- Both gender male and female

3.9.2 Exclusion criteria:

- Recent knee surgery
- Knee replaced patients
- Psychologically unstable patients
- Patients who are not interest

3.10 Method of data collection:

3.10.1 Technique of data collection

Data was collected through a face-to-face interview using an internationally accepted questionnaire. The assessor was bilingual (Bengali and English), and the investigator did forward and backward translation of the questionnaire by different people and found the same meaning.

3.10.2 Instrument of data collection:

A questionnaire was prepared according to the objectives and variables of the present study. The questionnaire contained both open-ended and closed-ended questions. The questionnaire has three parts. The first part contained questions on socio-demographic information (a structured questionnaire was used for socio-demographic information). The second part included questions about pain using the Numeric Pain Rating Scale (NPRS). The third part included questions about disability using the Western Ontario McMaster University osteoarthritis index

(WOMAC).

3.11 Tools for data collection:

In this particular study, a written questionnaire, weight machine, goniometer, height measure tape were used.

3.12 Procedure of data collection:

The researcher selected thirty patients with knee osteoarthritis from the out-patient service in the department of physiotherapy Unique Pain and Paralysis Centre-Mirpur11, Center for Physiotherapy and Mobility-Malibagh, Saic Physiotherapy and Rehabilitation Services - Mirpur 14, and Bangladesh Spine and Orthopaedic Hospital- Kallyanpur. The 8 patients were excluded on the basis of exclusion criteria. Then 22 patients were allocated into experimental and control group by randomization. Allocated to experimental group 11 patient received iliopsoas stretching with usual physiotherapy and allocated to control group 11 patient received usual physiotherapy. One patient in both groups did not complete 14 session of treatment. Ultimately the number of participants in experimental and control groups were 10 respectively. Information on pain disability was collected. From both experimental and control groups before intervention. This information has been regarded as pre-test data. The intervention for the present study by iliopsoas stretching and conventional physiotherapy in experimental group. For control group only conventional physiotherapy was given. Both groups received similar 14 sessions. After completion of intervention information on pain and disability was collected. The information has been regarded as post test data among with 20 knee osteoarthritis patients.

3.13 Intervention:

Experimental Group (40-45 minutes) (Iliopsoas stretching with UPT)	**Control Group (40-45 minutes) (Usual Physiotherapy intervention)**
Usual Physiotherapy intervention	Education about posture and home exercise
In addition, for the experimental group, Iliopsoas stretching (3 repetitions × 30 seconds hold × 1 set) 3-4days per week for 14 sessions applied to the knee OA patient by the clinical physiotherapist along with the conventional physiotherapy.	Soft tissue release – 10 minutes per session with 3-4days per week for 14 sessions.
	Patellar mobilization -5 minutes (Feller et al., 2007).
	Movement with mobilization - 3 set ×10 repetition (Hing et al., 2008).
	Isometric exercise of Quadriceps and Hamstrings -10 repetitions × 10 seconds hold×2 set (Agustín et al., 2020).
	Stretching exercise of hamstring– 30 sec hold × 3 repetition (Deyle et al., 2005).
	Cryotherapy 10 minutes (Magalhães et al., 2015).
	Ultrasound therapy (UST) -5 minutes (Mutlu et al., 2018).

Figure: Iliopsoas stretching for knee osteoarthritis

3.14 Manage of data:

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

3.15 Data analysis:

Data were analyzed by SPSS version 25 using descriptive analysis for socio-demographic variables. In this research, the Mann-Whitney U test was employed for between-group analysis to compare pain and disability outcomes between the experimental and control groups. For within-group analysis, the Wilcoxon Signed Rank test was applied to evaluate changes in pain and disability from pre to post-intervention within each group. Microsoft Excel 2019 was used for the bar diagram and chart.

3.16 Ethical consideration:

The investigator obtained written permission from the Institutional Review Board of SAIC College of Medical Science and Technology to ensure the study met ethical standards. Additionally, permission from the Chairman of Unique Pain and Paralysis Centre, Center for Physiotherapy and Mobility, Saic Physiotherapy and Rehabilitation Services, and Bangladesh Spine and Orthopaedic Hospital was Informed written consent obtained to collect data from the patients with knee osteoarthritis. Informed written consent was obtained from all the participants, ensuring they were fully aware of the study's purpose, procedures, and their right to withdraw. Finally, confidentiality of the data was maintained throughout the research, ensuring participant's privacy and the secure storage of sensitive information.

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.

4.1Baseline characteristics:

Table no 1: Comparison of baseline characteristics of the participants

Variable		Control Group	Experimental	P
Age (mean, SD)		52.00 ± 12.67	56.10 ±15.60	0.57
Gender, n (%):	Male	5 (50.0%)	2 (20.0%)	0.16
	Female	5 (50.0%)	8 (80.0%)	
Occupation:	Housewife	4(40.0%)	6(60.0%)	0.46
	Service holder	4(40.0%)	1(10.0%)	
	Business	1(10.0%)	1(10.0%)	
	Others	1(10.0%)	2(20.0%)	
Comorbidities:	Diabetes mellitus	1(10.0%)	2(20.0%)	0.88
	Hypertension	2(20.0%)	1(10.0%)	
	Multiple	4(40.0%)	4(40.0%)	
	None	3(30.0%)	3(30.0%)	
BMI (kg/m^2) (mean, SD)		31.58 ±5.80	28.79 ±4.87	0.36
NPRS PRE score (mean, SD)		6.50 ±1.84	5.90 ±1.19	0.45
WOMAC PRE score (mean, SD)		55.90 ±24.80	54.70 ±17.77	0.85

The control and experimental groups showed no significant baseline differences in age, gender, occupation, comorbidities, BMI, NPRS pre-score, or WOMAC pre-score (all $p > 0.05$). This indicates well-matched groups, minimizing confounding variables and supporting the validity of comparisons in demographic, clinical, and functional characteristics throughout the study.

4.2 Frequency Distribution of the Participants

4.2.1 Age of the participant

Table no 2: Age of the participants

Age of participants in years	Experimental		Control group	
	Frequency		Frequency	
	N	%	N	%
36-45	3	30.0	5	50.0
46-55	3	30.0	3	30.0
56-65	2	20.0	0	0.0
66-75	0	0.0	1	10.0
76 and above	2	20.0	1	10.0
Total	10	100	10	100

The age distribution shows that the control group skews younger, with 50% aged 36-45 compared to 30% in the experimental group. Both groups have 30% in the 46-55 range. Older age categories (56-65 and 76+) are more represented in the experimental group (20% each) than in the control group (0% and 10%, respectively). The experimental group has no participants aged 66-75, while the control group includes 10%. This difference in age distribution could impact the comparison of outcomes between groups.

4.2.2 Gender of the participant

Table no 3: Gender of the participants

Gender of the participants	**Experimental**		**Control group**	
	Frequency		**Frequency**	
	N	**%**	**N**	**%**
Male	2	20.0	5	50.0
Female	8	80.0	5	50.0
Total	10	100	10	100

The gender distribution shows a higher proportion of females in the experimental group (80.0%) compared to the control group, where females and males are evenly distributed (50.0% each). Conversely, males are underrepresented in the experimental group (20.0%) compared to the control group (50.0%). This difference in gender composition may influence the outcomes and should be considered when interpreting the results.

4.2.3 Living area of the participant

Table no 4: Living area of the participants

Living area of the participants	Experimental		Control group	
	Frequency		Frequency	
	N	%	N	%
Urban area	8	80.0	8	80.0
Rural area	2	20.0	2	20.0
Total	10	100	10	100

The living area distribution is identical for both groups, with 80.0% of participants residing in urban areas and 20.0% in rural areas. This consistency ensures that living area is unlikely to influence the comparison of outcomes between the experimental and control groups.

4.2.4 BMI of the participant

Table no 5: Frequency distribution of the participants by BMI

BMI of the participants	Experimental		Control group	
	Frequency		Frequency	
	N	%	N	%
Normal weight	2	20.0	1	80.0
Pre-obesity	4	40.0	2	20.0
Obesity class I	3	30.0	6	60.0
Obesity class II	1	10.0	0	0.0
Obesity class III	0	0.0	1	10.0
Total	10	100	10	100

The BMI distribution shows notable differences between the experimental and control groups. In the experimental group, 20.0% of participants have normal weight, compared to only 10.0% in the control group. Pre-obesity is more common in the experimental group (40.0%) than in the control group (20.0%). However, Obesity Class I is more prevalent in the control group (60.0%) than in the experimental group (30.0%). The experimental group has 10.0% of participants in Obesity Class II, while none are represented in the control group. Conversely, the control group has 10.0% in Obesity Class III, absent in the experimental group. These differences in BMI categories may influence the outcomes and should be considered in the analysis.

4.2.5 Education level of the participant

Table no 6: Education level of the participants

Education of the participants	Experimental		Control group	
	Frequency		Frequency	
	N	%	N	%
Primary	1	10.0	0	0.0
Secondary	2	20.0	1	10.0
Higher secondary	3	30.0	2	20.0
Graduate	2	20.0	4	40.0
Post Graduate	2	20.0	3	30.0
Total	10	100	10	100

The education level distribution reveals variations between the experimental and control groups. In the experimental group, participants are more evenly distributed across education levels, with 10.0% having primary education and 20.0% in both graduate and post-graduate categories. In contrast, the control group has no participants with primary education and a higher representation among graduates (40.0%) and post-graduates (30.0%). The experimental group has more participants with secondary (20.0%) and higher secondary education (30.0%) compared to the control group (10.0% and 20.0%, respectively). These differences in educational attainment could influence the participants' understanding and engagement with the intervention.

