EFFECTIVENESS OF ECCENTRIC QUADRICEPS STRENGTHENING EXERCISES ALONG WITH CONVENTIONAL PHYSIOTHERAPY FOR PATIENTS WITH KNEE OSTEOARTHRITIS

MAHMUDA RAHMAN

Roll No. : 918

Reg. No. 1722

Session: 2011-2012

BHPI, CRP, Savar, Dhaka-1343

Bangladesh Health Professions Institute (BHPI)

Department of Physiotherapy

CRP, Savar, Dhaka-1343

Bangladesh

August' 2016

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

EFFECTIVENESS OF ECCENTRIC QUADRICEPS STRENGTHENING EXERCISES ALONG WITH CONVENTIONAL PHYSIOTHERAPY FOR PATIENTS WITH KNEE OSTEOARTHRITIS

Submitted by **Mahmuda Rahman**, for partial fulfillment of the requirements for the degree of Bachelor of Science in Physiotherapy (B. Sc. PT).

…….....
Mohammad Habibur Rahman
Assistant Professor
Department of Physiotherapy
BHPI, CRP, Savar, Dhaka
Supervisor

…….....
Mohammad Anwar Hossain
Associate Professor & Head
Department of Physiotherapy
CRP, Savar, Dhaka

……
Ehsanur Rahman
Assistant Professor
Department of Physiotherapy
BHPI, CRP, Savar, Dhaka

.....
Md. Shofiqul Islam
Assistant Professor
Department of Physiotherapy
BHPI, CRP, Savar, Dhaka

…….
Md. Obaidul Haque
Associate Professor & Head
Department of Physiotherapy
BHPI, CRP, Savar, Dhaka

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)

Signature: **Date:**

Acknowledgement

First of all I would like to express my gratitude to the almighty Allah. When I started the study I didn't know whether I could complete it or not but I believe my fortune favors the brave. So, I was determined to try my best to make it successful and I am most grateful to almighty Allah.

After that I must go to my family who inspired me always and provide necessary support. I would like to pay my gratitude to my honorable supervisor Mohammad Habibur Rahman, Assistant Professor, Department of Physiotherapy, BHPI, CRP, Savar, Dhaka not only for his valuable suggestion and guidelines but also for his optimistic and courageous attitude that have inspired me throughout the project.

I would like to give special thanks to the Physiotherapists working in the Physiotherapy department CRP-Savar who helped me in all aspects of data collection. I also pay my thanks to the staffs of the BHPI library, which helps me to find out books for collecting information for the study.

I would also like to thank all of the participants of the study for their willingness to participate and co-operation.

I am expressing my special gratitude to Mohammad Habibur Rahman, Assistant Professor, Department of Physiotherapy,BHPI, CRP, Savar, Dhaka, Mohammad Anwar Hossain, Associate Professor & Head, Department of Physiotherapy, CRP, Savar, Dhaka, Ehsanur Rahman**,** Assistant Professor, Department of Physiotherapy, BHPI, CRP, Savar, Dhaka, Md. Shofiqul Islam, Assistant Professor, Department of Physiotherapy, BHPI, CRP, Savar, Dhaka, Md. Obaidul Haque, Associate Professor & Head, Department of Physiotherapy, BHPI, CRP, Savar, Dhaka, the board members of respectable institutional review board as well.

I would like to thank my all classmates, friends and those entire individual who are directly or indirectly involve with this study.

Content

Acronym

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

List of Tables

List of figures

Abstract

Purpose: The purpose find the effectiveness of eccentric quadriceps strengthening exercise along with conventional physiotherapy for patient with knee osteoarthritis.

Objectives: To find out the effectiveness of eccentric quadriceps strengthening exercise along with conventional physiotherapy for patient with knee osteoarthritis.

Methodology: An experimental study design was selected to carry out the research. The experimental study had conduct to find out the objectives.

Results: In this research, 20 participants were participated in this study. 10 in the Eccentric Quadriceps Strengthening exercise 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 eccentric quadriceps exercise is better treatment than the conventional physiotherapy alone for reducing pain and disability in osteoarthritis patient.

Key word: Osteoarthritis

CHAPTER I INTRODUCTION

1.1 Background

Osteoarthritis (OA) of the knee is a major cause of pain and movement related disability in the world. In January 2010, the Osteoarthritis Research Society International (OARSI) published an update to their evidence-based publication and it was their consensus recommendations for the treatment of OA of the hip and knee (McAlindon et al.2014).

