EFFECTIVENESS OF HAMSTRING STRENGTHENING AND STRETCHING EXERCISES ALONG WITH CONVENTIONAL PHYSIOTHERAPY TREATMENT FOR PATIENTS WITH KNEE OSTEOARTHRITIS

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

"EFECTIVENESS OF HAMSTRING STRENGTHENING AND STRETCHING EXERCISES ALONG WITH CONVENTIONAL PHYSIOTHERAPY TREATMENT FOR PATIENTS WITH KNEE OSTEOARTHRITIS"

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Declaration

I declare that the work presented here is my own. All source used have been cited appropriately. Any mistakes or inaccuracies are my own. I also declare that for any publication, presentation or dissemination of the study. I would be bound to take written consent from the Department of Physiotherapy, Bangladesh Health Professions Institute (BHPI).

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Contents

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Acronym

ACR	American College of Rheumatology
BHPI	Bangladesh Health Professions Institute.
BMRC	Bangladesh Medical & Research Council
CDC	Center for Disease Control
CRP	Centre for the Rehabilitation of the Paralysed
IRB	Institutional Review Board
NPRS	Numeric Pain Rating Scale
OA	Osteoarthritis
OARSI	Osteoarthritis Research Society International
PT	Physiotherapy
ROM	Range of Motion
SPSS	Statistical Package for Social Science
UK	United Kingdom
VAS	Visual Analogue Scale
WHO	World Health Organization
WOMAC	Western Ontario McMaster University

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Abstract

Purpose: The purpose find the effectiveness of Hamstring strengthening and stretching exercises along with conventional physiotherapy for patient with knee osteoarthritis. *Objectives:* To find out the effectiveness of Hamstring strengthening and stretching exercises along with conventional physiotherapy for patient with knee osteoarthritis. *Methodology:* This study was conducted by Randomized Control Trail (RCT) in which a total 20 participants were selected randomly included 10 control group and 10 experimental group .Data was collected by using Western Ontario McMaster University Osteoarthritis Index (WOMAC) questionnaire. SPSS was used for data analysis which was displayed through table, pie chart, bar chart and non-parametric test Mann Whitney U test .*Results:* In this research, 20 participants were participated in this study. 10 in the Hamstring Strengthening and stretching exercises along with conventional physiotherapy group (experimental group) and 10 in the only conventional group (control group). Every participant of both experimental and control group scored on Numeric Pain Rating Scale (NPRS) and WOMAC before and after completion of the treatment. *Conclusion:* The result of this experimental study has identified the effectiveness of conventional physiotherapy with Hamstring strengthening and stretching exercises is better treatment than the conventional physiotherapy alone for reducing pain and disability in osteoarthritis patient.

Key word: Osteoarthritis, Hamstring, Strengthening, Stretching.

CHAPTER I INTRODUCTION

1.1 Background

Osteoarthritis is a clinical syndrome which is defined by loss of articular cartilage, a variable subcondral bone reaction and involvement of other structures, including the ligament, meniscus, capsule, synovial membrane and periarticular muscles (Cooper et al., 2013). The term "osteoarthritis" come off notice of the fascinating extreme immoderation of terminal and subchondral bone found by medical specialist such as the pathologists and radiologists, osteoarthritis is a such type of disease which is not only disease but also a greater portion of usual reason of incapability, 10 corer human in the earth are bearing OA global statistics published it (Hinman et al., 2010). Another study told that osteoarthritis may be defined as a heterogeneous, group of conditions that lead to joint symptoms and signs which are associated with defective integrity of articular cartilage, in addition to related changes in the underlying bone at the joint margins (Islam et al., 2014).

OA is the most common skeletal disorder (Prieto-Alhambra et al., 2013). Osteoarthritis is usually classified as either primary or secondary which is associated with known condition ,osteoarthritis is joint failure ,a disease in which all structure of the joint have undergone pathologic features of disease are hyaline articular cartilage loss, present in a, focal and initially ,non uniform manner, this is accompanied by increasing thickness and sclerosis of the subcondral bony plate, by outgrowth of osteophyte of the joint margin, by stretching of the articular capsule, by mild synovitis in many affected joint and by weakness of muscle bridging the joint, and in knee meniscal degeneration is part of disease (Islam et al., 2014).

Copper et al. (20013) told that it is predominantly involves the knee, hip ,spine ,hands, and feet and the classical pathological hallmark is cartilage deterioration ,with fibrillation, fissures, ulceration, and ultimate loss, associated with hypertrophy of subchondral bone.

Hafez et al. (2013) mentioned that according to World Health Organization (WHO) osteoarthritis is regarded as one of the major public health problem and it is one of the

major cause of impaired function that decreases quality of life in the world wide. Copper et al. (2013) told that varying degree of joint pain, functional limitation and reduce quality of life due to loss of articular cartilage, a variable subcondral bone reaction and involvement of other structure, including ligament, meniscus, capsule, synovial membrane and periarticular muscle are the clinical syndrome of osteoarthritis. Hafez et al. (2013) told that knee is the most common weight bearing joint and it frequently affected by osteoarthritis.

Comparatively knee joint are most commonly affected by osteoarthritis in lower limb osteoarthritis, Osteoarthritis indicates that women, elderly people, increased knee damage risk such as those who are obese person and the history of people injured of knee joint and radio-graphics well as symptomatic osteoarthritis (Murphy et al., 2016).In radiological imaging it is characterized by degenerative changes in the bones, cartilage, menisci, ligaments, and synovial tissue, In this degenerative condition it is considered that it is disease of whole joint (Braun & Gold,2012).

Copper et al. (2013) mentioned that when severe, structural changes such as loss of joint space, presence of osteophytes, changes in subchondral bone, and cyst formation can be used in epidemiological studies to define the disorder and estimate the prevalence of osteoarthritis.

Inspite of being the urgent need of strategies for the prevention and treatment of this condition, demographic on the overall disease prevalence and the affected subgroups are not adequately characterized yet, and the reported prevalence of radio graphic knee osteoarthritis differs considerably among previous population based epidemiologic studies, in addition ,apart from age ,sex obesity and occupational activities, there are only few other established risk factor for knee osteoarthritis (Muraki et al., 2013).

Chapple et al. (2011) told that Osteoarthrithritis of the knee is a common disease with a prevalence of 12.5% in populations ages less than 45 years and the lifetime risk of developing symptomatic knee OA is estimated as 44.7% , and the annual rate of

progression in subject diagnosed with knee OA has been reported as approximately 4% per year, indicating slow evaluation of the disease.

Osteoarthritis is most common form of arthritis and by the general physician visit it is accounting for about 30%(Islam et al., 2014).Over 60 years of age or older people the prevalence of symptomatic knee OA is 13% in women and 10% in men in USA (Renaux et al., 2012). King & Rosenthal (2015) mentioned that, both diabetes mellitus and osteoarthritis ensure their common co-existence to increase the project ,and they found that in an era of increasing attention to personalized medicine, understanding the influence of common co morbidities such as DM should result in immediate care of patients with osteoarthritis, and that history review, we summarize the literature related the interaction between DM and OA extending from 1962 to 2014,they found differ in the research depending on whether the clinical population ,animals models, or cells and tissues investigate, this study literature associated with the influence of DM on OA and its therapeutics outcomes suggests that DM may enhance the development and severity of OA and clinical review suggests than DM increase risk associated with joint replacement operation, the few high quality studies using animal models which is characterized by support an adverse effect of DM on OA, they review strength and weakness of DM that is the normal rodent models on OA, versatile literature derived from studies of elliptical cells and tissues also supports the existence of biological and bio mechanical changes in articular tissues in DM, and begins to characterize molecular mechanism activated genetic-like environs which may contribute to OA,AN adverse effect of supports of DM on OA of the development, severity and therapeutic outcomes for OA, enhanced by clinical and laboratory support, to understand the mechanisms through which DM contributes to OA, more studies are clearly necessary, another study of the DM -affected system may focus on general procedure of OA, pathogenesis and provide results of more precise and effective therapies for all OA patients . Muraki et al. (2010) told that obesity is often a strong risk factor for incident knee OA, due to possible causes of mechanical stress over the knee joint.

In worldwide there are many musculoskeletal condition, in this musculoskeletal condition osteoarthritis occurs most commonly, due to causes of osteoarthritis affecting functional abilities of millions of people (Krugerjakins et al., 2016).It is estimated to be the 4th

leading causes of disability which degenerative diseasess condition name is osteoarthritis in which male are affected 10% and 13% are female in in total population.(Ahmed & Daud , 2016).In most developed countries knee osteoarthritis is one of the major public health issue, long term pain and disability develop among elderly, and it is characterized by a number of pathological properties, including narrow composition and osteopathy (Muraki et al., 2013).

But in the developing countries osteoarthritis is one of the ten most disabling diseases in developed countries and worldwide about 9.6% men and 18% women aged over 60 years are affected by OA (WHO, 2010). Prevalence rate of knee osteoarthritis are high in elderly people and most commonly affected in women in Asia specific country (Ahmed & Daud, 2016). Two neiuboring country Bangladesh and India it is reported to be 5.78% and 10.20% Respectively (Haq et al., 2005).

Chapple et al. (2011) told that Heterogeneity of knee osteoarthritis as a disease results in a wide range of clinical presentations and varying rates of progression and identifying those patient likely to progress or those at risk of rapid progression is important for optimal allocation of health care resources and research into therapeutic interventions Hafez et al. (2013) told that the clinical manifestation are pain, stiffness decrease range of movement, weakness of quadriceps and alteration in proprioception. Rafique et al. (2013) suggested that osteoarthritis (OA) is a progressive disorder that affects the joint capsule, cartilage, synovial and subcondral bone and narrowing of joint space that take place causes of no constructive and non-re-generation of articular cartilage, bony sclerosis, make a knife like of articular cartilage margins, intraarticular structure, marginal lipping, bony cyst and changes with the increasing of this condition and this are the common criteria of knee joint osteoarthritis and also etiological factor are responsible for osteoarthritis and it is this type of disease which is related to the degeneration. Repetitive movements, repetitive mechanical loads and age casually connected with knee osteoarthritis.

Hafez et al.(2013) told that patient with knee osteoarthritis frequently report symptoms of knee pain and stiffness as well as difficulty with activities of daily living such as walking,

stair climbing and housekeeping. Islam et al.(2014) mentioned that symptoms of osteoarthritis often variable and intermittent, this is a modest co relation between the presence of symptoms and the severity of anatomic change ,although variable in its presentation and course of osteoarthritis often carries significantly morbidity, in addition to the effects on the individual, the cost of osteoarthritis to society is significant, related to its high prevalence ,the reduced ability of those affected to perform both occupational loss of a patient ability to undertake self-care , and related to drain on health care resources.

Hafez et al. (2013) suggested that decreased progressive loss of function is associated with reduces strength in the muscle group involving the joint, these symptoms significantly restrict an Individual ability to get up from a chair, walk or climb stairs, limping,poor alignment of the limb instabilities can also be observed in individuals with osteoarthritis, he also told that during movement , capitation can be heard due to irregular joint surfaces cause by arthritis.

By radio graphical findings can easily understand in which stage are in knee osteoarthritis. Staging system of knee osteoarthritis can be classified by Kellgern and Lawrence scale .In stage 0 (no abnormality),stage 1 (incipient osteoarthritis, beginning of osteophyte formation on eminences),stage 2 (moderate joint space narrowing ,moderate subcondral sclerosis),stage 3 (>50% joint space narrowing, rounded femoral condyle , extensive subcondral sclerosis, extensive osteophyte formation),stage 4(joint destruction, obliterated joint space, subcondral cysts in tibial head and femoral condyle, subluxed position).Cartilage defects and bone marrow lesion are detected by other form of imaging such as Magnetic Resonance and Imaging (MRI) (Braun and Gold,2012). In nearly 80% of people by the age of 8 years only half of them have symptoms of osteoarthritis and osteoarthritis presented by histologic or radio graphic criteria (Islam et al., 2014).

Radiographic changes are variably associated with joint symptoms such as stiffness and loss of function the relationships may changes with time, as well as between joint sites, and are dependent on many variable and a conceptual model for pathogenesis of osteoarthritis

is that systemic factors such as age ,gender, ethnicity, metabolic syndrome, and genetic factors increase general susceptibility to the disease, while local mechanical factors such as obesity, joint injury or deformity, and muscle weakness influences its site and severity (Copper et al, 2013).