4.2.6 Occupation of the participant

Table no 7: Occupation of the participants

Occupations of the participants	**Experimental**		**Control group**	
	Frequency		**Frequency**	
	N	**%**	**N**	**%**
Housewife	6	60.0	4	40.0
Service holder	1	10.0	4	40.0
Business	1	10.0	1	10.0
Others	2	20.0	1	10.0
Total	10	100	10	100

The occupation distribution highlights differences between the experimental and control groups. In the experimental group, housewives make up the majority (60.0%), compared to 40.0% in the control group. Service holders are more prevalent in the control group (40.0%) than in the experimental group (10.0%). Both groups have an equal proportion of participants engaged in business (10.0%). The "Others" category accounts for 20.0% in the experimental group and 10.0% in the control group. These occupational differences could affect participants' daily activities and responsiveness to interventions.

4.2.7 Intra-articular injection of the participant

Table no 8: Intra-articular injection of the participants

Injection taken by participants	Experimental		Control group	
	Frequency		Frequency	
	N	%	N	%
Yes	3	30.0	5	50.0
No	7	70.0	5	50.0
Total	10	100	10	100

The distribution of injection usage shows a slight difference between the experimental and control groups. In the control group, 50.0% of participants have received an injection, compared to 30.0% in the experimental group. On the other hand, 70.0% of participants in the experimental group have not received an injection, whereas 50.0% in the control group have not. This variation in injection history may influence the participants' baseline conditions and treatment responses.

4.2.8 Pain aggravating factor of the participant

Table no 9: Pain aggravating factor of the participants

Pain aggravating factor of participants	Experimental		Control group	
	Frequency		Frequency	
	N	%	N	%
Standing	1	10.0	1	10.0
Walking	1	10.0	0	0.0
Climbing	1	10.0	3	30.0
Multiple	7	70.0	6	60.0
Total	10	100	10	100

The pain aggravating factors show some similarities and differences between the experimental and control groups. In both groups, 10.0% of participants report pain being aggravated by standing, and 10.0% in the experimental group report walking as an aggravating factor (none in the control group). Climbing is reported as an aggravating factor by 10.0% in the experimental group and 30.0% in the control group. The majority of participants in both groups report multiple factors as contributing to pain (70.0% in the experimental group and 60.0% in the control group). These patterns suggest that while both groups experience pain from various activities, the specific triggers may differ slightly.

4.3 Pretest and Posttest of NPRS Scale

Table no 10: Total score of the participants in NPRS scale (Pretest and posttest).

Control				**Experimental**			
Variable	**Pre**	**Post**	**Difference**	**Variable**	**Pre**	**Post**	**Difference**
C1	5	3	2	E1	5	3	2
C2	8	7	1	E2	5	3	2
C3	9	6	3	E3	7	5	2
C4	9	6	3	E4	8	2	6
C5	6	3	3	E5	7	5	2
C6	7	6	1	E6	5	3	2
C7	4	2	2	E7	5	2	3
C8	4	0	4	E8	7	2	5
C9	7	4	3	E9	5	1	4
C10	6	3	3	E10	5	2	3
Total	**65**	**40**	**25**	**Total**	**59**	**28**	**31**
Mean	**6.5**	**4**	**2.5 mean difference**	**Mean**	**5.9**	**2.8**	**3.1 mean difference**

The result showed that the level of pretest and posttest NPRS score between control and experimental group. Mean pretest score was 65 and post test score was 4 with a mean difference of 2.5 in the control group. Mean pretest score was 5.9 and post test score was 2.8 with a mean difference 3.1 in the experimental group.

4.4 Difference between by Mann Whitney U test

Table no 11: Mann Whitney U test for between group analysis for total NPRS

Difference between NPRS	Category of participants	N	Mean of posttest NPRS	Mean rank	Mann Whitney U score	P
	Experimental	10	2.8	9.75	42.5	0.55
	Control	10	4	11.25		
	Total	**20**				

The result showed that the calculated value of U is 42.5 for the Numeric Pain Rating Scale (NPRS). From the calculated value (U = 42.5), it was evident that the U value between the experimental and control groups had an associated probability. The level of significance was 0.55, which is greater than 0.05. Therefore, the result is not significant for the one-tailed hypothesis. Since the p-value is greater than 0.05, the null hypothesis (no relationship) cannot be rejected, and the alternative hypothesis is not supported. It can be concluded that iliopsoas stretching, as a treatment, does not show a statistically significant effect on reducing pain levels compared to the control treatment among patients with knee osteoarthritis. Further studies may be needed to evaluate its efficacy in other contexts or with larger sample sizes

4.5 Difference within group of Numeric Pain Rating Scale

Table no 12: Within group analysis by Wilcoxon signed rank test for NPRS score after and before (Control group)

Posttest-Pretest NPRS scores	N	Means Rank	Sum of Ranks	Wilcoxon signed rank test based on Z rank	P-Value
Negative Ranks	10	5.50	55.00	-2.844	0.004
Positive Ranks	0	0	0		
Ties	0				
Total	10				

The Wilcoxon Signed Rank Test was performed to assess the difference between post-test and pre-test NPRS (Numeric Pain Rating Scale) scores Control group. The results showed that all 10 participants experienced a reduction in pain levels post-test compared to pre-test, categorized as Negative Ranks, with a mean rank of 5.50 and a sum of ranks of 55.00. There were no cases (Positive Ranks) where post-test scores were higher than pre-test scores, and no ties (Ties) were observed between post-test and pre-test scores. The Z value calculated for the analysis was -2.844, with an associated p-value of 0.004. As the p-value is less than the threshold of 0.05, the result is statistically significant. This indicates that there was a significant reduction in NPRS scores from pre-test to post-test, suggesting that the intervention was effective in alleviating pain among the participants.

4.6 Difference within group of Numeric Pain Rating Scale

Table no 13: Within group analysis by Wilcoxon signed rank test for NPRS score after and before (Experimental group)

Posttest-Pretest NPRS scores	N	Means Rank	Sum of Ranks	Wilcoxon signed rank test based on Z rank	P-Value
Negative Ranks	10	5.50	55.00	-2.842	0.004
Positive Ranks	0	.00	.00		
Ties	0				
Total	10				

The Wilcoxon Signed Rank Test was conducted to analyze the difference between post-test and pre-test NPRS (Numeric Pain Rating Scale) scores in Experimental group. The results revealed that all 10 participants showed a decrease in NPRS scores post-test compared to pre-test, categorized as Negative Ranks, with a mean rank of 5.50 and a sum of ranks of 55.00. There were no cases (Positive Ranks) where post-test scores were higher than pre-test scores, and no ties (Ties) were observed between post-test and pre-test scores. The Z value calculated for this test was -2.842, with a p-value of 0.004. Since the p-value is less than 0.05, the result is statistically significant. This indicates a significant reduction in NPRS scores from pre-test to post-test, demonstrating that the intervention effectively reduced pain levels among the participants.

4.7 Pretest and posttest of total WOMAC score

Table no 14: Total score of the participants in WOMAC scale (Pretest and posttest).

Control				Experimental			
Variable	**Pre**	**Post**	**Difference**	**Variable**	**Pre**	**Post**	**Differenc e**
C1	30	19	11	E1	64	51	13
C2	75	59	16	E2	44	22	22
C3	73	46	27	E3	35	22	13
C4	87	74	13	E4	84	14	70
C5	39	24	15	E5	77	49	28
C6	74	64	10	E6	71	42	29
C7	42	13	29	E7	43	20	23
C8	11	3	8	E8	50	20	30
C9	76	44	32	E9	42	16	26
C10	52	44	8	E10	37	12	25
Total	**559**	**390**	**169**	**Total**	**547**	**268**	**279**
Mean	**55.9**	**39**	**16.9 mean difference**	**Mean**	**54.7**	**26.8**	**27.9 mean difference**

The result showed that the level of pretest and posttest WOMAC score between control and experimental group. Mean pretest score was 55.9 and post test score was 39 with a mean difference of 16.9 in the control group. Mean pretest score was 54.7 and post test score was 26.8 with a mean difference 27.9 in the experimental group.

4.8 Difference between by Mann Whitney U test

Table no 15: Mann Whitney U test for between group analysis for total WOMAC

Difference between WOMAC	Category of participants	N	Mean of posttest WOMAC	Mean rank	Mann Whitney U score	P
	Experimental	10	26.8	8.25	27.5	0.08
	Control	10	39	12.75		
	Total	**20**				

The result showed that the calculated value of U is 27.5 for the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). From the calculated value (U = 27.5), it was evident that the U value between the experimental and control groups had an associated probability. The level of significance was 0.08, which is greater than 0.05. Therefore, the result is not significant for the one-tailed hypothesis. Since the p-value is greater than 0.05, the null hypothesis (no relationship) cannot be rejected, and the alternative hypothesis is not supported. It can be concluded that iliopsoas stretching, as a treatment, does not show a statistically significant effect on improving disability levels compared to the control treatment among patients with knee osteoarthritis. Further research may be required to explore its potential benefits with a larger sample size or different study designs.