Osteoarthritis (OA) is common condition now-a-days. OA used to be considered the sole result of any process leading to increased pressure on one exacting joint or fragility of cartilage matrix. The discovery that many soluble mediators led to the first steps of an inflammatory theory. However, it took a decade before synovitis was accepted as a critical feature of OA, and some studies are now opening the way to consider the condition a aggrevating of the OA process. Recent experimental data have shown that subchondral bone may have a substantial role in the OA process, as a mechanical effect, as well as a source of inflammatory mediators implicated in the OA pain process and in the degradation of the deep layer of cartilage. Thus, initially considered cartilage driven, OA is a much more complex disease with inflammatory mediators released by cartilage, bone and synovium. Low-grade inflammation induced by the metabolic syndrome, innate immunity and inflammation are some of the more recent arguments in favor of the inflammatory theory of OA and highlighted in this review (Berenbaum et al., 2013).

Wittenauer et al. (2013) mentioned that, Osteoarthritis is a major cause of disability in elderly populations around the world, especially in developed countries like the other non communicable dieases. The prevalence of OA is increasing and will continue to do so as the population increases, ages, and is subject to risk factors such as the obesity epidemic. As OA causes pain and impairs functionality of the patient, it places a major burden on individuals, communities, health systems, and social care systems. Osteoarthritis (OA), the most common musculoskeletal condition, is a long-term chronic disease involving the

thinning of cartilage in joints which results in bones rubbing together, creating stiffness, pain, and impaired movement, the functional limitations as well. OA is related with age, but is associated with a variety of both modifiable and non-modifiable risk factors, including obesity, lack of exercise, genetic predisposition, bone density, occupational injury, trauma, and gender.

Linn et al. (2012) stated that, women older than 50 years have a considerably higher prevalence of osteoarthritis than men of the same age group. Although several factors have been proposed, there is some evidence that sex hormones influence the development of osteoarthritis. This article will focus on the basic science and clinical evidence that describe the current state of knowledge regarding the relationship between sex related hormones and the development of osteoarthritis.

King et al. (2015) focused that, projected increases in the prevalence of both diabetes mellitus (DM) and osteoarthritis (OA) ensure their common co-existence. In an era of increasing attention to personalized medicine, understanding the influence of common comorbidities such as DM should result in improved care of patients with OA. In this narrative review, we summarize the literature addressing the interactions between DM and OA spanning the years from 1962 to 2014. In another separated studies depending on whether they investigated clinical populations, animal models, or cells and tissues. The clinical literature addressing the influence of DM on OA and its therapeutic outcomes suggests that DM may augment the development and severity of OA and that DM increases risks associated with joint replacement surgery. The few high quality studies using animal models also support an adverse effect of DM on OA. We review strengths and weaknesses of the common rodent models of DM. The heterogeneous literature derived from studies of articular cells and tissues also supports the existence of biochemical and biomechanical changes in articular tissues in DM, and begins to characterize molecular mechanisms activated in diabetic-like environs which may contribute to OA. Increasing evidence from the clinic and the laboratory supports an adverse effect of DM on the development, severity, and therapeutic outcomes for OA. To understand the mechanisms through which DM contributes to OA, further studies are clearly necessary. Future studies of DM-influenced mechanisms may shed light on general mechanisms of OA pathogenesis and result in more specific and effective therapies for all OA patients.

Madry et al. (2012) stated that, risk factors for developing early OA include, but are not limited to, a genetic tendency, mechanical factors such as axial mal-alignment, and aging. In early OA, the articular cartilage surface is progressively becoming discontinuous, showing fibrillation and vertical fissures that extend not deeper than into the mid-zone of the articular cartilage, reflective of OARSI grades. Early changes in the subchondral bone comprise a progressive increase in subchondral plate and subarticular spongiosa thickness. Early OA affects not only the articular cartilage and the subchondral bone but also other structures of the joint, such as the menisci, the synovial membrane, the joint capsule, ligaments, muscles and the infrapatellar fat pad. Genetic markers or marker combinations may become useful in the future to identify early OA and patients at risk.