Dhillon et al. (2014) also found that Biomechanical abnormalities like excessive valgus and varus alignment have also been implicated as risk factor for development of knee osteoarthritis. While both the deformities predispose the knee for earlier OA, a varus deformity has shown to be a greater risk not only for the development, but also for the progression of the disease.. Due to osteoarthritis there is marked limitation daily living activity of the patient (Marmon et al., 2013). In knee osteoarthritis patient suffering from joint pain, decrease range of motion, joint effusion with or without sign of inflammation, muscle weakness and gait pattern are altered. Sometimes physical activity limitation could be accompanied with some psychological distress (Maly et al., 2006;Dhillon et al., 2014).The World Health Organization 2010 study defines physical activity as "any movement produced by skeletal muscle that requires energy expenditure". Osteoarthritis creates several burden they are physical, psychological and socioeconomic. Significant inabilities are associated with knee osteoarthritis, for example decrease ambulatory function and daily living activities. Main factors are feeling alone; decrease self esteem and mental stress. Economic burden are given high frequency of osteoarthritis in the population (Litwice et al., 2013).

Causes of the lower limb musculature is the natural brace of the knee joint, important muscle dysfunction may arise from either quadriceps weakness or weakness of the hamstring relative to the quadriceps ,which is usually assessed by the quadriceps hamstring ratio and thus evaluation of muscle dysfunction in relation to the knee joint should examine the strength of both quadriceps and hamstring muscles as well as balance of muscle strength, this study also said that that different muscles groups helps the knee joint ,the two main muscle groups that control knee movement and stability are the quadriceps and the hamstrings, the quadriceps and hamstring muscles have the potential to provide dynamic frontal plane knee stability because of their abduction and adduction moments

arms, this study also told that knee affects the hamstring muscles more than the quadriceps muscle, therefore there is need for physiotherapy who have traditionally focused primarily on strengthening the quadriceps muscle o knee patients, to include hamstring strengthening in their management protocols (Hafez et al., 2013).

Ahmed & Daud (2016) told that Pharmacological intervention include paracetamol, corticosteroids, oral ad topical NSAID'S , opoisd analgesics ,glucosamine, intra -articular hyaluronic acid ,chondroitin sulphate and Vitamin E supplements and surgical procedure include joint debriment, osteotomy, unicompartment arthroplasty and total knee arthroplasty and they also told that physiotherapy management are very helpful in knee osteoarthritis that are decrease pain ,muscle spasm and improve range of motion among this physiotherapy treatment strengthening exercises are also include.

Mcalindon et al. (2014) investigated that as a non-pharmacological treatment for knee osteoarthritis therapeutic exercise recommended in numerous from international guidelines. Brenmenn et al. (2012) suggested that strengthening exercise is the cornerstone of conservative treatment for knee osteoarthritis, in knee osteoarthritis "hamstring muscle is most affected than quadriceps muscle in knee osteoarthritis physiotherapy management protocol hamstring strengthening exercise included with quadriceps strengthening exercise for its obvious necessary.

OA knee affects the hamstring muscle more than the quadriceps muscle. Therefore, there is a need for physiotherapists" (Rafique et al., 2007). Hafez et al. (2013) told that treatment of osteoarthritis currently focus on the management of symptoms pain relief ,improve joint function and joint stability are main goals of therapy, thus rehabilitation and physiotherapy are prescribed often with intention of alleviating pain and increase mobility and therapeutic regimens either focus on muscle strengthening and stretching exercises.

1.2 Rationale

Pain is the one of the most and common complain during knee osteoarthritis and because of pain, osteoarthritis is the 4th leading cause of disability (Fransen et al., 2011). The prevalence of symptomatic OA knee 11% to 19% in two UK studies and other surveys that is under taken in other countries estimates that the rate is 5% to 15% (Neogi, 2013). The rate of the prevalence of OA is increasing day by day (Zhang & Jordan, 2010). 80% of those with OA who have limitation in movement, 25% patients cannot lead their ADLs (WHO, 2002). It occurs in 80% of people over 55 years of age, 23% experience limitation of activities, Radio graphic evidence of osteoarthritis is present in the majority of people over age 65; 80% of those over 75, Approximately 11% of those over 65 have symptomatic osteoarthritis of the knee .Now-a-days Knee osteoarthritis is a common problem in developing country. It is increasing day by day. Most female are affected than male, ratio of OA 3:1. Hamstring. Muscle strengthening can have effect of the knee joint in reducing the over load and thus to reduce the pain, disability as well. There are lot of studies that prove that strengthening exercise are effective for knee osteoarthritis. Also some specific strengthening has effects. It occurs most in women of age over 45. If the characteristics of OA is find out that means the vulnerable age group of OA, the group of people are affected by OA, Body type of the OA patient, aggravating factors of OA, clinical representation of knee OA and outcome of physio-therapeutic treatment in Knee OA, As a Physiotherapist it will help to diagnose Knee OA easily and will give details information to the patient about knee OA so that people can modify their life style regarding OA at knee and we can provide better treatment as well as essential advice to the patients. This study is helpful for physiotherapists to make awareness about knee osteoarthritis patients. Physiotherapy plays a vital role in the management of knee osteoarthritis patient, we know. So, it is also helpful for physiotherapists to work in this area for delivering treatment service, result patient becomes more benefited as well. As a health professional it improves our knowledge. Research makes the profession strongest. So there is no alternative option to do research as a professional to develop the profession. At present there is no study which conducted effectiveness of hamstring strengthening and stretching exercises for knee osteoarthritis. So I conduct this research.

1.3 Objectives:

General objective:

To find the Effectiveness of Hamstring Strengthening and Stretching exercises along with Conventional Physiotherapy Treatment for Patients with Knee Osteoarthritis.

Specific objectives:

1. To find the socio-demographic factors affect the level of pain and disability between groups.
2. To find out the effectiveness of Hamstring Strengthening exercise along with conventional physiotherapy on pain and disability between groups.

1.4 Hypothesis

Null Hypothesis

H_o: μ_1-μ_2= 0 or $\mu_1 \geq \mu_2$, where the experimental group and control group mean difference is not same or control group is higher than experimental group.

Alternative Hypothesis

H_a: μ_1-$\mu_2 \neq$ 0 or $\mu_1 \neq \mu_2$ where the experimental group and control group mean difference is not same.

Where,

H_o= Null hypothesis

H_a= Alternative hypothesis

μ_1 = mean difference in initial assessment

μ_2 = mean difference in final assessment

1.5 Operational Definitions

Hamstring Strengthening and Stretching exercise

Hamstring is one of the three posterior thigh muscle (from medial to lateral, semimembranosus, semitendinosus and biceps femoris).The hamstring is the single large tendon found behind the knee or comparable area. Strengthening exercise is an an exercise in which there is overall lengthening of the muscle in response to an external resistance and stretching exercise is a form of physical exercise in which a specific muscle or tendon is deliberately flexed or stretched in order to improve the muscles felt elasticity and achieve comfortable muscle tone

Conventional Physiotherapy

Physiotherapy interventions that are widely accepted and practiced by the mainstream medical community are called Conventional Physiotherapy.

Osteoarthritis

Osteoarthritis is a degenerative joint disease, which mainly affects the articular cartilage. It is associated with aging, and will most likely affect the joints that have been continually stressed throughout the years including the knees, hips, fingers, and lower spine region. Osteoarthritis is already one of the ten most disabling diseases in developed countries. Farming 1-9 years increases the risk of osteoarthritis 4.5 times; farming 10 or more years increase the risk 9.3 times. Worldwide estimates are that 9.6% of men and 18.0% of women aged over 60 years have symptomatic osteoarthritis. 80% of those with osteoarthritis will have limitations in movement, and 25% cannot perform their major daily activities of life (WHO, 2016).

CHPTER II LITERATURE REVIEW

Cooper et al.(2013) investigated that Osteoarthritis is a clinical syndrome which is defined by loss of articular cartilage, a variable subcondral bone reaction and involvement of other structures, including the ligament, meniscus, capsule, synovial membrane and periarticular muscles .Another study said that among of all arthritis osteoarthritis is most common which is characterized by focal loss of articular cartilage within synovial joints, which are associated with hypertrophy of bone near the joints (osteophyte and subcondral bone sclerosis) and thickening of the capsul (Pas et al., 2013).Among all of degenerative joint diseases osteoarthritis is one of them (Imoto et al., 2013).

Fransen et al. (2015) told that osteoarthritis the most common rheumatic disease, primarilyaffects the articular cartilage and subchondral bone of a synovial joint, eventually resulting in joint failure.

Osteoarthritis is not a static process and differ from simple wear and tear as it is not symmetrically distributed, often localized to only one part of joint and associated with abnormal loading rather than frictional wear (Bardoloi et al., 2017).

Hinmann et al. (2014) told that osteoarthritis is an irreversible degenerative disorder of the joints, characterized by the destruction of the articular cartilage and subchondral bone and it is the commonest form of arthritis with studies showing it to be the second most reported disorder in elderly patients. Silverwood et al. (2014) told that osteoarthritis is a serious joint disease that leads to a reduced quality of life and in the world osteoarthritis was the 6^{th} leading cause of disability worldwide, and has been estimated to rise to the 4^{th} leading cause by 2020.

Bardoloi et al. (2017) told that causes of breakdown and repair joint tissue osteoarthritis occurs and that time overwhelming imbalance happened. Zhang & Jordan (2011) mentioned that osteoarthritis can be defined in different way such as pathologically, radio graphically, or clinically and in that case osteoarthritis has long been considered the

reference standard, and multiple ways to define radiographic disease have been devised and the most common method for radiographic definition is the Kellgren-Lawrence(K/L)radiographic grading scheme and atlas which has been in use for over four decades and this overall joint scoring system grades osteoarthritis in five levels from 0-4,definig osteoarthritis by the presence of a definite osteophyte (Grade ≥2),and more severe grades by presumed successive appearance of joint space,narrowing,sclerosis,cysts,and deformity.

Osteoarthritis (OA) is the most common from of arthritis, typically seen with increasing age affecting all joint, the majority of people over 30 years of age show evidence presenting in 70% of hips or knees of those older than 65 years, and Osteoarthritis is one of the most prelavant articular disorder affecting humankind and a major cause of disability and socioeconomic burden (Vyas, 2013).It is estimated that 70% to 80% of adults 55 years and older experience degenerative joint changes ,of which osteoarthritis has been identified as the most prevalent rheumatic disease affecting this population (Davis & Nelson,2015) Knee osteoarthritis (OA)is the main cause of pain and disability in older people (Wylde et al., 2016).

Neogi (2013) told that knee osteoarthritis is the most common cause of pain and factional impairment in the knee .Although accurate cause is not known (Mounch et al., 2008) Another study shows the factors that are responsible for primary osteoarthritis are crystals in joint fluid or cartilage ,high bone mineral density, injury to the joint, peripheral hypermobility (Mounch et al., 2008).Osteoarthritis occurring predominantly in weight bearing joints, among weight bearing joints,knee joints are affected most commonly that's why it develops pain and functional limitation (Hinman et al, 2014).

Bardoloi et al. (2017) told that Some common causes that can lead to development of osteoarthritis are age related cartilage degeneration ,genetic inheritance ,trauma ,previous inflammatory condition and vascular changes.

Osteoarthritis affects one third of adults and tends to increase with age (Imoto et al., 2013).Repeated minor trauma may lead to mico fracture, occupational factors are thought to be important in the development of secondary OA Hemophilia, acromegaly and hyperthyroidism all predispose joints to secondary OA (Veerapan et al., 2007)..Osteoarthritis incidence studies indicate that women, older adults, and those who are obese or have a history of a knee injury have a moderate to strongly increase risk of knee symptoms, and radiographic and symptomatic osteoarthritis (Murphy et al., 2015).Swelling may be intermittent (suggesting an effusion) or continues(with capsular thickening or large osteophytes) (Lawrence et al., 2008). Stiffness is present after rest and a little time to wear off with movement (Veerapan et al., 2007). There is reduction in compliance of soft tissue as a result of degenerative change and secondary inflammatory process, in addition as the sub condral micro fracture heal and formation of callus that causes a loss of joint mobility and stiffness following the combination of joint pain, stiffness and possible effusion will often cause patients to limit their activities and consequent movement (Chapple et al., 2011).

Dhillon et al. (2014) told that Biomechanical abnormalities like excessive valgus and varus alignment have also been implicated as risk factors for development of knee osteoarthritis and while both the deformities predispose the knee for earlier osteoarthritis advance deformity has been shown to be greater risk not only for the development, but also for the progression of disease.