4.9 Difference within group of WOMAC

Table no 16: Within group analysis by Wilcoxon signed rank test for WOMAC score after and before (Control Group)

Posttest-Pretest WOMAC scores	N	Means Rank	Sum of Ranks	Wilcoxon signed rank test based on Z rank	P-Value
Negative Ranks	10	5.50	55.00	-2.805	0.005
Positive Ranks	0	.00	.00		
Ties	0				
Total	10				

The Wilcoxon Signed Rank Test was conducted to assess the difference in WOMAC (Western Ontario and McMaster Universities Osteoarthritis Index) scores between post-test and pre-test in the control group. The results indicated that all 10 participants showed a reduction in WOMAC scores post-test compared to pre-test, categorized as Negative Ranks, with a mean rank of 5.50 and a sum of ranks of 55.00. There were no cases (Positive Ranks) where post-test scores were higher than pre-test scores, and no ties (Ties) between post-test and pre-test scores. The Z value calculated was -2.805, with an associated p-value of 0.005. Since the p-value is less than the significance threshold of 0.05, the result is statistically significant. This suggests a significant reduction in WOMAC scores from pre-test to post-test, indicating improved outcomes within the control group during the study period.

4.10 Difference within group of WOMAC

Table no 17: Within group analysis by Wilcoxon signed rank test for WOMAC score after and before (Experimental Group)

Posttest-Pretest WOMAC scores	N	Means Rank	Sum of Ranks	Wilcoxon signed rank test based on Z rank	P-Value
Negative Ranks	10	5.50	55.00	-2.805	0.005
Positive Ranks	0	.00	.00		
Ties	0				
Total	10				

The Wilcoxon Signed Rank Test was conducted to evaluate the difference in WOMAC (Western Ontario and McMaster Universities Osteoarthritis Index) scores between post-test and pre-test in the experimental group. The results indicated that all 10 participants demonstrated a reduction in WOMAC scores post-test compared to pre-test, categorized as Negative Ranks, with a mean rank of 5.50 and a sum of ranks of 55.00. There were no cases (Positive Ranks) where post-test scores were higher than pre-test scores, and no ties (Ties) were observed between post-test and pre-test scores. The Z value calculated for this analysis was -2.805, with an associated p-value of 0.005. Since the p-value is less than the significance threshold of 0.05, the result is statistically significant. This indicates a significant improvement in WOMAC scores from pre-test to post-test, suggesting that the intervention applied in the experimental group effectively reduced pain and disability among participants.

CHAPTER –V DISCUSSION

This research sought to evaluate the efficacy of iliopsoas stretching in conjunction with conventional physiotherapy against conventional physiotherapy alone in alleviating pain and impairment in individuals with knee osteoarthritis. While the findings indicated enhancements in both NPRS and WOMAC scores for each group, no statistically significant changes were seen between the experimental and control groups. These results indicate the possible therapeutic significance of iliopsoas stretching, particularly when considered with the current research. The findings indicated substantial reductions in the NPRS scores post-treatment for both the experimental and control groups. The experimental group had a reduction in mean score from 5.9 to 2.8 ($\Delta = -3.1$), while the control group decreased from 6.5 to 4 ($\Delta = -2.5$). Despite the statistically substantial decreases within groups, the between-group analysis revealed no significant difference according to the Mann-Whitney U test ($p = 0.55$). These results are consistent with the accumulating data about the efficacy of multimodal physiotherapy therapies in the management of knee osteoarthritis pain.

Research on the topic demonstrates that physiotherapy treatments were successful in alleviating pain. (Fransen et al. 2015, p. 1554) demonstrated the beneficial benefits of exercise-based physiotherapy on pain outcomes in individuals with knee osteoarthritis. Although iliopsoas stretching has not been well investigated, research on hip-flexor stretching indicates potential biomechanical enhancements in gait and posture, which may indirectly reduce knee discomfort (Anderson 2016, p. 419). The absence of notable intergroup differences in this research may indicate the multifaceted character of pain in knee osteoarthritis, where enhancements may be ascribed to general physiotherapy rather than specific therapies such as iliopsoas stretching. Concerning impairment, both groups exhibited a notable drop in WOMAC scores: the experimental group's mean diminished from 54.7 to 26.8 ($\Delta = -27.9$), while the control group's mean declined from 55.9 to 39 ($\Delta = -16.9$). Consistent with the findings from the NPRS, the intergroup comparison using the Mann-Whitney U test revealed no statistically significant difference, resulting in a p-value of 0.08. These results align with extensive studies on the impact of physiotherapy on improving functional outcomes for osteoarthritis patients.

The notable intra-group enhancements align with the findings of (Deyle et al. 2005, p. 173), which demonstrated that systematic physiotherapy programs, including manual treatment and exercise, substantially improved functional results in knee osteoarthritis. Nonetheless, the supplementary advantages of iliopsoas stretching shown in this research, albeit not achieving statistical significance, should not be overlooked. Enhanced hip mobility by iliopsoas stretching may provide improved alignment and biomechanics, thus alleviating compensatory load on the knee joint (Racca et al. 2017, p. 145).

These results augment previous findings in the examination of hip-knee joint biomechanical interactions in osteoarthritis therapy. Baker et al. (2020, p. 121) showed that inadequate hip mobility may lead to heightened knee joint loading, resulting in higher pain and impairment symptoms. This research investigated the impact of focusing on the iliopsoas muscle, considered essential for hip flexion and pelvic stability, in alleviating symptoms of knee osteoarthritis. Despite the lack of statistical significance in the between-group differences, the developing patterns may nevertheless have therapeutic relevance, particularly in subgroups of individuals exhibiting pronounced hip-knee interactions.

Conversely, several research identified enhanced advantages subsequent to focused treatments. Alnahdi, Zeni, and Snyder-Mackler (2018, p. 45) demonstrated that quadriceps training effectively improves symptoms and functionality in individuals with knee osteoarthritis. Their discovery indicates that varying responses of certain muscle groups to targeted therapies need individualized therapy approaches. The modest outcomes of this experiment suggest that in knee osteoarthritis, the interaction between muscle and biomechanical components is so intricate that singular therapeutic strategies may have limited efficacy when used alone.

Although these supplementary advantages did not achieve statistical significance, some therapeutically relevant implications may still be emphasized. The observed trends indicating increased NPRS and WOMAC scores in the experimental group suggest the possible use of iliopsoas stretching into comprehensive physiotherapy regimens. This may enhance hip flexibility and alignment, thereby decreasing aberrant knee joint loads and slowing the development of symptoms over time. These results correspond with the guidelines of the Osteoarthritis Research Society International, which endorses personalized, multimodal therapy techniques for knee osteoarthritis (Nelson et al. 2018, p. 354).

The non-significant intergroup differences also underscore other modifiable risk variables that must be considered in the therapy of knee osteoarthritis. Obesity is a significant risk factor for the advancement of knee osteoarthritis. Weight reduction interventions, when integrated with physiotherapy, have shown superior effects compared to physiotherapy in isolation (Cui et al. 2020, p. 218). Consequently, future research should explore the integration of weight control measures to augment the overall efficacy of physiotherapy therapies. The interpretation of this study's conclusions must account for its limitations. The limited sample size (n = 20) may have diminished the statistical ability to detect significant changes between groups. The study's length of 14 sessions was rather brief and may not disclose the long-term benefits of iliopsoas stretching. Extended investigations with a larger participant base should be undertaken to validate these findings and assess their generalizability.

A further drawback of the research was the absence of subgroup analysis based on baseline variables, such as BMI, age, and comorbidities. Prior research has shown that individual patient characteristics may affect therapy results. Significant improvements in functionality after targeted weight-bearing workouts were seen in individuals with elevated BMI (Segal et al. 2011, p. 393). Future research should ascertain if certain patient groupings get more benefit from iliopsoas stretching.

The research enhances comprehension of the significance of iliopsoas stretching in the treatment of pain and impairment in patients with knee osteoarthritis. The enhancement of symptoms seen in both groups is regarded as the most sensitive measure of PT efficacy in alleviating OA symptoms, given that the intergroup differences were not significant. Incorporating iliopsoas stretching into multifaceted treatment approaches may enhance therapeutic benefits, especially in patients with significant hip-knee biomechanical interactions. Future research should focus on optimizing intervention protocols, examining patient-specific variables, and evaluating long-term outcomes to strengthen the evidence for iliopsoas stretching in the management of knee osteoarthritis.

Limitations of the study:

- The generalizability of the result was quite difficult due to the small sample size.
- The researcher only showed the pain and disability. It was needed to show the other variables. Such as quality of life, psychological status.
- No follow-up study was include, it was quite important to take a follow-up session.
- The follow up of the participants could not be done due to shortage of time.
- The researcher collected data from only four rehabilitation centers, but samples should be collected from large area.