Sanchez-Adams et al. (2014) stated that, articular cartilage injuries and degenerative joint diseases are responsible for progressive pain and disability in millions of people worldwide, yet there is currently no treatment available to restore full joint functionality. As the tissue functions under mechanical load, an understanding of the physiologic or pathologic effects of biomechanical factors on cartilage physiology is of particular interest. Here we highlight studies that have measured cartilage deformation at scales ranging from the macroscale to the microscale, as well as the responses of the resident cartilage cells, chondrocytes, to mechanical loading using *in vitro* and *in vivo* approaches. From these studies, it is clear that there exists a complex interplay between mechanical, inflammatory, and biochemical factors that can either support or inhibit cartilage matrix homeostasis under normal or pathologic conditions. Understanding these interactions is an important step toward developing tissue engineering approaches and therapeutic interventions for cartilage pathologies.

McColl. (2005) stated that it encompasses numerous treatment modes including exercise, manual techniques, knee taping, and education to impart patient self management strategies in case of OA. Most studies of physiotherapy for knee osteoarthritis have evaluated individual components, but this does not reflect typical clinical practice. While three randomized controlled trials have investigated a physiotherapy treatment package for knee osteoarthritis, only one used a placebo comparison group. Two trials reported a beneficial effect of physiotherapy, while one reported no effect. However, results are difficult to compare due to different osteoarthritis samples and treatments employed. Given the strong placebo effect

reported for pain outcomes in surgical and drug trials in this patient population, further controlled trials of physiotherapy are clearly needed.

Wittenauer et al. (2013) also stated, the current control strategy mainly consists of palliative pain treatment, as there are several medicines on the market that alleviate pain and improve function in OA patients. In severe cases, joint replacement surgery has been proven effective in relieving the painful and debilitating effects of the disease, though the high cost and use of advanced resources mean these procedures are not available in any countries around the world. There are currently no therapies available that can reverse or halt the progression of osteoarthritis; larger studies are needed to evaluate the clinical and cost effectiveness of the few therapies that have shown promise in animal trials. Another principal aspect of osteoarthritis care that requires further research is diagnostic techniques. The current methods of clinical diagnosis and X-rays are not precise enough to effectively measure status and progression of the condition, which presents serious difficulties in evaluating both the impact of risk factors and the effectiveness of potential therapies. The lack of valid biomarkers limits pharmaceutical development and clinical monitoring. The issues presented by the lack of both reliable diagnostics and medicines that can reverse the progression of osteoarthritis must be addressed through further research in order to effectively reduce the large health and economic burden of osteoarthritis.

1.2 Rational

Osteoarthritis is the most common form of arthritis, affecting millions of people worldwide which causes pain and functional disability and hampers in activity of daily living. Femorotibial knee osteoarthritis is associated with muscle weakness in the lower limbs, particularly in the quadriceps, which results in disease progression. The functional disability induced by knee osteoarthritis manifests itself principally when walking, notably downhill, during which the muscles are called upon to contract eccentrically. Many authors have advocated that Eccentric contraction of the muscle is more effective than concentric contraction due to lengthening contraction is benefit than shortening contraction and also the residual fatigue of the muscle takes place after 6 seconds in eccentric contraction but it takes place 5 seconds in concentric contraction. So, the force exerted during the eccentric contraction is more than in concentric contraction.

We can therefore think that eccentric muscular strengthening could bring a functional benefit that is superior to concentric muscular strengthening.

1.3 Hypothesis:

Eccentric quadriceps strengthening exercise along with conventional physiotherapy is more effective than conventional physiotherapy to reduce pain and disability.

1.4 Null Hypothesis:

Eccentric quadriceps strengthening exercise with conventional physiotherapy is no more effective than conventional physiotherapy to reduce pain and disability.

1.5 Aim

The aim of the study is to explore the effectiveness of eccentric quadriceps strengthening exercise along with conventional physiotherapy for patient with knee osteoarthritis.

1.6 Objectives

1.6.1 General objective:

To signify the effectiveness of eccentric quadriceps strengthening exercise along with conventional physiotherapy for patient with knee osteoarthritis.

1.6.2 Specific objectives:

1. To find out the socio-demographic factors affect the level of pain within and between groups.
2. To find out the socio-demographic factors affect the level of disability within and between groups.
3. To discover the effectiveness of eccentric quadriceps strengthening exercise along with conventional physiotherapy on pain and disability within and between groups.

1.7 Operational Definitions

1.7.1 Eccentric Quadriceps Strengthening Exercises

The quadriceps is a group of muscles located in the front of the thigh. The Latin translation of quadriceps is four headed as the group contains four separate muscles; an exercise in which there is overall lengthening of the muscle in response to an external resistance.