Crepitus can be increased from cracking sound in advanced disease, loss of proprioception, loss of ligamentous control and loss of negative pressure within the joint as a result of effusions all contribute to joint instability in OA (Veerapan et al., 2007).Chronic muscle inhibition is often linked to chronic pain and will lead to atrophy and ensuring muscle weakness (Chapple et al., 2011). Chronic oedema of synovial membrane and capsule makes the joint appear large, muscle atrophy may also make the joint look bigger (Veerapan et al., 2007). Meaning over Three million hospitalization for OA as principal diagnosis in 2011 ,OA account for 47.4% of all arthritis related hospitalization In all over the universe the rate of knee osteoarthritis are vary from country to country (Pas et al.,

2013). According to third National Health and Nutrition Examination Survey (NHANES III), approximately 37% of participants age >60 years or older had radio graphic knee OA. Symptomatic knee OA occurs in 10% men and 13% in women aged 60 years or older (Renaux et al., 2012). Another study shows that 9.2% of knee OA and 7.2% of hip OA in the Netherlands, in UK 32.6% of knee OA and 19.2% of hip OA, but in Italy 29.8% of knee OA, 7.7% of hip OA and 14.9% of hand OA and in Spain 29.2% for knee OA and 18.5% for hand OA (Pas et al. 2013). But in the developing countries, according to WHO the incidence of osteoarthritis is about 9.6% men and 18% women aged over 60 year. According to a WHO – APLAR COPCORD study conducted in Bangladesh to find the incidence of musculoskeletal pain and rheumatic disorders, 441 out of 2685 developed new musculoskeletal pain yielding an incidence rate of 16.9/100 person (Haq et al., 2005).

Islam et al.(2014) told that the prevalence of osteoarthritis correlates strikingly with age, regardless of how it is defined ,osteoarthritis is uncommon in adults under n age 40 and highly prevalent in those over age 60, and it is also a disease that, at least in middle aged and elderly persons, is much more common in women than in men, and sex difference in prevalence increase with age.

There are several inter related features common to osteoarthritic joints (Chapple et al., 2011)Predominant symptoms to osteoarthritis are pain (Conaghan et al., 2008).It is aggravated by prolongation of work or exertion and relieved by taking rest, pain occurs due to vascular congestion and interosseous hypertension (Lawrence et al., 2008).).

Aging changes in the matrix of the articular cartilage and chondrocyte that are key contributors to the aging processes which leading to progression of age-associated osteoarthritis (Loeser, 2013)丨 Deposition of high fat in the body in an obese person due to high-fat feeding causes Pan-*Trpv4*−/− genetic factor causes OA (O‟Conor et al., 2013) Vyas (2013) stated that osteoarthritis is a chronic degenerative disorder of multifactorial aetiology,including acute and or chronic insults from normal obesity, and joint injury.

The pain of OA is usually related to activity, for OA of the knee, activities such as climbing stairs, getting out of chair, and walking long distance beginning on pain, morning stiffness

usually lasts less than 30 minutes (Zahang & Jordan, 2010). In fact, knee OA is more responsible than any other disease for disability in walking, stair climbing and housekeeping among non-institutionalized people 50 years of age and older (Lane et al., 2011).The primary symptoms of OA include joint pain, stiffness and movement limitation but the progression of the disease is usually slow leading to joint failure with pain and disability and above all, the main symptoms of knee OA are joint pain (Litwic et al., 2013).

Dhillon et al. (2014) mentioned that present with joint pain, loss of motion, joint effusion with or without sign of inflammation, muscle weakness and altered gait pattern all of these problem are faced by knee osteoarthritis patient.

Davis & Nelson (2015) suggested that common symptoms of osteoarthritis are pain and dysfunction in the affected joints. Fransen et al. (2015) told that people with symptomatic osteoarthritis of the knee describe deep, aching pain and in early disease pain is intermittent and most often is as associated with joint use ,many people symptomatic disease progress ,and the pain becomes more chronic and may occur at rest during the night and the joint feels stiff ,resulting in typical pain and difficulty when movement is initiated after period of rest and also individual with advanced disease may experience crepitus or deep cracking sounds on movement and often limited range of joint motion, people with progressive symptomatic knee osteoarthritis experience increasing difficulty with daily functional activities.

Ruhdorfer et al.(2015) stated that knee osteoarthritis (OA) and obesity strongly impact on the quality of life, particularly in subjects of advanced age ,knee osteoarthritis is an important sources of functional defsicits, equally important as cardiovascular disease and greater than any other medical condition and people with knee osteoarthritis, do not only experiencpainbut also struggle with activities of daily living,incrasing their dependency on other and the need for medical attention .Imoto et al. (2013) mentioned that symptom of knee osteoarthritis associated with pain ,swelling ,instability ,and reduced range of motionand these symptoms lead to functional impairment, increasing the risk of morbidity, and also the synovium is infiltrated with inflammatory cells and secrets excess synovial

fluid, leading to capsular swelling. Fransen et al..(2015) told that symptomatic knee osteoarthritis is highly prevalent among older people worldwide (10% to 30%), especially in rural regions, where occupational physical demands are high. Bardoloi et al. (2017) mentioned that there are many risk factor associated with knee osteoarthritis, joint dysplasia, intraarticular fracture, meniscal injuries are common of them.

Studies have revealed that there are both endogenus and exogenus risk factors for osteoarthritis, genetic factor unquestionably play a role (Vyas, 2013).The menisci perform many important roles within the knee joint complex ,such as improving congruity and stability of the femoro-tibial contact,mechanical shock absorption and load sharing ,facilitating limited rotation via meniscotibial translation, and generating proprioceptive feedback via internal mechanoreceptors, and menisci consist of approximately75% collagen by dry weight ,with collagen fibrils predominantly orientated in circumferential fashion to resist tensile hoop stresses during loading ,and also a complex meniscotibial, meniscofemoral, and peripheral capsular attachments restrain meniscal movement, particularly out word extrusion under loading (Cake et al., 2013).

Bardoloi et al. (2017) told that pathophysiology means converage of pathology and physiology and thus describe the operating mechanism of the structure and the abnormal or undesired conditions prevailing, and overall pathophysiology explains the mechanisms whereby such condition develop and progresses.

During the physical examination, doctor will observe for any signs and symptoms which commonly are associated with osteoarthritis ,and the doctor will observe for joint selling and Joint tenderness, decreased range of motion in joints, visible joint damage (I,e., bony growths),and in imaging studies X-rays are typically used to confirm the diagnosis of osteoarthritis, and also X-ray can reveal osteophytes at the joint margins, joint space narrowing and subchonral bone sclerosis, and subchondral bone is the layer of bone which is just below the cartilage (Silverwood et al., 2015).

Fransen et al. (2015) mentioned that the most typical radiographic features include formation of osteophytes at the joint margins, joint space narrowing, subchondral sclerosis,

Subchondral cyst formation and chondrocalcinosis and it has been estimated that about 40% to 80%of people with radiographic changes will have symptomatic disease.

White et al. (2014) told that Physical activity has been shown to delay the progression of OA and of functional limitations .Ahmed & Daud, (2016) mentioned that Nonsurgical OA management combines pharmacological treatments with physical therapy(PT) interventions . Bardoloi et al. (2017) told that physiotherapy for knee osteoarthritis include exercise therapy. Davis & Nelson (2015) suggested that Exercise is frequently recommended as a non-pharmacological treatment for symptoms of osteoarthritis.

Recommendations and guidelines for the management of osteoarthritis have been published by several different scientific organization, however most of them are produced by national organizations, or are restricted to the use of specific interventions, such as physical therapy in many instances, or selected drug classes many OA management recommendations across organizations, controversies remain and are related to the use of some non-pharmacological intervention (e.g. acupuncture, knee braces, heel wedges)and, within pharmacological treatments, to the pharmacological class of symptomatic slow -- acting drugs in osteoarthritis ,mainly rep-resented by glucosinsamine sulfate and chondroitin sulfate, and to some extent by intraarticular hyaluronic acid (Reginsteret al., 2015).

The management of OA depends on the joint involvement, the stage of the disorder, the severity of the symptoms, age of the patient and his or her functional needs (Lawrence et al., 2008). Brennemen et al. (2016) suggested that strengthening exercise is the cornerstone of conservative treatment for knee osteoarthritis. Kornaat et al. (2006) told that Strengthen weak muscles related to the arthritis joint, encourage correct function, minimize disability.

Muscle strength is a broad term which refers to the capability of contractile structure to produce tension and a resultant force based on the demanding area on the muscle (Kisner & Colby, 2007). Rafique et al. (2013) said that muscle strength is defined as the ability of a muscle or a group of muscles to develop a tension resulting from a dynamic or static force that is place upon on it. They also add that muscle strength is a complex phenomenon due

to its wide range of variability. Another studies reported that an increase in hamstring muscle activation with knee OA was seen while performing the activities of daily living. Normal knee joint load distribution may be altered due to over activation of hamstring muscle and contribution in disease progression in knee OA. Normalizing altered hamstring muscle over activation would be as important as strengthening the quadriceps muscle in preventing the disease progression. (Hortobágyi et al., 2005).

Imoto et al .(2013) Suggested that exercise strengthen the muscles reduce pain improve physical function and are therefore considered a major intervention in the conservative treatment of patient with knee osteoarthritis ,in addition to to muscle strengthening exercises stretching exercises are commonly used to increase range of motion and are often prescribed in rehabilitation protocol as part of routine warm up to prepare the muscles and joints for other types of exercises such as aerobic and strengthening programs.

Hafez et al. (2013) found that systemic reviews of conservative treatment have documented effectiveness of exercise reducing pain and disability due to knee, evidence suggested suggested that stretching and strengthening exercises decrease pain and improve muscular strength, functional ability and psychological wellbeing, stretching the hamstring muscle has been the functional ability of deficient knee. Imoto et al. (2013) told that stretching of hamstring muscle may improve knee extension ROM in osteoarthritis patients.

CHAPTER III METHODOLOGY

This research was a randomized controlled trail (RCT) design to evaluate the effectiveness of hamstring strengthening and stretching exercises along with conventional physiotherapy for patients with knee osteoarthritis.

To identify the effectiveness of this treatment regime, Numeric Pain Rating Scale (NPRS) and The Western Ontario and McMaster Osteoarthritis Index (WOMAC) were used as measurement tools for measuring the pain intensity and disability caused by osteoarthritis.

All patients signed an informed consent form prior to their inclusion into the study.

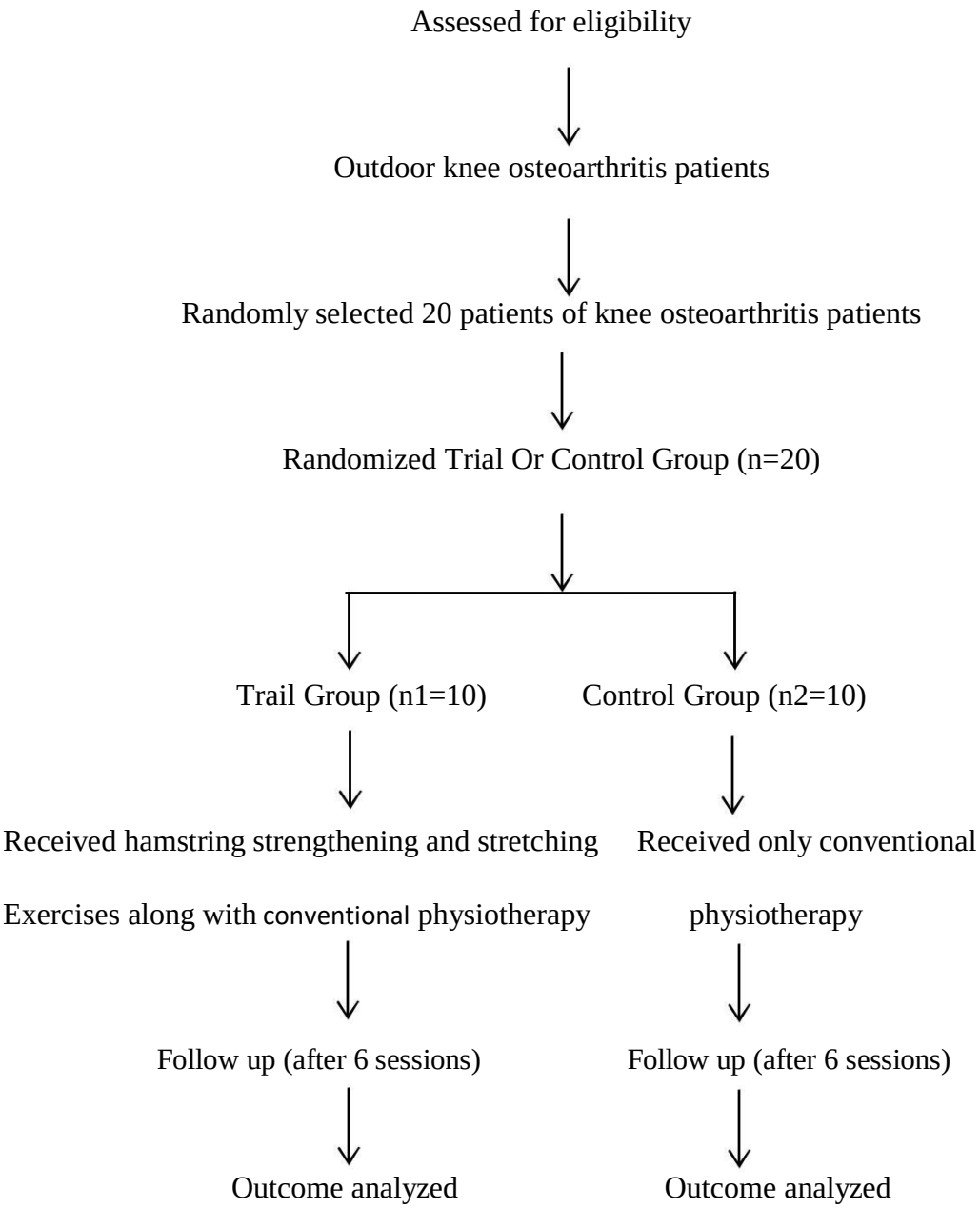
3.1 Study Design

The study was conducted using a quantitative randomized control trial design with two different subject groups .Randomized control; trial design method of testing hypothesis by which cause and effect can be established.