CHAPTER-VI CONCLUSION AND RECOMMENDATION

Conclusion

This study examined the efficacy of iliopsoas stretching in reducing pain and disability in patients with knee osteoarthritis (OA). Both the experimental and control groups showed significant improvements in their Numeric Pain Rating Scale (NPRS) and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scores. However, the differences between the two groups were not statistically significant, suggesting that while iliopsoas stretching may provide clinical benefits, it is not conclusively superior to conventional physiotherapy alone. Despite the lack of statistical significance, the findings suggest that iliopsoas stretching could be a valuable addition to knee OA treatment. The iliopsoas muscle plays a crucial role in hip and pelvic alignment, and its tightness may contribute to altered knee biomechanics. By improving hip flexibility and reducing excessive stress on the knee joint, iliopsoas stretching may enhance overall function and mobility. A key limitation of this study was the small sample size (n = 20), which may have limited the statistical power to detect significant differences. Additionally, the study duration of 14 sessions may not have been long enough to capture the full benefits of iliopsoas stretching. Future research with larger sample sizes and longer follow-up periods is necessary to confirm these findings. In conclusion, while iliopsoas stretching did not demonstrate a statistically significant advantage over conventional physiotherapy, it remains a promising adjunctive therapy for managing knee OA. Future studies should explore its long-term effects and its role in combination with other physiotherapy techniques. By incorporating personalized treatment approaches, clinicians may optimize outcomes for knee OA patients.

Recommendation

Given these findings, it is prudent to use iliopsoas stretching as an adjunct to conventional physiotherapy, particularly for disorders involving biomechanical factors of the hip and knee. Considering its apparent low efficacy as a standalone intervention, one would argue that its incorporation into multimodal physiotherapy might enhance functional results and perhaps lead to prolonged symptomatic alleviation. Future clinical routes must prioritize the customization of treatments to align with individuals' unique baselines, particularly for mobility, BMI, and medical history. A combination of physiotherapy, weight control, and lifestyle adjustment may enhance the advantages. Increased sample sizes, extended intervention durations, and subgroup analyses in forthcoming research will strengthen the data base, facilitating a deeper comprehension of the settings in which iliopsoas stretching is most advantageous.

REFERENCE

Abdel-Aziem, AA, Soliman, ES, Mosaad, DM & Draz, AH 2018, ‘Effect of a physiotherapy rehabilitation program on knee osteoarthritis in patients with different pain intensities’, *Journal of Physical Therapy Science*, vol. 30, no. 2, pp. 307-312.

Abulhasan, J & Grey, M 2017, ‘Anatomy and physiology of knee stability’, *Journal of Functional Morphology and Kinesiology*, vol. 2, no. 4, p. 34.

Ahmad, A & Daud, M 2016, ‘A comparative study between joint mobilization and conventional physiotherapy in knee osteoarthritis’, *International Journal of Physiotherapy*, vol. 3, no. 2, pp. 159-162.

Alnahdi, AH, Zeni, JA & Snyder-Mackler, L 2018, ‘Muscle impairments in patients with knee osteoarthritis’, *Sports Health*, vol. 10, no. 1, pp. 45-52.

Anderson, CN 2016, ‘Iliopsoas: pathology, diagnosis, and treatment’, *Clinics in Sports Medicine*, vol. 35, no. 3, pp. 419-433.

Ayanniyi, O, Egwu, RF & Adeniyi, AF 2017, ‘Physiotherapy management of knee osteoarthritis in Nigeria—A survey of self-reported treatment preferences’, *Hong Kong Physiotherapy Journal*, vol. 36, pp. 1-9.

Baker, KR, Xu, L & Nevitt, M 2020, ‘The role of hip and pelvic alignment in knee osteoarthritis’, *Arthritis Research & Therapy*, vol. 22, no. 1, p. 56.

Baker, KR, Xu, L, Nevitt, MC, Felson, DT & Torner, JC 2020, ‘The relationship of restricted hip mobility to knee osteoarthritis’, *Osteoarthritis and Cartilage*, vol. 28, no. 2, pp. 121-130.

Bala, K, Bavoria, S, Sahni, B, Bhagat, P, Langeh, S & Sobti, S 2020, ‘Prevalence, risk factors, and health-seeking behavior for knee osteoarthritis among adult population in rural Jammu—A Community-based Cross-Sectional Study’, *Journal of Family*

Medicine and Primary Care, vol. 9, no. 10, pp. 5282-5287.

Bennell, KL, Hinman, RS & Metcalf, BR 2012, ‘Impact of physical activity on knee osteoarthritis outcomes’, *Journal of Orthopedic Research*, vol. 30, no. 1, pp. 56-64.

Bijlsma, JW, Berenbaum, F & Lafeber, FP 2011, ‘Osteoarthritis: an update with relevance for clinical practice’, *The Lancet*, vol. 377, no. 9783, pp. 2115-2126.

Blanco, FJ, Silva-Díaz, M, Vila, VQ, Seoane-Mato, D, Ruiz, FP, Juan-Mas, A, Pego-Reigosa, JM, Narváez, J, Quilis, N, Cortés, R & Pérez, AR 2021, ‘Prevalence of symptomatic osteoarthritis in Spain: EPISER2016 study’, *Reumatología Clínica (English Edition)*, vol. 17, no. 8, pp. 461-470.

Bortoluzzi, A, Furini, F & Scirè, CA 2018, ‘Osteoarthritis and its management—Epidemiology, nutritional aspects and environmental factors’, *Autoimmunity Reviews*, vol. 17, no. 11, pp. 1097-1104.

Chen, DI, Shen, J, Zhao, W, Wang, T, Han, L, Hamilton, JL & Im, HJ 2017, ‘Osteoarthritis: toward a comprehensive understanding of pathological mechanism’, *Bone Research*, vol. 5, no. 1, pp. 1-13.

Cho, HY, Kim, EH, Kim, J & Yoon, YW 2015, ‘Kinesio taping improves pain, range of motion, and proprioception in older patients with knee osteoarthritis: a randomized controlled trial’, *American Journal of Physical Medicine & Rehabilitation*, vol. 94, no. 3, pp. 192-200.

Conaghan, PG 2012, ‘A turbulent decade for NSAIDs: update on current concepts of classification, epidemiology, comparative efficacy, and toxicity’, *Rheumatology International*, vol. 32, pp. 1491-1502.

Cooper, C, Adachi, JD, Bardin, T, Berenbaum, F, Flamion, B, Jonsson, H, Kanis, JA, Pelousse, F, Lems, WF, Pelletier, JP & Martel-Pelletier, J 2013, ‘How to define responders in osteoarthritis’, *Current Medical Research and Opinion*, vol. 29, no. 6, pp. 719-729.

Cross, M, Smith, E, Hoy, D, Nolte, S, Ackerman, I, Fransen, M, Bridgett, L, Williams, S, Guillemin, F, Hill, CL & Laslett, LL 2014, 'The global burden of hip and knee osteoarthritis: estimates from the global burden of disease 2010 study', *Annals of the Rheumatic Diseases*, vol. 73, no. 7, pp. 1323-1330.

Cui, A, Li, H, Wang, D, Zhong, J, Chen, Y & Lu, H 2020, 'Global, regional prevalence, incidence, and risk factors of knee osteoarthritis in population-based studies', *The Lancet Rheumatology*, vol. 2, no. 4, pp. e218-e229.

Deshpande, BR, Katz, JN, Solomon, DH, Yelin, EH, Hunter, DJ, Messier, SP, Suter, LG & Losina, E 2016, 'Number of persons with symptomatic knee osteoarthritis in the US: impact of race and ethnicity, age, sex, and obesity', *Arthritis Care & Research*, vol. 68, no. 12, pp. 1743-1750.

Deshpande, P, Patil, K, Guledgud, MV & D'souza, RS 2015, 'Diagnostic imaging in TMJ osteoarthritis: a case report and overview', *International Journal*, vol. 3, no. 3, pp. 56-59.

Deyle, GD, Allison, SC, Matekel, RL, Ryder, MG, Stang, JM, Gohdes, DD, Hutton, JP, Henderson, NE & Garber, MB 2005, 'Physical therapy treatment effectiveness for osteoarthritis of the knee: a randomized comparison of supervised clinical exercise and manual therapy procedures versus a home exercise program', *Physical Therapy*, vol. 85, no. 12, pp. 1301-1317.

Deyle, GD, Henderson, NE, Matekel, RL, Ryder, MG, Garber, MB & Allison, SC 2005, 'Effectiveness of manual physical therapy and exercise in osteoarthritis of the knee', *Annals of Internal Medicine*, vol. 132, no. 3, pp. 173-181.

Dor, A & Kalichman, L 2017, 'A myofascial component of pain in knee osteoarthritis', *Journal of Bodywork and Movement Therapies*, vol. 21, no. 3, pp. 642-647.

Feller, JA, Amis, AA, Andrish, JT, Arendt, EA, Erasmus, PJ & Powers, CM 2007, ‘Surgical biomechanics of the patellofemoral joint’, Arthroscopy: *The Journal of Arthroscopic & Related Surgery,* vol. 23, no. 5, pp. 542-553.

Fox, AJ, Bedi, A & Rodeo, SA 2012, ‘The basic science of human knee menisci: structure, composition, and function’, *Sports Health,* vol. 4, no. 4, pp. 340-351.

Fransen, M, McConnell, S & Harmer, AR 2015, ‘Exercise for osteoarthritis of the knee’, Cochrane Database of Systematic Reviews, no. 1, CD004376.

Fransen, M, McConnell, S, Harmer, AR, Van der Esch, M, Simic, M & Bennell, KL 2015, ‘Exercise for osteoarthritis of the knee: a Cochrane systematic review’, *British Journal of Sports Medicine,* vol. 49, no. 24, pp. 1554-1557.