1.7.2 Conventional Physiotherapy

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

1.7.3 Osteoarthritis

Osteoarthritis is a degenerative joint disease, which mainly affects the articular cartilage. It is associated with ageing 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.

1.8 Variables

1.8.1 Independent variable

1. Eccentric quadriceps strengthening exercise along with conventional physiotherapy.
2. Conventional physiotherapy.

1.8.2 Dependent variable

1. Pain
2. Disability

CHPTER II LITERATURE REVIEW

Busija et al. (2010) suggested that, Osteoarthritis (OA), the most common rheumatic disease, primarily affects the articular cartilage and the sub-chondral bone of a synovial joint, eventually resulting in joint failure. The most typical radiographic features include formation of osteophytes at the joint margins, joint space narrowing, sub-chondral sclerosis, sub-chondral cyst formation and chondrocalcinosis. It has been estimated that about 40% to 80% of people with radiographic changes will have symptomatic disease. Symptomatic knee OA is highly prevalent among older people worldwide (10% to 30%), especially in rural regions, where occupational physical demands are high.

Osteoarthritis (OA) is a type of joint disease that results from breakdown of joint cartilage and underlying bone (Cyrus et al., 2014).

The principal changes in knee OA are joint space narrowing due to degeneration and disappearance of articular cartilage, sharpening of articular margins and intra-articular structures (e.g. tibialtubercules), bony sclerosis, osteophytes and marginal lapping and bony cysts (Brandt., 2001).

Glyn-Jones et al. (2015) suggests that, osteoarthritis is a major source of pain, disability, and socioeconomic cost worldwide. The epidemiology of the disorder is complex and multifactorial, with genetic, biological, and biomechanical components. Aetiological factors are also joint specific. Joint replacement is an effective treatment for symptomatic end-stage disease, although functional outcomes can be poor and the lifespan of prostheses is limited. Consequently, the focus is shifting to disease prevention and the treatment of early osteoarthritis. This task is challenging since conventional imaging techniques can detect only quite advanced disease and the relation between pain and structural degeneration is not close. Nevertheless, advances in both imaging and biochemical markers offer potential for diagnosis and as outcome measures for new treatments. Joint-preserving interventions under development include lifestyle modification and pharmaceutical and surgical modalities. Some show potential, but at present few have proven ability to arrest or delay disease progression.

Berenbaum., (2013) said that, Osteoarthritis (OA) has long been considered a *wear and tear* disease leading to loss of cartilage. OA used to be considered the sole consequence of any process leading to increased pressure on one particular joint or fragility of cartilage matrix. Progress in molecular biology in the 1990s has profoundly modified this paradigm. The discovery that many soluble mediators such as cytokines or prostaglandins can increase the production of matrix metalloproteinase by chondrocytes led to the first steps of an inflammatory theory. However, it took a decade before synovitis was accepted as a critical feature of OA, and some studies are now opening the way to consider the condition a driver of the OA process. Recent experimental data have shown that subchondral bone may have a substantial role in the OA process, as a mechanical damper, as well as a source of inflammatory mediators implicated in the OA pain process and in the degradation of the deep layer of cartilage. Thus, initially considered cartilage driven, OA is a much more complex disease with inflammatory mediators released by cartilage, bone and synovium. Low-grade inflammation induced by the metabolic syndrome, innate immunity and inflammation are some of the more recent arguments in favor of the inflammatory theory of OA and highlighted in review.

Michael P., (2010) suggests that Osteoarthritis is not a curable disease at present, as the mechanism by which it arises and progresses remains incompletely understood. Therefore, the goal of treatment is to alleviate the signs and symptoms of the disease and, if possible, to slow its progression. The therapeutic spectrum ranges from general measures to physiotherapy, orthopedic aids and orthoses, pharmacotherapy, and finally surgery and rehabilitation. As Mohig et al. stated, “The best treatment for knee osteoarthritis is prevention” Surgery is indicated when the patient’s symptoms accord with the physical and radiological findings and all conservative treatments have been exhausted.

Yousif. (2012) suggests that the most conspicuous risk factor and of great interest because it is potentially modifiable. Although some studies have related higher concentrations of C-reactive protein to both greater prevalence and incidence of knee OA, not all studies have reported this .The patterns of association between metabolic factors and OA have led some to declare that the primary contribution of obesity to OA may be joint specific and dependent upon the degree to which obesity contributes

to the mechanical loading of articular cartilage at a specific site For example, varus knee alignment is thought to place mechanical loads, including those loads generated by excess body mass, mostly on the medial tibiofemoral compartment. The impact of excess body mass at this site could generate both mechanical and metabolic contributions, whereas the impact of excess body mass on hand.