The study was true experimental between different subject designs. Both groups received a common treatment regimen. In this, the experimental group received Hamstring strengthening and stretching exercises along with conventional physiotherapy and control group received conventional physiotherapy only.

A pre-test (before exercise) and post-test (after exercise) was administrated with each subject of both groups to compare the pain effects, and functional ability before and after the treatment. The design could be shown by flow chart -

Flowchart of the phases of randomized controlled trial



A flowchart for a randomized controlled trial of a treatment program including hamstring strengthening and stretching exercises along with conventional physiotherapy and only conventional physiotherapy for patient with knee joint osteoarthritis.

3.2 Study Area:

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

3.3 Study Population

The study population was the patients diagnosed as Osteoarthritis in the Musculo-skeletal Unit of Physiotherapy Department at CRP, Savar, Dhaka.

3.4 Sample Size

In this study, 20 participants were selected according to inclusion and exclusion criteria. 10 participants were in experimental group and 10 participants in control group.

3.5 Sampling

Simple Random Sample Technique are used in this study. Subjects, who met the inclusion criteria, were taken as sample in this study. 20 patients with osteoarthritis were selected from outpatient musculoskeletal unit of physiotherapy department of CRP, Savar and then 10 patients were assigned to Experimental group for the treatment approaches of Hamstring Strengthening and stretching exercises along with conventional physiotherapy and 10 patients to the Control group for conventional physiotherapy treatment by computer generated random number using Microsoft Office Excel 2013 because it improves internal validity of experimental research. The samples were given numerical number C1, C2, C3 etc. for the control group and E1, E2, E3 etc. for experimental group. The study was a single blinded technique.

3.6 Inclusion Criteria

1. Patient who is diagnosed by knee osteoarthritis.
2. Both male and female are included.
3. Any age includes.
4. Pain in either one knee joint or both.
5. Subject who are willingly participate.

3.7 Exclusion Criteria

1. Any history of recent surgery or fracture of femur, tibia, fibula or foot bones.
2. Any history of pathological condition (malignancy, heart disease etc).
3. Any history of osteoporosis.
4. Any previous or current history of psychiatric or psychological treatment.
5. Any intra-articular or epidural injection in the last 6 months.

3.8 Data Collection Procedure

The study procedure was conducted through assessing the patient, initial recording, treatment and final recording. After screening the patient at department, the patients were assessed by qualified physiotherapist. Six sessions of treatment was provided for every subject. Twenty.

subjects were chosen for data collection according to the inclusion criteria. The researcher divide all participants into two groups and coded C1 (10) for control group and E1 (10) for experimental group. Experimental group received conventional physiotherapy with Hamstring strengthening and stretching exercises and control group received only conventional physiotherapy.

Data was gathered through a randomization, pretest, and intervention and posttest procedure and by using a written questionnaire form which was formatted and prepared by

the researcher under the supervision of the supervisor which also includes the Numeric Pain Rating Scale (NPRS) to measure pain intensity level and Western Ontario and McMaster University Osteoarthritis Index (WOMAC) to measure the disability level. Pretest was performed before the intervention and the same procedure was performed to collect the posttest data. A Bangla questionnaire of Western Ontario and McMaster University Osteoarthritis Index (WOMAC) was used as the participants are native Bangla speaker and the Bangla translation of was used with the permission from the Developers of the questionnaire. The researcher collected the data both in experimental and control group in front of the qualified physiotherapist in order to reduce the biasness. At the end of the study, specific test was performed for statistical analysis.

3.9 Data Collection Tool

In this particular study, a written questionnaire, pen, paper and a Numeric Pain Rating Scale and the Western Ontario and McMaster University Osteoarthritis Index (WOMAC) were used as a data collection tools.

3.10 Questionnaire

The questionnaire for this study was carefully developed under the constant observations, advice and permission of the supervisor following certain guidelines. There were close ended questions with Numeric Pain Rating Scale (NPRS) and the Western Ontario and McMaster University Osteoarthritis Index (WOMAC) with some objective questions which were measured by the examiner and each question was formulated to identify the effect of motor control exercise along with the conventional physiotherapy for the treatment of osteoarthritis.

3.11 Measurement Tools

3.11.1 Numeric Pain Rating Scale (NPRS)

The Numeric Pain Rating Scale (NPRS) is a segmented numeric version of the visual analog scale (VAS) in which a respondent selects a whole number (0–10 integers) that best reflects the intensity of the individual's pain (Rodriguez, 2001).

According to Mc Caffery et al. (1989) and later on Stevens, Lin, and Maher, (2016) the Numeric Pain Rating Scale (NPRS -11) is an 11-point scale for the patient self-reporting of pain. It is for adults and children 10 years old or older.

3.11.2The Western Ontario and McMaster Universities Arthritis Index (WOMAC)

The Western Ontario and McMaster Universities Arthritis Index (WOMAC) is a widely used, proprietary set of standardized questionnaires used by health professionals to evaluate the condition of patients with osteoarthritis of the knee including pain, stiffness, and physical functioning of the joints.

The WOMAC measures five items for pain (score range 0–20), two for stiffness (score range 0–8), and 17 for functional limitation (score range 0–68). Physical functioning questions cover everyday activities such as stair use, standing up from a sitting or lying position, standing, bending, walking, getting in and out of a car, shopping, putting on or taking off socks, lying in bed, getting in or out of a bath, sitting, and heavy and light household duties.

The WOMAC takes approximately 12 minutes to complete, and can be taken on paper, over the telephone or computer. Both the computerized and the mobile versions of the test have been found to be comparable to the paper form, with no significant difference.

The test questions are scored on a scale of 0-4, which correspond to: None (0), Mild (1), Moderate (2), Severe (3), and Extreme (4).

The scores for each subscale are summed up, with a possible score range of 0-20 for Pain, 0-8 for Stiffness, and 0-68 for Physical Function. Usually a sum of the scores for all three subscales gives a total WOMAC score, however there are other methods that have been

used to combine scores. Higher scores on the WOMAC indicate worse pain, stiffness, and functional limitations. The test-retest reliability of the WOMAC varies for the different subscales. The pain subscale has not been consistent across studies, but it generally meets the minimum standard. The physical function subscale is more consistent, and has stronger test-retest reliability. The stiffness subscale has shown low test-retest reliability.

3.12 Data Analysis

In order to ensure that the research have some values, the meaning of collected data has to be presented in ways that other research workers can understand. In other words the researcher has to make sense of the results. As the result came from an experiment in this research, data analysis was done by using the software named Statistical Package for Social Science (SPSS) version 20.

Mann Whitney U test had used to analysis the collected data. All participants were code according to group to maintain participant's confidentiality and both the experiment and control group participants score their pain intensity on the Numeric Pain Rating Scale (NPRS) and disability level through Western Ontario and McMaster University Osteoarthritis Index (WOMAC) prior to the trial and after the intervention sessions. Reduction of pain intensity level for both groups and improvement of functional disability are the differences between pre-test and post-test score and it should be analysed with the help of U test.

The U test was done for the analysis of the pain and disability after six session treatment of both control and experimental groups. Experimental studies with the different subject design where two groups are used and each tested in two different conditions and the data is ordinal should be analyzed with Mann-Whitney U test. This test can only be used with ordinal or interval/ ratio data.

The study has an experimental study and has unmatched groups of different participants, who was randomly assigned by computer generated random allocation using Excel to conventional physiotherapy along with Hamstring strengthening and stretching and only conventional physiotherapy group.

Estimated predictor

Hypothesis test of mean difference between the experimental group and the control groups, within groups, unlike the t- test it does not require the assumption of normal distribution. It is nearly as efficient as the t- test on normal distributions. This test can be used to determine whether two independent samples were selected from population having the same distribution.

Hypothesis test

Mann Whitney U test

Mann-Whitney U test is a non-parametric test that is simply compares the result obtained from the each group to see if they differ significantly.

Assumption

- All the observations from both groups are independent of each other.
- The responses are ordinal
- Under the null hypothesis Ho, the distribution of both populations are equal.

Null and alternative hypothesis

Null Hypothesis

H_o: μ_1-μ_2= 0 or $\mu_1 \geq \mu_2$, where the experimental group and control group mean difference is not same or control group is higher than experimental group.

Alternative Hypothesis

H_a: μ_1-$\mu_2 \neq 0$ or $\mu_1 \neq \mu_2$ where the experimental group and control group mean difference is not same.

Where,

H_o= Null hypothesis

H_a= Alternative hypothesis

μ_1 = mean difference in initial assessment

μ_2 = mean difference in final assessment

Formula: test statistic is follows:

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

Where,

n_1 = The number of subjects in trail group

n_2 = The number of subjects in control group

T_x =The larger rank total

n_x = The numberof subject in the group with large rank total

Calculation of U value of post-test pain between groups

Accordingly Mann Whitney U test formula here researcher need the value of T_x that means researcher need the value of larger rank total in posttest pain in between group.so researcher found T_x in this following way.

Table-1: Score of the participants in NPRS scale (Post –test)

Experimental group			**Control group**		
Subject	**NPRS score**	**Rank**	**Subject**	**NPRS score**	**Rank**
E1	6	11	C1	7	15.5
E2	5	8	C2	6	11
E3	3	3.5	C3	6	11
E4	2	2	C4	5	8
E5	5	8	C5	7	15.5
E6	8	19.5	C6	7	15.5
E7	4	5.5	C7	4	5.5
E8	3	3.5	C8	7	15.5
E9	1	1	C9	7	15.5
E10	7	15.5	C10	8	19.5
Total	**44**	**77.5**	**Total**	**64**	**132.50**
Mean	**4.4**		**Mean**	**6.4**	

Above this table researcher found larger rank total T_x, Calculated U test for posttest pain in between group according to the formula.

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

Where,

n_1=The number of subject in experimental group (10)

n_2= The number of subject in control group (10)

T_x= The larger rank total (132.50)

n_x= The numberof subject in the group with large rank total(10)

U = ?

So,

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

$=10\times10+\frac{10(10+1)}{2} - 132.50$

=100+55-132.5

=155-132.5

=22.5

Level of Significant

The researcher has used 5% level of significant to test the hypothesis. Calculated the value and compared with standard U value .Null hypothesis will be rejected when observed U vale is smaller than the standard U value and alternative hypothesis is accepted

In this way researcher had calculated nonparametric U value and significant level for post-test pain between group and presented in the following tables

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

Table-2: Analysis of post -test pain (Between group analysis)

Numerical pain rating scale score	Category of the participant	Number	Mean of post- test pain	Mean Rank	Mean Whitney U score	P
	Control	10	6.40	13.25	22.500	0.035
	Experimental	10	4.40	7.75		
	Total	20				

Calculation of U value of Disability between groups

Accordingly Mann Whitney U test formula here we need the value of T_x that means researcher needed the value of larger rank total in posttest disability in between group.so researcher found T_x in this following way.