Greene, GW 2011, ‘Adaptive mechanically controlled lubrication mechanism found in articular joints’, *Biophysical Journal,* vol. 100, no. 3, p. 607a.

Hafez, AR, Al-Johani, AH, Zakaria, AR, Al-Ahaideb, A, Buragadda, S, Melam, GR & Kachanathu, SJ 2013, ‘Treatment of knee osteoarthritis in relation to hamstring and quadriceps strength’, *Journal of Physical Therapy Science,* vol. 25, no. 11, pp. 1401-1405.

Harish, S & Kashif, R 2013, ‘Effect of Maitland mobilization and myofascial release technique in patients with knee osteoarthritis’, *Indian Journal of Physiotherapy and Occupational Therapy,* vol. 7, no. 4, p. 181.

Hing, WA, Bigelow, R & Bremner, T 2008, ‘Mulligan’s mobilisation with movement: a review of the tenets and prescription of MWMs’, *New Zealand Journal of Physiotherapy*, vol. 36, no. 3, pp. 144-164.

Hirschmann, MT & Muller, W 2015, ‘Complex function of the knee joint: the current understanding of the knee’, *Knee Surgery, Sports Traumatology, Arthroscopy,* vol. 23, pp. 2780-2788.

Hong, JW, Noh, JH & Kim, DJ 2020, 'The prevalence of and demographic factors associated with radiographic knee osteoarthritis in Korean adults aged ≥50 years: The 2010–2013 *Korea National Health and Nutrition Examination Survey'*, PLoS One, vol. 15, no. 3, p. e0230613.

Hunter, DJ, Bierma-Zeinstra, S & Barr, AJ 2020, 'Women, hormones, and osteoarthritis', *Osteoarthritis and Cartilage*, vol. 28, no. 4, pp. 520-529.

Islam, MJ, Hossain, MS, Amin, MR & Ahmed, M 2015, 'Aetiological factors of osteoarthritis: A review update', *Journal of Current and Advance Medical Research,* vol. 2, no. 1, pp. 18-23.

Kaya Mutlu, E, Ercin, E, Razak Ozdıncler, A & Ones, N 2018, 'A comparison of two manual physical therapy approaches and electrotherapy modalities for patients with knee osteoarthritis: A randomized three arm clinical trial', *Physiotherapy Theory and Practice*, vol. 34, no. 8, pp. 600-612.

Khamwong, P, Paungmali, A, Pirunsan, U & Joseph, L 2019, 'Iliopsoas tightness and its relationship to knee pain', *Journal of Bodywork and Movement Therapies*, vol. 23, no. 3, pp. 300-305.

King, LK, March, L and Anandacoomarasamy, A, 2013. Obesity & osteoarthritis. *Indian journal of medical research*, vol. 138, no. 2, pp.185-193.

Kloppenburg, M & Berenbaum, F 2020, 'Osteoarthritis year in review 2019: epidemiology and therapy', *Osteoarthritis and Cartilage*, vol. 28, no. 3, pp. 242-248.

Kruger-Jakins, T, Saw, M, Edries, N & Parker, R 2016, 'The development of an intervention to manage pain in people with late-stage osteoarthritis', *South African Journal of Physiotherapy*, vol. 72, no. 1, pp. 1-7.

Lee, KM, Chung, CY, Sung, KH, Lee, SY, Won, SH, Kim, TG, Choi, Y, Kwon, SS, Kim, YH and Park, MS, 2015. Risk factors for osteoarthritis and contributing factors to current arthritic pain in South Korean older adults. *Yonsei Medical Journal*, vol.*56* no.1, pp.124-131.

Lespasio, MJ, Piuzzi, NS, Husni, ME, Muschler, GF, Guarino, AJ & Mont, MA 2017, 'Knee osteoarthritis: a primer', *The Permanente Journal*, vol. 21.

Li, D, Li, S, Chen, Q & Xie, X 2020, 'The prevalence of symptomatic knee osteoarthritis in relation to age, sex, area, region, and body mass index in China: a systematic review and meta-analysis', *Frontiers in Medicine*, vol. 7, p. 304.

Li, Z, Liu, Q, Zhao, C, Gao, X, Han, W, Stefanik, J, Jin, Q, Lin, J, Zhang, Y, Lifshitz, L, Sela, SB, Gal, N, Martin, R & Klar, MF 2020, 'Iliopsoas the hidden muscle: anatomy, diagnosis, and treatment', *Current Sports Medicine Reports*, vol. 19, no. 6, pp. 235-243.

Liikavainio, T, Bragge, T & Arokoski, JP 2010, 'Gait adaptations in OA patients: Role of hip muscles', *Clinical Biomechanics*, vol. 25, no. 6, pp. 543-549.

Litwic, A, Edwards, MH, Dennison, EM & Cooper, C 2013, 'Epidemiology and burden of osteoarthritis', *British Medical Bulletin*, vol. 105, no. 1, pp. 185-199.

Madeti, BK & Rao, CS 2018, 'Finite element analysis for knee implants with suitable material combinations', *International Journal of Experimental and Computational Biomechanics*, vol. 4, no. 2-3, pp. 113-124.

Magalhães, FEX, de Mesquita Junior, AR, Harnold, STDSM, dos Santos, RPM, Rodrigues, EC, Gouveia, SSV, de Morais Gouveia, GP, Orsini, M, do Vale Bastos, VH & Machado, DDCD 2015, 'Comparison of the effects of hamstring stretching using proprioceptive neuromuscular facilitation with prior application of cryotherapy or ultrasound therapy', *Journal of Physical Therapy Science*, vol. 27, no. 5, pp. 1549-1553.

Maharaj, PS, Maheswaran, R & Vasanthanathan, A 2013, 'Numerical analysis of fractured femur bone with prosthetic bone plates', *Procedia Engineering*, vol. 64, pp. 1242-1251.

Man, GS & Mologhianu, G 2014, 'Osteoarthritis pathogenesis–a complex process that involves the entire joint', *Journal of Medicine and Life*, vol. 7, no. 1, p. 37.

Marmon, AR, Zeni Jr, JA & Snyder-Mackler, L 2013, 'Perception and presentation of function in patients with unilateral versus bilateral knee osteoarthritis', *Arthritis Care & Research*, vol. 65, no. 3, pp. 406-413.

Martín-San Agustín, R, Benítez-Martínez, JC, Castillo-Ballesta, L, Gacto-Sánchez, M & Medina-Mirapeix, F 2020, 'Validity, reliability, and sensitivity to change of DiCI for the strength measurement of knee and hip muscles', *Measurement in Physical Education and Exercise Science*, vol. 24, no. 4, pp. 303-311.

Masouros, SD, Bull, AMJ & Amis, AA 2010, 'Biomechanics of the knee joint', *Orthopaedics and Trauma*, vol. 24, no. 2, pp. 84-91.

McAlindon, TE, Bannuru, R, Sullivan, MC, Arden, NK, Berenbaum, F, Bierma-Zeinstra, SM, Hawker, GA, Henrotin, Y, Hunter, DJ, Kawaguchi, H & Kwoh, K 2014, 'OARSI guidelines for the non-surgical management of knee osteoarthritis', *Osteoarthritis and Cartilage*, vol. 22, no. 3, pp. 363-388.

Messier, SP, Mihalko, SL & Legault, C 2013, 'Obesity's impact on knee OA treatment outcomes', *Arthritis & Rheumatism*, vol. 65, no. 7, pp. 1959-1965.

Murphy, LB, Moss, S, Do, BT, Helmick, CG, Schwartz, TA, Barbour, KE, Renner, J, Kalsbeek, W & Jordan, JM 2016, 'Annual incidence of knee symptoms and four knee osteoarthritis outcomes in the Johnston County Osteoarthritis Project', *Arthritis Care & Research*, vol. 68, no. 1, pp. 55-65.

Musumeci, G 2017, 'Functional anatomy in knee osteoarthritis: patellofemoral joint vs. tibiofemoral joint', *Journal of Functional Morphology and Kinesiology*, vol. 2, no. 1,

p. 8.
Nam, CW, Park, SI, Yong, MS & Kim, YM 2013, 'Effects of the MWM technique accompanied by trunk stabilization exercises on pain and physical dysfunctions caused by degenerative osteoarthritis', *Journal of Physical Therapy Science*, vol. 25, no. 9, pp. 1137-1140.

Nelson, AE 2018, 'Osteoarthritis year in review 2017: clinical', *Osteoarthritis and Cartilage*, vol. 26, no. 3, pp. 319-325.

Nelson, AE, Allen, KD, Golightly, YM, Goode, AP & Jordan, JM 2014, 'A systematic review of recommendations and guidelines for the management of osteoarthritis: the chronic osteoarthritis management initiative of the US bone and joint initiative', *Seminars in Arthritis and Rheumatism*, vol. 43, no. 6, pp. 701-712.

Nelson, AE, Allen, KD, Golightly, YM, Goode, AP & Jordan, JM 2018, 'A systematic review of recommendations and guidelines for the management of osteoarthritis: The role of the Osteoarthritis Research Society International', *Osteoarthritis and Cartilage*, vol. 26, no. 3, pp. 354-364.