People with symptomatic OA of the knee describe deep, aching pain. In early disease, pain is intermittent and most often is associated with joint use. For many people, symptomatic disease progresses, and the pain becomes more chronic and may occur at rest and during the night. The joint feels 'stiff,' resulting in typical pain and difficulty when movement is initiated after a period of rest. Individuals with advanced disease may experience crepitus or deep 'creaking' sounds on movement and often limited range of joint motion. People with progressive symptomatic knee OA experience increasing difficulty with daily functional activities. 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 (Davis., 2011).

Ultimately, chronic OA involving lower limb joints leads to reduced physical fitness with result an increased risk of cardio metabolic co-morbidity early mortality (Hochberg.,2008).

The most common form of arthritisis a progressive joint disorder characterized by gradual loss of cartilage is Osteoarthritis (OA). OA of the knee troubles 28 percent of adults over age 45 and 37 percent of adults over age 65 in the United States (Lawrence et al., 2008).

Osteoarthritis (OA) is a degenerative joint disease involving the cartilage and many of its surrounding tissues. Disease progression is usually slow but can ultimately lead to joint failure with pain and disability. OA of the hips and knees tends to cause the greatest burden to the population as pain and stiffness in these large weight bearing joints often leads to significant disability requiring surgical intervention. Osteoarthritis (OA) is the most common joint disorder in the United States. Symptomatic knee OA occurs in 10% men and 13% in women aged 60 years or older. The number of people affected with symptomatic OA is likely to increase due to the aging of the population and the obesity epidemic. OA has a multi-factorial etiology and can be considered the

product of interplay between systemic and local factors. Old age, female gender, overweight and obesity, knee injury, repetitive use of joints, bone density, muscle weakness, and joint laxity all play roles in the development of joint osteoarthritis, particularly in the weight-bearing joints. Modifying these factors may reduce the risk of osteoarthritis and prevent subsequent pain and disability (Yuqing., 2010).

Knee osteoarthritis is associated with muscle weakness in the lower limbs, particularly in the quadriceps, which results in disease progression. The interest of having muscular strengthening as part of the therapeutic arsenal for the medical treatment of knee osteoarthritis is now well established. The eccentric contraction of the quadriceps muscles seems to play a fundamental role in walking and other activities of everyday life, allowing control of the bending of the knee (cushioning) and an active joint stability. The protocols for isokinetic muscular strengthening, in combined concentric-eccentric mode, have shown better results than the concentric mode alone in terms of functional improvement in knee osteoarthritis (Anne et al., 2014).

Treatment includes exercise, efforts to decrease joint stress, support groups, and pain medications. Efforts to decrease joint stress include resting and the use of a cane. Weight loss may help in those who are overweight. Pain medications may include paracetamol (acetaminophen) as well as NSAIDs such as naproxen or ibuprofen. Long-term opioid use is generally discouraged due to lack of information on benefits as well as risks of addiction and other side effects. If pain interferes with normal life despite other treatments, joint replacement surgery may help. An artificial joint typically lasts 10 to 15 years. OA is the most common form of arthritis with disease of the knee and hip affecting about 3.8% of people as of 2010. Among those over 60 years old about 10% of males and 18% of females are affected. It is the cause of about 2% of years lived with disability. In Australia about 1.9 million people are affected, and in the United States over 30 million people are affected. It becomes more common in both sexes as people become older (NIAMS, 2016).

Thomas. (2013) suggests that, benefits of manual therapy include improved joint mobility and ROM, reduced soft-tissue contracture and fibrosis, decreased pain, and improved function. Although some might propose that knee OA symptom relief may occur with rest or knee joint unloading, research by Mangione and Axen has shown that unweighting of the knee through deweighted treadmill training has not relieved

pain in patients with knee OA. Deyle and colleagues have reported 20% to 40% pain relief from patients in clinical treatments of manual therapy and exercise. This rapid reduction in symptoms implies the structures responsible for at least a portion of patients' pain are not uncontrollable aspects of OA pathology; therefore peri-articular connective or muscular tissue could potentially generate symptoms. Repeated tension challenges to these tissues with manual therapy techniques such as end-range passive stretching and active ROM provide a strong stimulus for pain relief.