Table-3: Score of the participants in WOMAC scale (Post –test)

Experimental group			**Control group**		
Subject	**WOMAC score**	**Rank**	**Subject**	**WOMAC score**	**Rank**
E1	18	3	C1	47	16
E2	29	10	C2	41	12
E3	5	1	C3	42	13.5
E4	28	4.5	C4	28	8.5
E5	24	6	C5	49	17
E6	28	8.5	C6	42	13.5
E7	27	7	C7	45	15
E8	22	4.5	C8	51	18
E9	13	2	C9	54	19.5
E10	31	11	C10	54	19.5
Total	**225**	**57.5**	**Total**	**453**	**152.5**
Mean	**22.5**		**Mean**	**45.3**	

Above this table researcher found larger rank total T_x, Calculated U test for posttest disability in between group according to the formula

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

Where,

n_1=The number of subject in experimental group (10)

n_2= The number of subject in control group (10)

T_x= The larger rank total (152.5)

n_x= The numberof subject in the group with large rank total(10)

U = ?

So,

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

$=10\times10+\frac{10(10+1)}{2} - 152.5$

=100+55-152.5

=155-152.5

= 2.5

Level of Significant

The researcher has used 5% level of significant to test the hypothesis. Calculated the value and compared with standard U value .Null hypothesis will be rejected when observed U vale is smaller than the standard U value and alternative hypothesis is accepted

In this way researcher had calculated nonparametric U value and significant level for post -test disability between group and presented in the following tables.

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

Table-4: Analysis of post- test disability (Between group analysis*)*

The Western Ontario and McMaster University Osteoarthritis Index (WOMAC) score	Category of the participant	Number	Mean of post- test pain	Mean Rank	Mean Whitney U score	P
	Control	10	44.33	15.25	2.500	0.000
	Experimental	10	21.90	5.75		
	Total	20				

3.13 Ethical Consideration

The proposal of the dissertation including methodology was approved by IRB and obtained permission from the concern authority of ethical committee of Bangladesh Health Profession Institute (BHPI) .The whole process of this research project was done by following the Bangladesh Medical and Research Council (BMRC) guidelines and World Health Organization (WHO) research guidelines.

In order to avoid ethical claims, the participants were set free to receive treatment for other purposes as usual. Each participant was informed about the purpose and goal of the study before collecting data. The information regarding the study had kept confidential and after the study all the documents had been destroyed.

A signed informed consent was ensured from every participant prior to the beginning of the trial and the data collector. The researcher obtained consent to participate from every subject. All participants stopped taking medicine willingly for the particular trial period and that was known prescribed by the responsible physiotherapist. All participants are informed that they have full authority over the decision. Participants were informed that they were completely free to decline answering any questions during the study and were free to withdraw their consent and terminate participation at any time. Withdrawal of the participation from the study, it would not affect their treatment in the Physiotherapy Department and they would still get the same facilities and treatment according to their condition.

Every subject had the opportunity to discuss their problem with the senior authority or administration of CRP and have any questioned answer to their satisfaction. Any query or questions related to the study or participation would be welcomed by the researcher herself.

3.14 Treatment Protocol

3.14.1 Control Group Treatment Protocol

Table- 5. Control Group Treatment Protocol

Treatment option	Duration/Repetition
Soft tissue release technique	3-5 minutes
Patellar mobilization	2 minutes
Rotation mobilization	1 minute
Isometric strengthening exercise	3 repetition
Pendulum exercise	2-3 minutes
MWD	6 repetition
Joint play	10 repetition
Knee gaping	10 repetition
Ice	5 minutes
UST	5-7 minutes
IRR	15 minutes

3.14.2 Experimental group treatment protocol

In Hamstring strengthening exercise patient is in prone lying position ,and that time performed active resistance exercise 10 times/session and Hamstring stretching exercise patient is in sitting position and that time stretching exercise are performed 3 times,3 sets and hold time 30 sec and relax time 30 sec.

CHAPTER: IV RESULTS

In this research, 20 participants were participated in this study. 10 in the Hamstring strengthening and stretching exercises along with conventional physiotherapy group (experimental group) and 10 in the only conventional group (control group). Every participant of both experimental and control group scored on Numeric Pain Rating Scale (NPRS) and WOMAC before and after completion of the treatment.

4.1 Sociocultural Related Information

4.1.1 Age Variable

Table 6: Mean age of the participants

Experimental Group		Control Group	
Subjects	**Age (Years)**	**Subjects**	**Age (Years)**
E1	45	C1	56
E2	30	C2	75
E3	56	C3	70
E4	70	C4	60
E5	50	C5	45
E6	46	C6	55
E7	35	C7	30
E8	51	C8	65
E9	59	C9	65
E10	45	C10	50
Mean Age	**48.7± 13.817years**	**Mean Age**	**57.1±9.886 years**

20 participants were participated in the study, 10 in the experimental group and 10 in the control group. The mean ages of experimental group were 48.7±13.817 and control group were 57.1 ±9.886.

4.1.2 Sex Ratio

20 participants with osteoarthritis were participated in this study where 6 participants were male and 4 participants were female in experimental group.

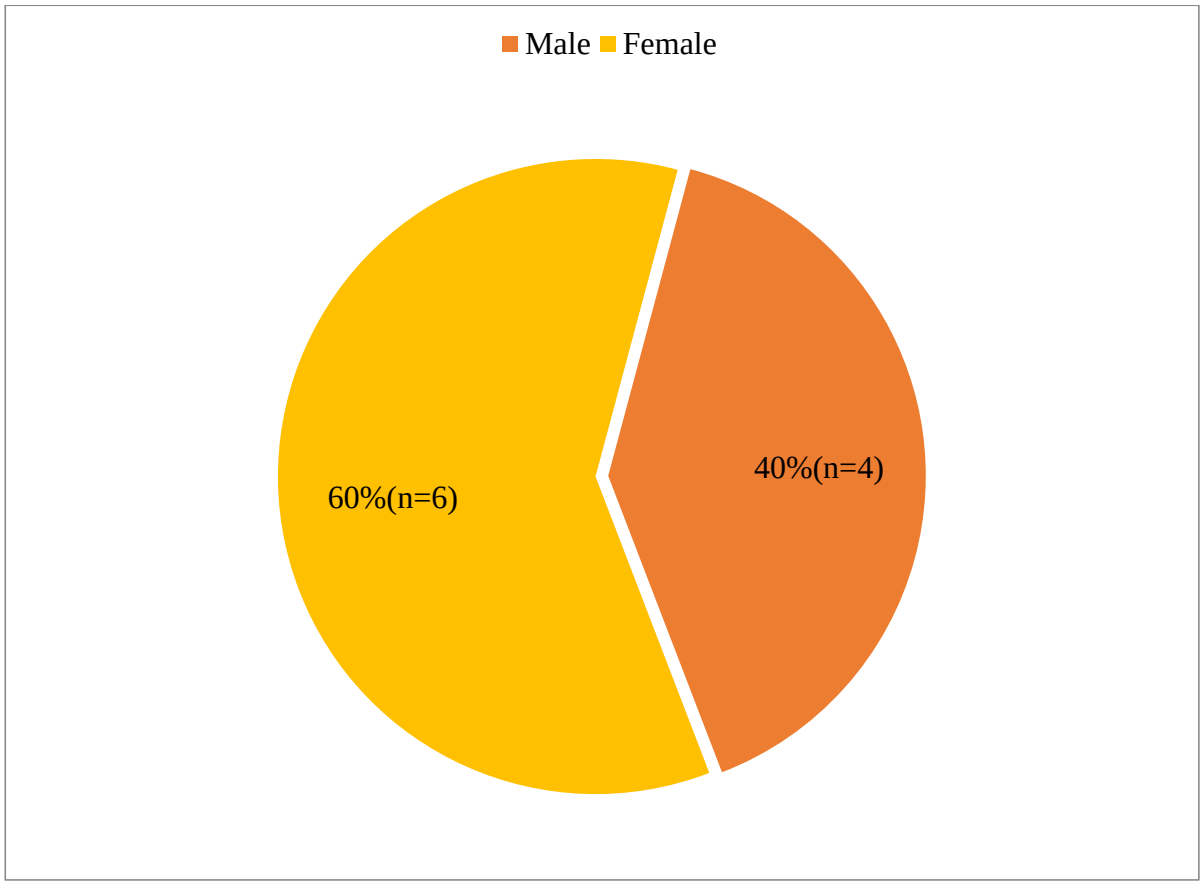


Figure 1: Sex ratio of the participants in experimental group

5 participants were male and 5 participants were female in control group.

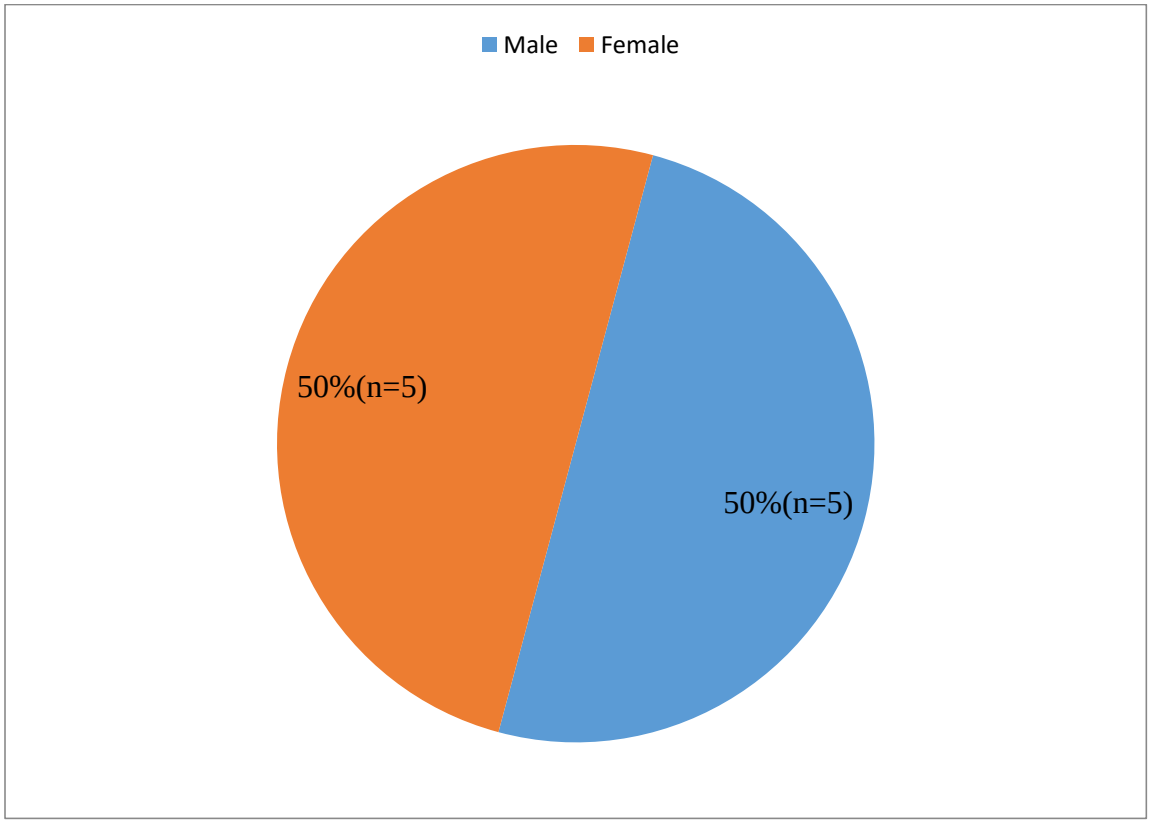


Figure 2: Sex ratio of the participants in control group

So total 11 participants are male were male and 9 participants were female in both group.

4.1.3 Occupation

Among the 20 participants, there were 5 kinds of occupation. Most of them are house wife (n=8) and rest of them are retried (n=1), service holder (n=6), farmer (n=2) and businessman (n=3).