Olagbegi, OM, Adegoke, BO & Odole, AC 2017, 'Effectiveness of three modes of kinetic-chain exercises on quadriceps muscle strength and thigh girth among individuals with knee osteoarthritis', *Archives of Physiotherapy*, vol. 7, pp. 1-11.

O'Neill, TW, McCabe, PS & McBeth, J 2018, 'Update on the epidemiology, risk factors and disease outcomes of osteoarthritis', *Best Practice & Research Clinical Rheumatology*, vol. 32, no. 2, pp. 312-326.

Park, JH, Hong, JY, Han, K, Suh, SW, Park, SY, Yang, JH & Han, SW 2017, 'Prevalence of symptomatic hip, knee, and spine osteoarthritis nationwide health survey analysis of an elderly Korean population', *Medicine*, vol. 96, no. 12, p. e6372.

Prieto-Alhambra, D, Judge, A, Javaid, MK, Cooper, C, Diez-Perez, A & Arden, NK 2014, 'Incidence and risk factors for clinically diagnosed knee, hip and hand osteoarthritis: influences of age, gender and osteoarthritis affecting other joints', *Annals of the Rheumatic Diseases*, vol. 73, no. 9, pp. 1659-1664.

Racca, V, Bordoni, B, Castiglioni, P, Modica, M & Ferratini, M 2017, 'Osteopathic manipulative treatment improves heart surgery outcomes: a randomized controlled trial', *The Annals of Thoracic Surgery*, vol. 104, no. 1, pp. 145-152.

Racca, V, Magnani, B, Perugini, M & Lanza, P 2017, 'Osteopathic manipulative treatment and iliopsoas dysfunction: A review of the literature', *Manual Therapy*, vol. 25, pp. 1-8.

Regnaux, JP, Trinquart, L, Boutron, I, Nguyen, C, Brosseau, L & Ravaud, P 2012, 'High-intensity versus low-intensity physical activity or exercise in patients with hip or knee osteoarthritis', Cochrane Database of Systematic Reviews, vol. 11.

Rolf, C, Sandell, H & Tveit, M 2021, 'Neuromuscular control in osteoarthritis: Effects of exercise', *Sports Medicine*, vol. 51, no. 3, pp. 403-415.

Rooij, MD, van Der Leeden, M, Heymans, MW, Holla, JF, Häkkinen, A, Lems, WF, Roorda, LD, Veenhof, C, Sanchez-Ramirez, DC, de Vet, HC & Dekker, J 2016, 'Course and predictors of pain and physical functioning in patients with hip osteoarthritis: systematic review and meta-analysis', *Journal of Rehabilitation Medicine*, vol. 48, no. 3, pp.

Segal, NA & Glass, NA 2011, 'Is quadriceps muscle weakness a risk factor for incident or progressive knee osteoarthritis?', *The Physician and Sports Medicine*, vol. 39, no. 4, pp. 44-50.

Segal, NA, Glass, NA, Torner, JC, Yang, M, Felson, DT, Sharma, L, Nevitt, M, Lewis, CE & Frey Law, LA 2011, 'Quadriceps weakness predicts risk for knee osteoarthritis', *Arthritis Care & Research*, vol. 63, no. 3, pp. 393-400.

Sharma, AR, Jagga, S, Lee, SS & Nam, JS 2013, 'Interplay between cartilage and subchondral bone contributing to pathogenesis of osteoarthritis', *International Journal*

of Molecular Sciences, vol. 14, no. 10, pp. 19805-19830.
Sharma, L, Dunlop, DD & Cahue, S 2019, 'Effects of hip flexor stretching on knee pain in OA', *Arthritis Care & Research*, vol. 71, no. 2, pp. 135-142.

Silverwood, V, Blagojevic-Bucknall, M, Jinks, C, Jordan, JL, Protheroe, J & Jordan, KP 2015, 'Current evidence on risk factors for knee osteoarthritis in older adults: a systematic review and meta-analysis', *Osteoarthritis and Cartilage*, vol. 23, no. 4, pp. 507-515.

Stubbs, B, Aluko, Y, Myint, PK & Smith, TO 2016, 'Prevalence of depressive symptoms and anxiety in osteoarthritis: a systematic review and meta-analysis', *Age and Ageing*, vol. 45, no. 2, pp. 228-235.

Sun, X, Zhen, X, Hu, X, Li, Y, Gu, S, Gu, Y and Dong, H, 2019. Osteoarthritis in the middle-aged and elderly in China: prevalence and influencing factors. *International Journal of Environmental Research and Public Health*, vol.16, no. 23, p.4701.

Swain, S, Sarmanova, A, Mallen, C, Kuo, CF, Coupland, C, Doherty, M & Zhang, W 2020, 'Trends in incidence and prevalence of osteoarthritis in the United Kingdom: findings from the Clinical Practice Research Datalink (CPRD)', *Osteoarthritis and Cartilage*, vol. 28, no. 6, pp. 792-801.

Thomas, E, Peat, G & Croft, P 2014, 'Defining and mapping the person with osteoarthritis for population studies and public health', *Rheumatology*, vol. 53, no. 2, pp. 338-345.

Van der Made, AD, Wieldraaijer, T, Kerkhoffs, GM, Kleipool, RP, Engebretsen, L, Van Dijk, CN & Golanó, P 2015, 'The hamstring muscle complex', *Knee Surgery, Sports Traumatology, Arthroscopy*, vol. 23, pp. 2115-2122.

Van der Pas, S, Castell, MV, Cooper, C, Denkinger, M, Dennison, EM, Edwards, MH, Herbolsheimer, F, Limongi, F, Lips, P, Maggi, S & Nasell, H 2013, 'European project on osteoarthritis: design of a six-cohort study on the personal and societal burden of osteoarthritis in an older European population', *BMC Musculoskeletal Disorders*, vol. 14, pp. 1-11.

Vina, E & Kwoh, C 2018, 'Epidemiology of osteoarthritis', *Current Opinion in Rheumatology,* vol. 30, no. 2, pp. 160-167.

Wallace, IJ, Worthington, S, Felson, DT, Jurmain, RD, Wren, KT, Maijanen, H, Woods, RJ & Lieberman, DE 2017, 'Knee osteoarthritis has doubled in prevalence since the mid-20th century', *Proceedings of the National Academy of Sciences,* vol. 114, no. 35, pp. 9332-9336.

Zhang, JF, Song, LH, Wei, JN, Zhang, AL, Dong, HY, Wen, HY, Luo, J & Liu, G 2016, 'Prevalence of and risk factors for the occurrence of symptomatic osteoarthritis in rural regions of Shanxi Province, China', *International Journal of Rheumatic Diseases*, vol. 19, no. 8, pp. 781-789.

Appendix- A

Institutional Review Board (IRB) Permission Letter

SCMST-BPT/IRB/05-23/040

To
Mohammad Kaochhar Hossain
4th Year Student of B.Sc. in Physiotherapy
Session: 2018-2019 , Reg No: 10481
SAIC College of Medical Science & Technology (SCMST)
Mirpur-14, Dhaka-1216, Bangladesh.

Subject: Approval of the thesis proposal **"Assessing the Efficacy of Iliopsoas Stretching on Pain and Disability Among the Patient with Knee Osteoarthritis"** by ethics committee.

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

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

The purpose of the study is to determine Assessing the Efficacy of Iliopsoas Stretching on Pain and Disability Among the Patient with Knee Osteoarthritis.The study involves face to face interview by using semi-structured questionnaire to explore the efficacy of iliopsoas stretching on pain and disability among the patient with knee osteoarthritis in Dhaka that may take 30 to 40 minutes to fill in the questionnaire and there is no likelihood of any harm to the participants. The members of the Ethics committee have approved the study to be conducted in the presented form at the meeting held at 09.00 AM on 28th September 2023 at SCMST.

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

Best regards,

29.05.24

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

Appendix- B

Permission letter for data collection

SAIC COLLEGE OF MEDICAL SCIENCE AND TECHNOLOGY

Approved by Ministry of Health and Family Welfare
Affiliated with Dhaka University

Ref :

Date : ....

3rd July 2024

To

The Chairman

Unique Pain and Paralysis Centre (UPPC)

Mirpur -11, Dhaka

Subject: Prayer for permission to collect data from the Unique Pain and Paralysis Centre (UPPC), to conduct a research project.

Sir,

With due respect and humble submission to state that I am a student of B.Sc. in Physiotherapy at SAIC College of Medical Science and Technology (SCMST). As a part of our course curriculum, we have to conduct a research project for the partial fulfillment of the requirement for the degree of B.Sc. in Physiotherapy. My research title is " **Assessing the Efficacy of Iliopsoas Stretching on Pain and Disability Among the Patient with Knee Osteoarthritis"** and the aim of the study is to identify the efficacy of iliopsoas stretching on pain and disability among the patient with knee osteoarthritis .This is a randomized control trial under the supervision of Zahid Bin Sultan Nahid, Assistant Professor and Head, Department of Physiotherapy, SCMST. I want to collect data from the Unique Pain and Paralysis Centre (UPPC). So, I need your permission to collect data and ensure that the study will not be harmful for participants.

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

Yours Faithfully

Kaochhar Hossain

Mohammad Kaochhar Hossain

Student of B.Sc. in Physiotherapy

Session:2018 -2019

Reg No:10481

SAIC College of Medical Science and Technology (SCMST)

Mirpur-14, Dhaka 1216, Bangladesh.

Asst. Prof. Dr. Md. Faruqul Islam, PT
MSc, Physio (DU) CRP, PGT-BT, Bobath (UK)
Manual Therapy (Joint Pain), India
Head Physiotherapy Dept. CRP-Mirpur (Ex.)

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

SAIC COLLEGE OF MEDICAL SCIENCE AND TECHNOLOGY
Approved by Ministry of Health and Family Welfare
Affiliated with Dhaka University

SCMST July 2024

Ref o   Date : ....

The Chairman

Center for Physiotherapy and Mobility (CPM)

95 DIT Road, Malibagh Railgate, Malibagh,

Dhaka - 1217

Subject: Prayer for permission to collect data from the Center for Physiotherapy and Mobility (CPM), to conduct a research project.

Sir,

With due respect and humble submission to state that I am a student of B.Sc. in Physiotherapy at SAIC College of Medical Science and Technology (SCMST). As a part of our course curriculum, we have to conduct a research project for the partial fulfillment of the requirement for the degree of B.Sc. in Physiotherapy. My research title is **"Assessing the Efficacy of Iliopsoas Stretching on Pain and Disability Among the Patient with Knee Osteoarthritis"** and the aim of the study is to identify the efficacy of iliopsoas stretching on pain and disability among the patient with knee osteoarthritis. This is a randomized control trial under the supervision of Zahid Bin Sultan Nahid, Assistant Professor and Head, Department of Physiotherapy, SCMST. I want to collect data from the Center for Physiotherapy and Mobility. So, I need your permission to collect data and ensure that the study will not be harmful for participants.

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

Yours Faithfully

Kaochhar Hossain

Mohammad Kaochhar Hossain

Student of B.Sc. in Physiotherapy

Session:2018 -2019

Reg No:10481

SAIC College of Medical Science and Technology (SCMST)

Mirpur-14, Dhaka 1216, Bangladesh.

Approved for Collecting Data for this research project.

06.0

Zahid Bin Sultan Nahid
Assistant Professor & Head
Physiotherapy Department
SAIC College of Medical Science & Technology (SCMST)
Mirpur-14, Dhaka-1216

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

2nd July 2024

To

The Principal

Saic College of Medical Science and Technology

Mirpur-14, Dhaka-1216

Subject: Prayer for permission to collect data from the saic outdoor mirpur to conduct a research project.

Sir,

With due respect and humble submission to state that I am a student of B.Sc. in Physiotherapy at SAIC College of Medical Science and Technology (SCMST). As a part of our course curriculum, we have to conduct a research project for the partial fulfillment of the requirement for the degree of B.Sc. in Physiotherapy. My research title is " **Assessing the Efficacy of Iliopsoas Stretching on Pain and Disability Among the Patient with Knee Osteoarthritis"** and the aim of the study is to identify the efficacy of iliopsoas stretching on pain and disability among the patient with knee osteoarthritis .This is a randomized control trial under the supervision of Zahid Bin Sultan Nahid, Assistant Professor and Head, Department of Physiotherapy, SCMST. I want to collect data from the saic outdoor Mirpur. So, I need your permission to collect data and ensure that the study will not be harmful for participants.

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

Allowed to collect from the outdoor of physiotherapy.

[signature] 02.07.24.

Dr. Abul Kasem Mohammad Enamul Haque
MBBS, M.Phil(PSM)
Principal
SAIC College of Medial Science and Technology (SCMST)
Mirpur-14, Dhaka.

Yours Faithfully

Kaochhar Hossain

Mohammad Kaochhar Hossain

Student of B.Sc. in Physiotherapy

Session:2018 -2019

Reg No:10481

SAIC College of Medical Science and Technology (SCMST) Mirpur-14, Dhaka 1216, Bangladesh.

SAIC COLLEGE OF MEDICAL SCIENCE AND TECHNOLOGY
Approved by Ministry of Health and Family Welfare
Affiliated with Dhaka University

Ref: *Date : ....*

8th September 2024

To

The Incharge

Bangladesh Spine & Orthopaedic Hospital (BSOH)

10 Main Road, Kallyanpur (Bus Stand)

Dhaka - 1216

Subject: Prayer for permission to collect data from the Bangladesh Spine & Orthopaedic Hospital (BSOH), Physiotherapy department to conduct a research project.

Sir,

With due respect and humble submission to state that I am a student of B.Sc. in Physiotherapy at SAIC College of Medical Science and Technology (SCMST). As a part of our course curriculum, we have to conduct a research project for the partial fulfillment of the requirement for the degree of B.Sc. in Physiotherapy. My research title is **"Assessing the Efficacy of Iliopsoas Stretching on Pain and Disability Among the Patient with Knee Osteoarthritis"** and the aim of the study is to identify the efficacy of iliopsoas stretching on pain and disability among the patient with knee osteoarthritis.This is a randomized control trial under the supervision of Zahid Bin Sultan Nahid, Assistant Professor and Head, Department of Physiotherapy, SCMST. I want to collect data from the Bangladesh Spine & Orthopaedic Hospital (BSOH). So, I need your permission to collect data and ensure that the study will not be harmful for participants.

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

Yours Faithfully

Kaochhar Hossain

Mohammad Kaochhar Hossain

Student of B.Sc. in Physiotherapy

Session:2018 -2019

Reg No:10481

SAIC College of Medical Science and Technology (SCMST)

Mirpur-14, Dhaka 1216, Bangladesh.

08/09/24
MD. MASUM BISWAS

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

Appendix- C

মৌখিক সম্মতিপত্র

আসসালামু আলাইকুম,

আমি মোহাম্মদ কাওছার হোসেন, ৪র্থ প্রফেশনাল, বিএসসি ফিজিওথেরাপির ছাত্র, সাইক কলেজ অফ মেডিকেল সায়েন্স অ্যান্ড টেকনোলজি (এসসিএমএসটি), ঢাকা বিশ্ববিদ্যালয়ের অধিনে । আমার ব্যাচেলর ডিগ্রী পেতে, আমাকে একটি গবেষণা প্রকল্প পরিচালনা করতে হবে এবং এটি আমার অধ্যয়নের একটি অংশ। আমার গবেষণার শিরোনাম "হাঁটু অস্টিওআর্থারাইটিস রোগীর মধ্যে ব্যথা এবং অক্ষমতার উপর ইলিওসোয়াস স্ট্রেচিং এর কার্যকারিতা মূল্যায়ন।" আমার গবেষণা প্রকল্পটি পূরণ করার জন্য, তথ্য সংগ্রহ করার জন্য আমার আপনার কাছ থেকে কিছু তথ্য দরকার, তাই আপনি এই গবেষণার একজন সম্মানিত অংশগ্রহণকারী হতে পারেন এবং কথোপকথনের সময় হবে ২০-৩০ মিনিট। আমি আপনাকে জানাতে চাই যে এটি একটি সম্পূর্ণরূপে একাডেমিক অধ্যয়নের কাজে ব্যাবহার করা হবে। আমি আশ্বাস দিচ্ছি যে সমস্ত তথ্য গোপন রাখা হবে। আপনার অংশগ্রহণ স্বেচ্ছায় হবে। অধ্যয়নের যেকোনো সময় আপনার সম্মতি প্রত্যাহার এবং অংশগ্রহণ বন্ধ করার অধিকার থাকতে পারে। আপনি পছন্দ করেন না এমন কোনো প্রশ্ন প্রত্যাখ্যান করার অধিকারও আপনার আছে।

অধ্যয়ন সম্পর্কে আপনার কোন প্রশ্ন থাকলে, আপনি আমার সুপারভাইজার জাহিদ বিন সুলতান নাহিদ, সহকারী অধ্যাপক এবং প্রধান, ফিজিওথেরাপি বিভাগ, (এসসিএমএসটি), মিরপুর-১৪, ঢাকা- ১২১৬-এর সাথে যোগাযোগ করতে পারেন। সাক্ষাৎকার শুরু করার আগে আপনার কোন প্রশ্ন আছে।

তাহলে, আমি কি সাক্ষাৎকার নিয়ে এগিয়ে যেতে পারি?