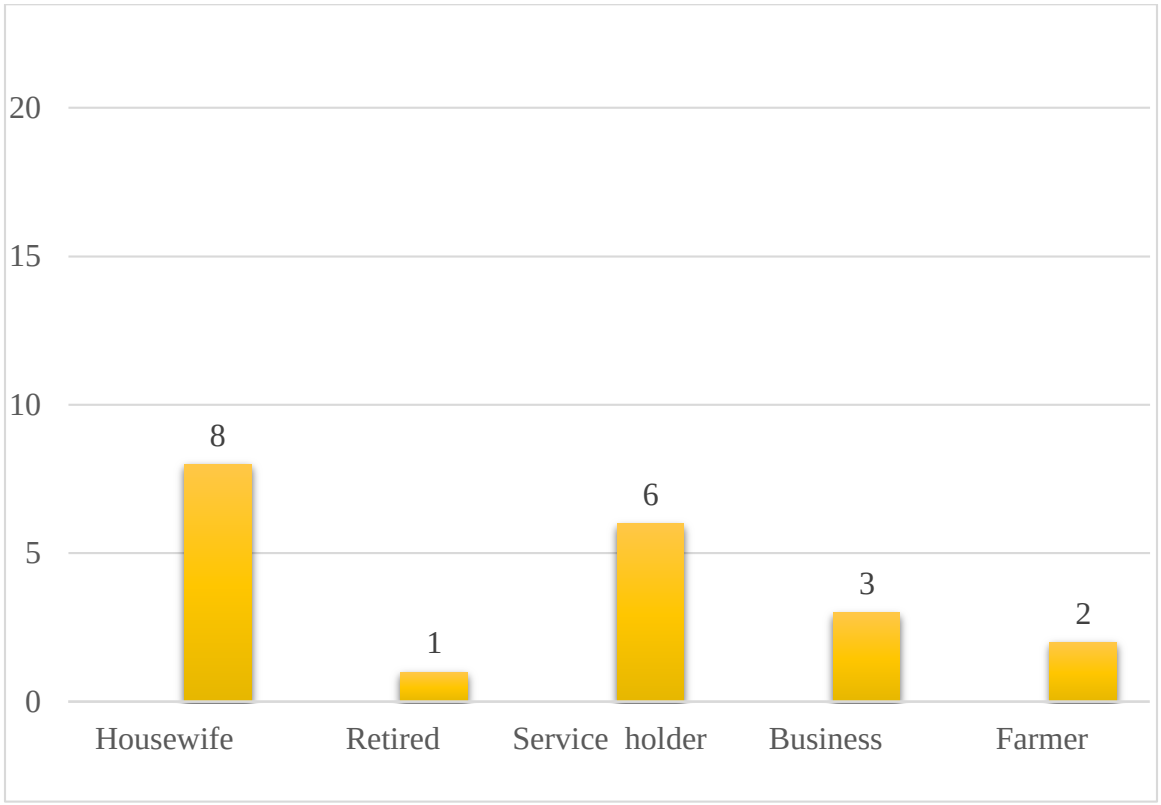


Figure 3: Occupation of the participants

4.1.4 Marital status

Table 7: Marital status of the participants

Marital status	Experimental group	Control group	Total Number of the participants
Married	9	8	17
Unmarried	1	2	3

The table shows that, among the 20 participants most were married (85%, n= 17) and few of them were unmarried (15%, n= 3). Among them 9participants in experimental group and 8 participants in control group were married on the other hand 1 participants and 2 participants in control group were unmarried. No participant in experimental group was unmarried.

4.2 Pain and Disability Related Information

4.2.1 Comparison of Pain

From Comparison of pain data, it can be concluded that pain reduction score on the Numerical Pain Rating Scale (NPRS) in experimental group was statistically significantly higher than the control group (U = 22.500, p = .035).

The observe U value was 22.5 in the between group and standard table value in U test was 27 which is larger than observed U value. So, Null hypothesis was rejected and alternative hypothesis was accepted at 5% level of significant. That means there was an associated between pain and disability.

4.2.2 Comparison of Disability

The above mentioned disability tabulated data, it can be concluded that disability reduction score on the The Western Ontario and McMaster Universities Arthritis Index (WOMAC) in experimental group was statistically significantly higher than the control group (U = 2.500, p = 0.000).

The observe U value was 2.5 in the between group and standard table value in U test was 27 which is larger than observed U value. So, Null hypothesis was rejected and alternative hypothesis was accepted at 5% level of significant. That means there was associated between pain and disability.

CHAPTER V DISCUSSION

The study was indicated a process that could be continuing to establish the result. Here the aim of this study could be achieved if the researcher could show effective support, The objective of this study was to evaluate whether Hamstring strengthening stretching exercises has beneficial effect in patients with knee osteoarthritis.

In this experimental study 20 patients were enrolled and 10 patients were assigned to control group who received only conventional physiotherapy treatment .The rest of 10 patients were assigned to experimental group who received Hamstring strengthening and stretching exercise along with conventional physiotherapy treatment. Each group attended for 6 sessions of treatment within 3 weeks in the physiotherapy .outpatient Unit of CRP, Savar in order to demonstrate the improvement. The outcome was measured by using Numeric Pain Rating Scale (NPRS) for pain intensity and Ontario &McMaster Universities Osteoarthritis Index was used as measurement tools for measuring the level of pain, stiffness and functional activities in several functional position. The results of this study demonstrated that Hamstring strengthening and stretching exercises brought significant improvements in all the parameters after the 6 session training program. The demographic details including age, showed no significant difference between the two groups .The results of the study demonstrated that Hamstring strengthening and stretching exercises brought significant gains in strength of the Hamstring muscle in the experimental group after the 6 session training program. In the between-group analysis, the improvement in the experimental group was greater than that of the control group at the end of the training period. The analysis of significance was carried out by using non parametric Mann-Whitney U test to compare the effectiveness of Hamstring strengthening and stretching exercises along with conventional physiotherapy compared to the only conventional physiotherapy for the management of osteoarthritis.

By using a non-parametric Mann-Whitney U test on the data the results were found to be significant ($p < 0.005$ for a one tailed hypothesis). The null hypothesis therefore can be rejected. That actually means that the hamstring strengthening and stretching exercises s

along with conventional physiotherapy is more effective than only conventional physiotherapy technique reducing pain and disability in the patients with osteoarthritis.

The researcher found significance improvement of pain. . Numerical pain rating scale was used in the study to measure pain level in participants in pretest and after intervention. In experimental group, Mean difference of reduction of pain was 2.0. In case of the pain reduction was statistically significant in all cases; in all groups pain was reduced.

In this study Western Ontario and McMaster University Osteoarthritis Index was used in case of osteoarthritis generated disability in here, subjects scored in between 0-96 in the WOMAC score. The mean difference of the WOMAC score was 22.4.3 the functional level of the patient was increased and the disability caused by osteoarthritis was significantly reduced. The disability scored reduced in both groups but the experimental group shows promising result.

The results of the present study showed that the 6 session intervention brought about a significant reduction in knee pain and improvement in function in the experimental group. The significant reduction in pain and improvement in function in the experimental group may be attributed to improved Hamstring strength and stretching and therefore increase stability of the knee joint.

Brenmenn et al (2012) suggested that strengthening exercise is the cornerstone of conservative treatment for knee osteoarthritis, in knee osteoarthritis “hamstring muscle is most affected than quadriceps muscle in knee osteoarthritis physiotherapy management protocol hamstring strengthening exercise included with quadriceps strengthening exercise for its obvious necessary. Imoto et al. (2013) told that stretching of hamstring muscle may improve knee extension ROM in osteoarthritis patients.

The researcher had not got the enough time for such a study, this is the main limitation of this study. In this study it was used 20 patients with osteoarthritis. This was a very small number of samples in both groups which was not sufficient for the study to generalize to wider population of osteoarthritis. Physiotherapists could not be blinded to the interventions.

The limitation of this study was this research carried out in CRP, Savar such a small environment; it was very difficult to keep confidential the aims of the study for blinding procedure. The samples were selected between the age group of 30-70year, but the researcher couldn't find out which age group patients were more effective. If the most effective age group were found then the result will be more specific. There were no available researches representing effectiveness of this intervention.

CHAPTER VI CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The result of this experimental study have identified the effectiveness of conventional physiotherapy with Hamstring strengthening and stretching exercises are better treatment than the conventional physiotherapy alone for reducing pain and disability in osteoarthritis patient. Participants in the conventional physiotherapy with Hamstring strengthening and stretching exercises showed a greater benefit than those in the only conventional physiotherapy group, which indicate that the conventional physiotherapy with Hamstring strengthening and stretching can be an effective therapeutic approach for patient with osteoarthritis.

Hamstring strengthening and stretching technique is used along with conventional physiotherapy that aims to reduce pain on knee, to facilitate rehabilitation program. It is a cost effective treatment alternative for many common injuries and overuse syndrome which is effective for restoring the joint play and for establishing proper structural alignment. So it may become helpful for patients with osteoarthritis to determine hamstring strengthening and stretching with conventional physiotherapy as intervention for reducing the features of osteoarthritis. From this research the researcher wishes to explore the effectiveness of hamstring strengthening and stretching exercises along with conventional physiotherapy to reduce the features of patient with osteoarthritis, which will be helpful to facilitate their rehabilitation and to enhance functional activities.

6.2 Recommendation

As a consequence of this researcher it is recommended to do further study including comparison of the conventional physiotherapy and Hamstring strengthening and stretching exercises with conventional physiotherapy alone to assess the effectiveness of these interventions with well controlled blinding procedure. It is also recommended to include the functional outcome assessment of patient and to identify the average number of sessions that are needed to be discharged from treatment to validate the treatment technique.

REFERENCES

Ahmad, A. and Daud, M., (2016). A comparative study between joint mobilization and conventional physiotherapy in knee osteoarthritis. International Journal of Physiotherapy, 3(2):159-162.

Bardoloi,B.,Bhutia ,C.,Bhatia,D. and Paul,S.,(2017).Knee osteoarthritis: an overview of recent interventions. Journal of Biomedical Engineering and Biosciences,4:1-18.

Braun, H.J. and Gold, G.E., (2012). Diagnosis of osteoarthritis: imaging. Bone, 51(2) :278-288.

Brenneman, E.C., Kuntz, A.B., Wiebenga, E.G. and Maly, M.R., (2016). Does pain relate with activation of quadriceps and hamstrings muscles during strengthening exercise in people with knee osteoarthritis? SpringerPlus, *5*(1): 463.

Cake, M.A., Read, R.A., Corfield, G., Daniel, A., Burkhardt, D., Smith, M.M. and Little, C.B., (2013). Comparison of gait and pathology outcomes of three meniscal procedures for induction of knee osteoarthritis in sheep. Osteoarthritis and Cartilage, 21(1):226-236.

Chapple CM, Nicholson H, Baxter GD and Abbott JH, (2011). Patient characteristics that predict progression of knee osteoarthritis: A systematic review of prognostic studies. Arthritis Care and Research, 63(8):1115-25.

Cooper, C., Adachi, J.D., Bardin, T., Berenbaum, F., Flamion, B., Jonsson, H., Kanis, J.A., Pelousse, F., Lems, W.F., Pelletier, J., Martel-Pelettier, J., Reiter, S., Reginster,J., Rizzolin, R. and Bruyere, O., (2013). How to define responders in osteoarthritis. Current Medical Research and Opinion, 29(6): 719–29.

Davis,J and Nelson R.,(2015) .Aquatic exercise for pain management older adults with osteoarthritis .Therapeutic Recreation Journal,XIIX(4):326-330.

Dhillon, H.S., Sharma, M. and Sharma, S., (2014). Effectiveness of Exercise Therapy and its Variations in Lower Limb Osteoarthritis: A Literature Review. Journal of Postgraduate Medicine, Education and Research, 48(4):190.

Fransen,M.,McConnell,S., Harmar,AR.Van,M.,Simmic,M.,Bennell,KL.,(2015).Exercise for osteoarthritis knee. Cochrane Database of Systematic Review,1.

Hafez,A.R.Al-Johani,A.H.,Zakaria,A.R.,Al-Ahadeb.,A.,Buragadda,S.J.,(2013).Treatment of Knee Osteoarthritis in Relation to Hamstring and Quadriceps Strength. The Society of Physical Therapy Science 25(11):1402.

Haq, S.A., Darmawan, J., Islam, M.N., Uddin, M.Z., Das, B.B., Rahman, F., Chowdhury, M.A.J., Alam, M.N., Mahmud, T.A.K., Chowdhury, M.R. and Tahir, M., (2005). Prevalence of rheumatic diseases and associated outcomes in rural and urban communities in Bangladesh: a COPCORD study. The Journal of Rheumatology, 32(2):348-353.

Hinman, R.S., Hunt, M.A., Creaby, M.W., Wrigley, T.V., McManus, F.J. and Bennell, K.L., (2010). Hip muscle weakness in individuals with medial knee osteoarthritis. Arthritis Care & Research, 62(8):1190-1193.

Hortobágyi, T., Westerkamp, L., Beam, S., Moody, J., Garry, J., Holbert, D. and DeVita, P., (2005). Altered hamstring-quadriceps muscle balance in patients with knee osteoarthritis. Clinical Biomechanics, 20(1):97-104.

Islam,M.J.,Hossain,M.S.,Amin,M.R.and Ahmed,M.,(2015).Aetiological Factors of Osteoarthritis A Review Update .Journal of Current and Advance Medical Research ,2(1):18-23.

King, K.B. and Rosenthal, A.K., (2015). The adverse effects of diabetes on osteoarthritis: update on clinical evidence and molecular mechanisms.Osteoarthritis Cartilage,23(6):841-850.

Kisner, C. and Colby, L.A., (2007). Therapeutic Exercise Foundations and Techniques.5th ed. America: Margaret Biblis.