হ্যাঁ…………… না ……………

অংশগ্রহণকারীর স্বাক্ষর ………………………. তারিখ ………………

গবেষকের স্বাক্ষর…………………………........... তারিখ………………

সাক্ষীর স্বাক্ষর ……………………………… তারিখ …………

গবেষণার শিরোনাম: হাঁটু অস্টিওআর্থাইটিস রোগীদের মধ্যে ব্যাথা এবং অক্ষমতার উপর ইলিওসোয়াস স্ট্রেচিং এর কার্যকারিতা।

প্রশ্নাবলী (বাংলা)

পর্ব-১: সামাজিক জনতাত্ত্বিক তথ্যাবলী

রোগীর আইডি নং:

অংশ গ্রহণকারীর নাম:	
বয়স:	
লিঙ্গ:	১। পুরুষ ২। মহিলা
ঠিকানা:	১।গ্রাম: ২।ডাকঘর: ৩।থানা: ৪।জেলা:
ফোন নাম্বার:	
বসবাসের স্থানঃ	১।গ্রাম ২।শহর
পেশা:	১। ছাত্র ২। গৃহিণী ৩। শ্রমিক ৪। চাকুরীজিবী ৫। ব্যাবসায়ী ৬। অন্যান্য
শিক্ষাগত যোগ্যতাঃ	১।নিরক্ষর ২।প্রাথমিক ৩।মাধ্যমিক ৪।উচ্চ মাধ্যমিক ৫।স্নাতক ৬।স্নাতকোত্তর

পর্ব ২: নৃতাত্ত্বিক পরিমাপ

উচ্চতা	
ওজন	
বিএমআই	

পর্ব -৩: চিকিৎসা ইতিবৃত্ত

অন্যান্য রোগ	১।ডায়বেটিস ২।উচ্চ- রক্তচাপ ৩।হৃদ রোগ ৪।বিগত অস্ত্রোপচার
ঔষধ (এনএসএআইডিএস)	হ্যাঁ না
আঘাতের ইতিবৃত্ত	হ্যাঁ না
জয়েন্টে ইনজেকশন	হ্যাঁ না

পর্ব - ৪: অস্টিওআর্থাইটিস রোগ সম্পর্কে তথ্য

কতদিন ধরে ভুগছেন	………………(মাস)
কোন অংশে এ সমস্যা	১।ডান ২।বাম ৩।উভয়
ব্যথার ধরণ	১।তীব্র ২।দীর্ঘস্থায়ী
হাঁটুর গতি সম্পর্কিত তথ্যে	১।হাঁটু সংকোচন…………….ডিগ্রী ২।হাঁটু প্রসারণ……………… ডিগ্রী
ব্যাথা বাড়ার কারণ	১। বিশ্রাম ২। দাঁড়ানো ৩। হাঁটা ৪। সিঁড়ি দিয়ে উঠা

পর্ব - ৫: ব্যথার তীব্রতা

নীচের স্কেলে দাগ দিয়ে বুঝিয়ে দিন আপনার ব্যথা কতটা তীব্র।

নিদেশনাবলীঃ

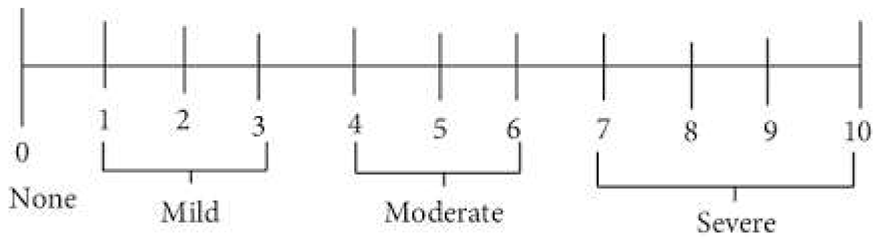
০ = কোন ব্যথা নেই

১-৩ = আল্প ব্যাথা

৪-৬ = মাঝারি ব্যথা

৭-১০ = তীব্র ব্যথা

আপনার ব্যথা এখন কতটা তীব্র?



পর্ব - ৬: শারীরিক অক্ষমতার প্রশ্নাবলী

এই প্রশ্নপত্রটি তৈরি করা হয়েছে ওয়েস্টান অন্টারিও ও ম্যাকমাস্টার ইউনিভারসিটি অস্টিওআর্থাইটিস ইনডেক্স ওম্যাক স্কোর অনুযায়ী অস্টিওআর্থাইটিস রোগীদের হাটুর ব্যাথা ও অক্ষমতা 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 (আসবাবপত্র নাড়াচাড়া) আপনি কি ধরনের সমস্যা অনুভব করেন?	০	১	২	৩	৪
১৭। হালকা গৃহস্থালি কাজের সময় (রান্না,ঝাড়ামোছা) আপনি কি ধরনের সমস্যা অনুভব করেন ?	০	১	২	৩	৪

CONSENT FORM (ENGLISH)

Assalamualaikum,

I am Mohammad Kaochhar Hossain, a student of 4th Professional, B.Sc. in Physiotherapy, SAIC College of Medical Science and Technology (SCMST), University of Dhaka. To obtain my Bachelor degree, I have to conduct a research project and it is a part of my study. My research title is "Assessing the Efficacy of Iliopsoas Stretching on Pain and Disability Among the Patient with Knee Osteoarthritis." To fulfill my research project, I need some information from you to collect data. So, you can be a respected participant of this research and the conversation time will be 20-30 minutes. I would like to inform you that this is a purely academic study and will not to be used for any other purposes. I assure that all data will be kept confidential. Your participation will be voluntary. You may have the rights to withdraw consent and discontinue participation at any time of the study. You also have the right to reject a particular question that you don't like.

If you have any query about the study, you may contact with my supervisor Zahid Bin Sultan Nahid, Assistant Professor and Head, Department of Physiotherapy, SCMST, Mirpur-14, Dhaka- 1216. Do you have any questions before start this session?

So, can I proceed with the interview?

Yes …….   No …….

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

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

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

Research Title: Assessing the Efficacy of Iliopsoas Stretching on Pain and Disability Among the Patient with Knee Osteoarthritis.

Questionnaire (English)

Part-1: Socio-demographic information

Patient ID no:

Name of the participant:	
Age:	
Sex:	1. Male 2. Female
Address:	1. Village/Area: 2. P/O: 3. P/S: 4. District:
Contact No:	
Living area	1. Rural 2. Urban
Occupation:	1. Student 2. Housewife 3. Worker 4. Service holder 5. Business 6. Others
Education:	1. Illiterate 2. Primary 3. Secondary 4. Higher secondary 5. Graduate 6. Post Graduate

Part-2: Anthropometric Measurement

Height	
Weight	
BMI	

Part- 3: Medical History

Co-morbidities	1.Diabetes mellitus 2.Hypertention 3.Heart disease Previous surgery	
Medication (NSAIDs)	Yes	No
History of trauma	Yes	No
Intra-articular injection	Yes	N0

Part- 4: OA related information

Duration of suffering	…........ (month)
Side of involvement	1. Right 2. Left 3. Both
Types of pain	1. Acute 2. Chronic
Knee range of motion	1. Flexion…............degree. 2. Extension…........degree.
Pain aggravating factor	1. Rest 2. Standing 3.Walking 4. Stair climbing

Part- 5: Pain Intensity

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

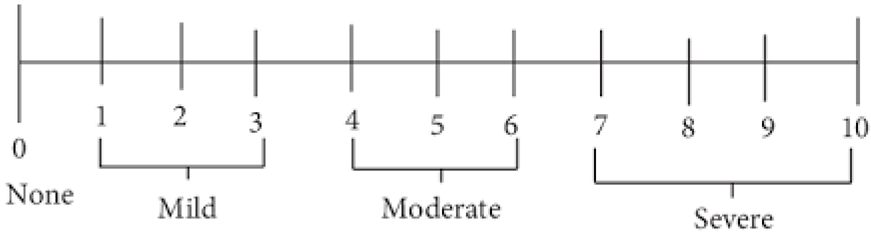
0 = No pain

1-3 = Mild pain

4-6 = Moderate

7-10 = Severe

How intense is your pain now?



Part-6: Physical disability questionnaire

This questionnaire is developed according to, "The Western Ontario and MacMaster Universities Osteoarthritis Index (WOMAC SCORE)" for measuring the pain and disability of the patient with knee osteoarthritis. Each question has 4 score. Total questions are 24. Total number is 96. Score of the patient is _/ 96.

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

0 = None

1 = Slight

2 = Moderate

3 = Severe

4 = Extreme

Circle one number for each activity

A) Pain:

1. How much pain you feel during walking?	0	1	2	3	4
2. How much pain you feel during climbing on the stairs?	0	1	2	3	4
3. How much pain you feel during sleeping at night?	0	1	2	3	4
4. How much pain you feel while you taking rest?	0	1	2	3	4
5. How much pain you feel during weight bearing?	0	1	2	3	4

B) Stiffness:

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

C) **Physical Function:**

1. What kind of problems you feel during getting down to the stairs?	0	1	2	3	4
2. What kind of problems you feel during climbing up to the stairs?	0	1	2	3	4
3. What kind of problems you feel during rising from sitting?	0	1	2	3	4
4. What kind of problems you feel during standing?	0	1	2	3	4
5. What kind of problems you feel during bending toward the floor?	0	1	2	3	4
6. What kind of problems you feel during walking on flat surface?	0	1	2	3	4
7. What kind of problems you feel during getting in or getting out from a car?	0	1	2	3	4
8. What kind of problems you feel when you going for shopping?	0	1	2	3	4
9. What kind of problems you feel during putting on socks?	0	1	2	3	4
10. What kind of problems you feel while you get out from bed?	0	1	2	3	4
11. What kind of problems you feel during taking off socks?	0	1	2	3	4
12. What kind of problems you feel when you rising from bed?	0	1	2	3	4
13. What kind of problems you feel during getting in getting out of bath?	0	1	2	3	4
14. What kind of problems you feel when you sitting for a while?	0	1	2	3	4
15. What kind of problems you feel when you getting on/ off toilet?	0	1	2	3	4
16. What kind of problems you feel when doing your heavy domestic duties like moving furniture?	0	1	2	3	4
17. What kind of problems you feel when doing your light domestic duties like cooking, dusting?	0	1	2	3	4

Appendix- D

Gant Chart

Activities/ months	Sep 23	Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	Mar 24	Apr 24	May 24	June 24	Jul 24	A ug 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												