Kruger-Jakins, T., Saw, M., Edries, N. and Parker, R., (2016). The development of an intervention to manage pain in people with late-stage osteoarthritis. South African Journal of Physiotherapy, 72(1):1-7.

Lawrence RC, Felson DT, Helmick CG, Arnold LM, Choi H, Deyo RA, Gabriel S, Hirsch R, Hochberg MC, Hunder GG, Jordan JM, Katz JN, Kremers HM, Wolfe F and National Arthritis Data Workgroup, (2008). Estimates of the prevalence of arthritis and other rheumatic conditions in the United States: Part II. Arthritis and Rheumatism, 58(1):26-35.

Litwic, A., Edward, M.H., Dennison, E.M. and Cooper, C., (2013). Epidemiology and burden of osteoarthritis. British Medical Bulletin, 105: 185–99.

Loeser, R.F., (2013). Aging processes and the development of osteoarthritis. Current Opinion in Rheumatology, 25(1): 108–13.

Maly, M.R., Costigan, P.A. and Olney, S.J., (2006). Determinants of self-report outcome measures in people with knee osteoarthritis. Archives of Physical Medicine and Rehabilitation, 87(1):96-104.

Marmon, A.R., Zeni, J. and Snyder-Mackler, L., (2013). Perception and presentation of function in patients with unilateral versus bilateral knee osteoarthritis. Arthritis Care & Research, 65(3): 406–13.

McAindon,T.E.,Bannuru,R.,Sullivan,M.C.,Arden,N.K.,Berenbaum,F.,Bierma Zeinstra,S.M.,Haeker,G.A.,Henrotin,Y.,Hunter,D.J.,Kawaguchi,H.and Kwoh,K.,(2014).OARSI guidelines for thenon-surgical management of knee osteoarthritis.Osteoartheritis and cartilage,22(3):363-388.

Mizusaki Imoto, A., Peccin, S., Gomes da Silva, K.N., de Paiva Teixeira, L.E.P., Abrahão, M.I. and Fernandes Moça Trevisani, V., (2013). Effects of neuromuscular electrical stimulation combined with exercises versus an exercise program on the pain and the function in patients with knee osteoarthritis: a randomized controlled trial. BioMed Research International,

Mounach, A., Nouijai, A., Ghozlani, I., (2008). Risk factors for knee osteoarthritis in Morocco: A case control study. Clinical Rheumatology, 27:323-326.

Muraki, S., Tanaka, S. and Yoshimura, N., (2013). Epidemiology of knee osteoarthritis. OA Sports Medicine Journal, 1(3):21

Murphy, L.B., Moss, S., Do, B.T., Helmick, C.G., Schwartz, T.A., Barbour, K.E., Renner,

J., Kalsbeek, W. and Jordan, J.M., (2016). Annual incidence of knee symptoms and four knee osteoarthritis outcomes in the Johnston County Osteoarthritis Project. Arthritis Care & Research, 68(1):55-65.

Neogi, T.,(2013). The epidemiology and impact of pain in osteoarthritis. Osteoarthritis and Cartilage, 21(9):1145-1153.

O‟onor, C.J., Griffin, T.M., Liedtke, W. and Guilak, F., (2013). Increased susceptibility of Trpv4-deficient mice to obesity and obesity-induced osteoarthritis with very high-fat diet. Annals of the Rheumatic Diseases, 72(2): 300–4.

Pas, S.V.D., Castell,M.V.,Cooper, C. and Denkinger, E.M., (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, 14(1): 138.

Prieto-Alhambra, D., Judge, A., Javaid,M.K., Cooper, C., Diez-Perez, A. and Arden, N.K., (2013). 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, 73(9) 1659-1664. doi: 10.1136/annrheumdis-2013-203355.

Rafique, N., Nizami, G.N. and Rafique, A.,(2013). Effectiveness of isotoinic exercises on quadriceps-hamstring strength ratio in osteoarthritic females. Pakistan Journal of Rehabilitation, 2(2).2(2):23-31.

Reginster, J.Y., Cooper, C., Hochberg, M., Pelletier, J.P., Rizzoli, R., Kanis, J., Abadie, E., Maheu, E., Brandi, M.L., Devogelaer, J.P. and Branco, J., (2015). Comments on the

discordant recommendations for the use of symptomatic slowacting drugs in knee osteoarthritis. Current Medical Research and Opinion, 31(5):1041-1045.

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

Richmond, J., Hunter, D., Irrgang, J., Jones, M.H., Levy, B., Marx, R., Snyder-Mackler, L., Watters, W.C., Haralson, R.H., Turkelson, C.M. and Wies, J.L.,(2009). American Academy of Orthopaedic Surgeons Treatment of osteoarthritis of the knee (nonarthroplasty), Journal of American Academy Orthopaedic Surgeons.17 (9): 591–600.

Ruhdorfer, A.,Writh,W., and Eckstein,F.,(2015).Relationship between isometric thigh muscle strength and minimum clinically important differences in knee function in osteoarthritis:Data from the osteoarthritis initiative. American College of Rheumatology,67(4) :509-518.

Silverwood, V., Blagojevic-Bucknall, M., Jinks, C., Jordan, J.L., Protheroe, J. and Jordan, K.P., (2015). Current evidence on risk factors for knee osteoarthritis in older adults: a systematic review and meta-analysis. Osteoarthritis and Cartilage, 23(4):507-515.

Veerapen K, Wigley RD, and Valkenburg H, (2007). Musculoskeletal pain in Malaysia: a COPCORD survey. Journal of Rheumatology, 34(1):207-13.

Vyas,D.,(2015).The effect of physiotherapy and lifestyle modification in treatment of osteoarthritis of knee Joint in elderly in community. International Journal of Science and Research, 6(14) .2319-7064.

Wylde,V.,Artz..N.,Marques,E.,Lenguerrand.E.,Dixon.S.,D.A.,Burston.A.B.,Murry.J.,Par wez.T.,Blom ,A.W., and Hill .R.G.,(2016).Effectiveness and cost –effectiveness of outpatient physiotherapy after knee replacement for osteoarthritis :study protocol for a randomize controlled trail .17:289.

White, D.K., Tudor-Locke, C., Zhang, Y., Fielding, R., LaValley, M., Felson, D.T., Gross, K.D., Nevitt, M.C., Lewis, C.E., Torner, J. and Neogi, T., (2014) Daily walking and the risk of incident functional limitation in knee osteoarthritis: an observational study. Arthritis Care & Research, 66(9):1328-1336.

Zhang,Y. and Jordan,J.M.,(2010).Epidemiology of osteoarthritis. Clinics in Geriatric Medicine, 26(3):355-69

APPENDIX

সম্মতিপত্র (বাংলা)

আসলামু আলাইকুম,

আমি শারমিন নাহার বিউটি, ঢাকা বিশ্ববিদ্যলয়ের চিকিৎসা অনুষদের অধীনে বাংলাদেশ হেলথ প্রফেশনস ইন্সিটিডিট এর বি.এস.সি ইন ফিজিওথেরাপি কোর্সের ৪র্থ (চুড়ান্ত) বর্ষের একজন শিক্ষার্থী। অধ্যয়নের অংশ হিসেবে আমাকে একটি গবেষণা সম্পাদন করতে হবে এবং এটা আমার প্রাতিষ্ঠানিক কাজের একটা অংশ। আমার গবেষণার বিষয় হল "অষ্টিও আথ্রাইটিস রোগীরদের মধ্যে প্রচলিত ফিজওথেরাপির সাথে হ্যামস্ট্রিং স্ট্রেইনদেনিং এবং স্ট্রেচিং এক্সরসাইজের এর কার্যকারিতা" ।

এখন আমি আপনাকে কিছু প্রশ্ন করতে চাচ্ছি যা এই ফর্ম এ উল্লেখ আছে। এতে আনুমানিক ২০-৩০ মিনিট সময় নিবো।

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

এই অধ্যয়নে অংশ গ্রহণ কারী হিসেবে যদি আপনার কোন প্রশ্ন থাকে তাহলে আপনি আমাকে অথবা এবং আমার সুপারভাইজার মোঃ ওবায়দুল হক , সহযোগী অধ্যাপক ও বিভাগীয় প্রধান, ফিজিওথেরাপী বিভাগ, বি.এইচ.পি.আই , সিআরপি , সাভার, ঢাকা -১৩৪৩ তে যোগাযোগ করতে পারেন।

সাক্ষাত কার শুরু করার আগে কী আপনার কোন প্রশ্ন আছে?

সুতারাং আমি আপনার অনুমতিতে এই সাক্ষাতকার শুরু করতে পারি?

☐ হ্যাঁ ☐ না

১। অংশগ্রণকারীর স্বাক্ষর ও তারিখ _____

২। স্বাক্ষীর স্বাক্ষর ও তারিখ _____

৩। গবেষকের স্বাক্ষর ও তারিখ _____

প্রশ্নপত্র (বাংলা)

অংশ- ১: সামাজিক-প্রেক্ষাপটের তথ্যাবলী

এই প্রশ্ন পত্রটি তৈরি করা হয়েছে অস্টিওআর্থ্রাইটিস রোগীদের হাটু ব্যথার পরিমাপ এবং অক্ষমতাজনিত তথ্যাবলী এই অংশটি ফিজিওথেরাপিস্ট / গবেষক কালো কলম / পেন্সিল দ্বারা পূরণ করবেন।

অনুগ্রহপূর্বক নিচের প্রশ্নগুলোর মধ্যে সঠিক উত্তরের বাম পাশে টিক ✓ চিহ্ন দিন

১) রোগীর নাম: কোড নং:

২) মোবাইল নং: তারিখ:

৩) ঠিকানা: গ্রাম: পোস্ট অফিস:

থানা: জেলা:

৪) পেশা:

৫) বয়স: (বছর)

৬) লিঙ্গ:
- ☐ পুরুষ
- ☐ মহিলা

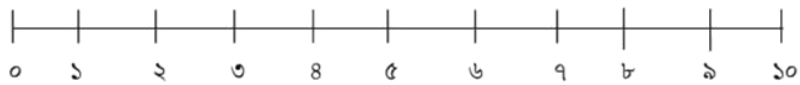
৭) বৈবাহিক অবস্থা:
- ☐ বিবাহিত
- ☐ অবিবাহিত
- ☐ তালাকপ্রাপ্ত
- ☐ বিধবা

৮) আবাসিক এলাকা:
- ☐ শহর
- ☐ গ্রাম

চিকিৎসার পূর্ববর্তী তথ্য

অংশ- ২: ব্যথার পরিমান

i) আপনার ব্যথার তীব্রতা আজকে কতটুকু?



০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০

ব্যথা নাই সর্বাধিক ব্যথা

অংশ- ৩: শারীরিক অক্ষমতার প্রশ্নাবলী

প্রত্যেক প্রশ্নের চারটা স্কোর, সর্বমোট প্রশ্ন ২৪ এবং সর্বমোট ফলাফল ৯৬

নির্দেশিকা: দয়া করে প্রত্যেক ধরনের কাজকে নিচের কাঠিন্যের মাপকাঠি অনুযায়ী নির্ধারণ করুন

০ = নাই

১ = অল্প

২ = মাঝারী

৩ = অনেক

৪ = সর্বাধিক

প্রত্যেক কাজের জন্য **একটা সংখ্যায়** গোল দাগ দিন

i) ব্যাথা:

১। যখন হাঁটেন	০	১	২	৩	৪
২। যখন সিড়িতে উঠেন	০	১	২	৩	৪
৩। রাতের বেলায়	০	১	২	৩	৪

৪। বিশ্রামের সময়	০	১	২	৩	৪
৫। যখন ওজন বহন করেন	০	১	২	৩	৪

ii) শক্ত হয়ে যায়:

১। সকালে শক্ত হয়ে যায়	০	১	২	৩	৪
২। দিনের অন্য সময় শক্ত হয়ে যায়	০	১	২	৩	৪

iii) শারীরিক কাজ:

১। সিঁড়ি দিয়ে নামতে	০	১	২	৩	৪
২। সিঁড়ি দিয়ে উঠতে	০	১	২	৩	৪
৩। বসা থেকে ওঠার সময়	০	১	২	৩	৪
৪। দাড়িয়ে থাকার সময়	০	১	২	৩	৪
৫। আসন দিয়ে বসার সময়	০	১	২	৩	৪
৬। সমতলে হাটার সময়	০	১	২	৩	৪
৭। যানবাহনে ওঠার সময়/ যানবাহন থেকে নামার সময়	০	১	২	৩	৪
৮। কেনাকাটা করার সময়	০	১	২	৩	৪
৯ । মোজা পরার সময়	০	১	২	৩	৪
১০। বিছানায় শুতে	০	১	২	৩	৪
১১। মোজা খোলার সময়	০	১	২	৩	৪

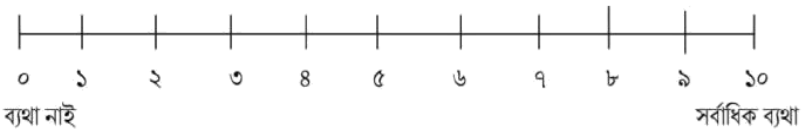
১২। শোয়া থেকে ওঠার সময়	০	১	২	৩	৪
১৩। গোসলে যাওয়ার সময়/বের হওয়ার সময়	০	১	২	৩	৪
১৪। বসে থাকা অবস্থায়	০	১	২	৩	৪
১৫। টয়লেটে যাওয়ার সময়	০	১	২	৩	৪
১৬। বাসার ভারী কাজ গুলো করতে	০	১	২	৩	৪
১৭। বাসার হালকা কাজ গুলো করতে	০	১	২	৩	৪

চিকিৎসার পূর্ববর্তী রোগীর প্রাপ্ত নম্বর _____ /৯৬

চিকিৎসার পরবর্তী তথ্য

অংশ- ৪: ব্যথার পরিমান

i)আপনার ব্যথার তীব্রতা আজকে কতটুকু ?



অংশ ৩: শারীরিক অক্ষমতার প্রশ্নাবলী

নির্দেশিকা: দয়া করে প্রত্যেক ধরনের কাজকে নিচের কাঠিন্যের মাপকাঠি অনুযায়ী নির্ধারণ করুন

০ = নাই

১ = অল্প

২ = মাঝারী

৩ = অনেক

৪ = সর্বাধিক

প্রত্যেক কাজের জন্য **একটা সংখ্যায়** গোল দাগ দিন

i) ব্যাথা:

১। যখন হাটেন	০	১	২	৩	৪
২। যখন সিড়িতে উঠেন	০	১	২	৩	৪
৩। রাতের বেলায়	০	১	২	৩	৪
৪। বিশ্রামের সময়	০	১	২	৩	৪
৫। যখন ওজন বহন করেন	০	১	২	৩	৪

ii) শক্ত হয়ে যায়:

১। সকালে শক্ত হয়ে যায়	০	১	২	৩	৪
২। দিনের অন্য সময় শক্ত হয়ে যায়	০	১	২	৩	৪

iii) শারীরিক কাজঃ

১। সিঁড়ি দিয়ে নামতে	০	১	২	৩	৪
২। সিঁড়ি দিয়ে উঠতে	০	১	২	৩	৪
৩। বসা থেকে ওঠার সময়	০	১	২	৩	৪
৪। দাড়িয়ে থাকার সময়	০	১	২	৩	৪
৫। আসন দিয়ে বসার সময়	০	১	২	৩	৪
৬। সমতলে হাটার সময়	০	১	২	৩	৪
৭। যানবাহনে ওঠার সময়/ যানবাহন থেকে নামার সময়	০	১	২	৩	৪
৮। কেনাকাটা করার সময়	০	১	২	৩	৪
৯ । মোজা পরার সময়	০	১	২	৩	৪
১০। বিছানায় শুতে	০	১	২	৩	৪
১১। মোজা খোলার সময়	০	১	২	৩	৪
১২। শোয়া থেকে ওঠার সময়	০	১	২	৩	৪
১৩। গোসলে যাওয়ার সময়/বের হওয়ার সময়	০	১	২	৩	৪
১৪। বসে থাকা অবস্থায়	০	১	২	৩	৪
১৫। টয়লেটে যাওয়ার সময়	০	১	২	৩	৪
১৬। বাসার ভারী কাজ গুলো করতে	০	১	২	৩	৪
১৭। বাসার হালকা কাজ গুলো করতে	০	১	২	৩	৪

চিকিৎসার পরবর্তী রোগীর প্রাপ্ত নম্বর ____/৯৬

CONSENT FORM

Assalamu Alaikum

I am Shermin Naher Beauty student of 4th Professional(final year) B.Sc. in Physiotherapy, Bangladesh Health Professions Institute (BHPI), faculty of medicine under the University of Dhaka .For the partial fulfillment of my Bachelor degree,I have to conduct a research project and is a part of my study. My Research title is "**Effectiveness of Hamstring Strengthening and Stretching exercises along with Conventional Physiotherapy Treatment for Patients with Knee Osteoarthritis".**

Now I want to ask you some questions those are mentioned this form .The conversation time will be 20-30 minute.

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 your consent and discontinue from the study.You also have the right not to answer any other question that you don't like of this questionnaire.

If you have any query about the study, you may contact with me and my supervisor Md. Obaidul Haque, Associate Professor & Head of Physiotherapy Department BHPI, CRP, Savar, Dhaka-1343.

Do you have any question before start the session?

So, can I proceed with the interview?

Yes No

Signature of the participant and Date.....

Signature of the witness and Date.....

Signature of the researcher and Date.....

Questionnaire (English)

This questionnaire is developed to measure the pain and disability of the patient with knee osteoarthritis and this portion will be filled by physiotherapist/researcher using a pencil.

Please give a tick (√) mark on the left side of the box of correct answer

Part-I: Socio-demographic information

Patient name: Code no:

Contact no: Date:

Address: Village: Post office:

Police station: District:

Occupation:

Age: years

Sex: ☐ Male

☐ Female

Marital status: ☐ Married

☐ Unmarried

☐ Divorced

☐ Widow

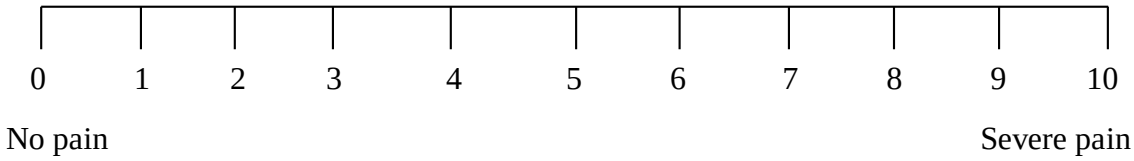
Residential area: ☐ Urban

☐ Rural

Pre-test Data

Part-II: Pain Intensity

1. How much you feel pain today?



Part-III: Physical disability questionnaire

Each question has 4 score. Total questions are 24. Total number is 96.

Pre - test score of the patient is _____ / 96.

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

0 = None

1 = Slight

2 = Moderate

3 = Very

4 = Extremely

Circle **one number** for each activity

Pain:

1. Walking	0	1	2	3	4
2. Stair climbing	0	1	2	3	4
3. Nocturnal	0	1	2	3	4
4. Rest	0	1	2	3	4
5. Weight bearing	0	1	2	3	4

Stiffness:

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

Physical Function:

1. Descending stairs	0	1	2	3	4
2. Ascending stairs	0	1	2	3	4
3. Rising from sitting	0	1	2	3	4
4. standing	0	1	2	3	4
5. Bending to floor	0	1	2	3	4
6. Walking on flat surface	0	1	2	3	4
7. Getting in/ out of car	0	1	2	3	4
8. Going shopping	0	1	2	3	4
9. Putting on socks	0	1	2	3	4
10. Lying in bed	0	1	2	3	4

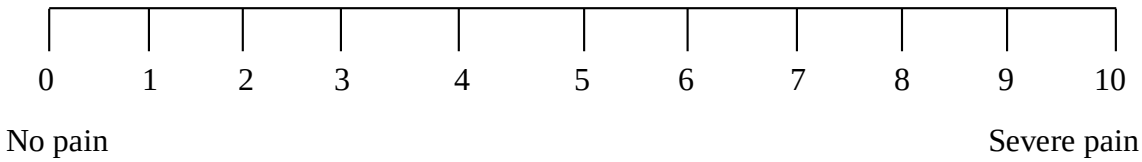
11. Taking off socks	0	1	2	3	4
12. Rising from bed	0	1	2	3	4
13. Getting in/ out of bath	0	1	2	3	4
14. Sitting	0	1	2	3	4
15.Getting on/ off toilet	0	1	2	3	4
16. Heavy domestic duties	0	1	2	3	4
17. Light domestic duties	0	1	2	3	4

Result of patient before taken treatment _____ /96

Post-test Data

Part-II: Pain Intensity

1. How much you feel pain today?



Part-III: Physical disability questionnaire

Each question has 4 score. Total questions are 24. Total number is 96.

Pre - test score of the patient is _____ / 96.

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

0 = None

1 = Slight

2 = Moderate

3 = Very

4 = Extremely

Circle **one number** for each activity

Pain:

1. Walking	0	1	2	3	4
2. Stair climbing	0	1	2	3	4
3. Nocturnal	0	1	2	3	4
4. Rest	0	1	2	3	4
5. Weight bearing	0	1	2	3	4

Stiffness:

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

Physical Function:

1. Descending stairs	0	1	2	3	4
2. Ascending stairs	0	1	2	3	4
3. Rising from sitting	0	1	2	3	4
4. standing	0	1	2	3	4
5. Bending to floor	0	1	2	3	4
6. Walking on flat surface	0	1	2	3	4
7. Getting in/ out of car	0	1	2	3	4
8. Going shopping	0	1	2	3	4
9. Putting on socks	0	1	2	3	4
10. Lying in bed	0	1	2	3	4
11. Taking off socks	0	1	2	3	4

12. Rising from bed	0	1	2	3	4
13. Getting in/ out of bath	0	1	2	3	4
14. Sitting	0	1	2	3	4
15.Getting on/ off toilet	0	1	2	3	4
16. Heavy domestic duties	0	1	2	3	4
17. Light domestic duties	0	1	2	3	4

Result of patient after taken treatment _____ /96

Permission letter

May 03, 2017

The Head of the Physiotherapy Department,

Centre for the rehabilitation of the paralysed (CRP)

CRP, Chapain, Savar, Dhaka-1343.

Through: Head of the department. BHPI

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

Dear Sir,

With due respect and humble submission to state that I am Shermin Naher Beauty, student of 4th Professional, B.Sc. in Physiotherapy at Bangladesh Health Professional Institute (BHPI). According to course curriculum, I have to conduct a research for the partial fulfillment of our degree. My research project entitled on **"Effectiveness of Hamstring Strengthening and Stretching exercises along with Conventional Physiotherapy Treatment for Patients with Knee Osteoarthritis".** Under the supervision of Md. Obaidul Haque, Associate Professor and Head of the Physiotherapy Department, BHPI, CRP, Savar. To conduct this research, I want to collect data from the patients of the musculoskeletal unit, Physiotherapy Department of the CRP-Savar. So, I need permission for data collection. I would like to assure that anything of my study will not be harmful for the participants.

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

Sincerely yours

Shermin Naher Beauty

Shermin Naher Beauty.
4th Professional B.Sc. in Physiotherapy
Class Roll-29, Session: 2012-2013
Bangladesh Health Professions Institute (BHPI)
(An Academic Institute of CRP)
CRP, Chapain, Savar, Dhaka-1343.

Recommended & Forwarded
03/05/17
Md. Obaidul Haque
Associate Professor & Head of the Department
Department of Physiotherapy
Bangladesh Health Professions Institute (BHPI)
CRP, Chapain, Savar, Dhaka-1343

Approved
Please contact with Shahidul Islam Sumon CPT and OPD incharge PT as a counterpart of the data collection process.
05/05/17

Mohammad Anwar Hossain
Associate Professor
Dept. of Physiotherapy
CRP, Chapain, Savar, Dhaka-1343

বাংলাদেশ হেল্‌থ প্রফেশন্স ইনষ্টিটিউট (বিএইচপিআই)
BANGLADESH HEALTH PROFESSIONS INSTITUTE (BHPI)
(The Academic Institute of CRP)

Ref: CRP-BHPI/IRB/04/17/122 *Date:* 15/04/2017

To
Shermin Naher Beauty,
B.Sc. in Physiotherapy
Session: 2012-2013, Student ID 112120030
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

Subject: "Effectiveness of Hamstring Strengthening and Stretching exercises along with Conventional Physiotherapy Treatment for patient with Knee Osteoarthritis."

Dear Shermin Naher Beauty,

The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application on 16/08/2016 to conduct the above mentioned thesis, with yourself, as the Principal investigator. The Following documents have been reviewed and approved:

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

Since the study involves a Western Ontario and McMaster Universities OA index (WOMAC) Questionnaire on will takes 20 to 30 minutes and have 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 August 17, 2016 at BHPI.

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

Best regards,

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

CRP-Chapain, Savar, Dhaka-1343. Tel: 02-7745464-5, 7741404 , Fax: 02-7745069,
Email: contact@crp-bangladesh.org, www.crp-bangladesh.org