Joseph. (2015), Physical therapy can help to reduce the pain, swelling, and stiffness of knee osteoarthritis, and it can help improve knee joint function. It can also make it easier for walk, bend, kneel, squat, and sit. In fact, a 2000 study found that a combination of manual physical therapy and supervised exercise has functional benefits for patients with knee osteoarthritis and may delay or prevent the need for surgery.

Eccentric quadriceps strengthening exercise is effective in other conditions of the patients who are having knee problems. The best evidence to date demonstrates that eccentric exercise is likely a useful treatment for tendinosis; however, evidence is currently insufficient to suggest it is superior or inferior to other forms of therapeutic exercise. Eccentric exercise maybe more effective in treating tendinosis than splinting or some physical agents, yet eccentric exercise was no more effective than any treatment during a competitive sports season (Wasielewski., 2007).

The other relevant studies are also showing the changes where From the results above, it has found that, there is significant improvement in group (eccentric) when significant difference between pre and post measures of compared to another group (concentric) regarding pain, ROM pain, ROM, WOMAC index in the first group, as there and WOMAC scores. It was an increase in the power of the quadriceps muscles (Hafez et al.2012).

Hinman. (2011) suggests that, Physiotherapy, which encompasses a number of modalities, is a non-invasive treatment option in the management of OA. This review summarizes the evidence for commonly used physiotherapy interventions. There is strong evidence to show short-term beneficial effects of exercise on pain and function, although the type of exercise does not seem to influence treatment outcome. Delivery modes, including individual, group or home exercise are all effective, although

therapist contact may improve benefits. Attention to improving adherence to exercise is needed to maximize outcomes in the longer-term. Knee taping applied with the aim of realigning the patella and unloading soft tissues can reduce pain. There is also evidence to support the use of knee braces in people with knee OA. Biomechanical studies show that lateral wedge shoe insoles reduce knee load but clinical trials do not support symptomatic benefits. Recent studies suggest individual shoe characteristics also affect knee load and there is current interest in the effect of modified shoe designs. Manual therapy, while not to be used as a stand-alone treatment, may be beneficial. In summary, although the research is not equivocal, there is sufficient evidence to indicate that physiotherapy interventions can reduce pain and improve function in those with knee OA.

Joshua et al. (2016) showed that, prescription of resistance training (RT) exercises is an essential aspect of management for knee osteoarthritis (OA). However, whether patients with knee OA who are randomly assigned to receive RT simply substitute RT for other modes of physical activity remains unclear.

Deyle et al. (2016) had shown that, in 2006, 28% of the patients seen by a physical therapist came by direct access. Patients with non–further-specified back problems, patients with nonspecific neck complaints, and higher-educated patients were more likely to refer themselves to a physical therapist, as were patients with health problems lasting for less than 1 month. Younger patients made more use of direct access. In addition, patients with recurring complaints more often referred themselves, as did patients who had received earlier treatment by a physical therapist. Patients with direct access received fewer treatment sessions. Compared with 2005, there was no increase in the number of patients visiting a physical therapist.

Katz et al. (2014) has showed that it has also found that the arthroscopic debridement for OA was no better than a sham procedure in relieving knee pain or improving functional status, and that patients who underwent arthroscopic partial meniscectomy for a degenerative meniscal tear generally did not show more improvement than those who underwent sham meniscal resection or an intensive course of physical therapy.

Potts et al. (2013) has had a study where it is found that approximately half of the patient population surveyed had received physiotherapy treatment for their hip or knee OA. The majority of participants with OA of the hip or knee (80%) stated

physiotherapy was an important part of their management and that the benefits of physiotherapy continued after the conclusion of treatment. Some reported that these benefits depended on their continued performance of prescribed exercises. These findings support the another research works, demonstrated that these particular physiotherapy interventions are effective for the purpose of reducing pain and increasing function in OA patients. The results are also consistent with similar surveys of patient preferences whereby medications and physiotherapy were the most requested interventions by patients with OA of knee when consulting their general practitioners. Recent findings consistent with respect to the use of exercise and mobilization in particular. Furthermore, recommendations made in the Osteoarthritis Research Society International (OARSI) guidelines support referral to physiotherapy, along with patient education and self-management, aerobic and muscle strengthening exercises, thermal modalities, and acupuncture.

Dewey et al. (2008), has had a study where it is found that interventions that include physiotherapy functional exercises after discharge from hospital result in a short-term benefit after primary Totlal Knee Arthoplasty. The effect sizes were small to moderate, with no long-term benefit.

CHAPTER III METHODOLOGY

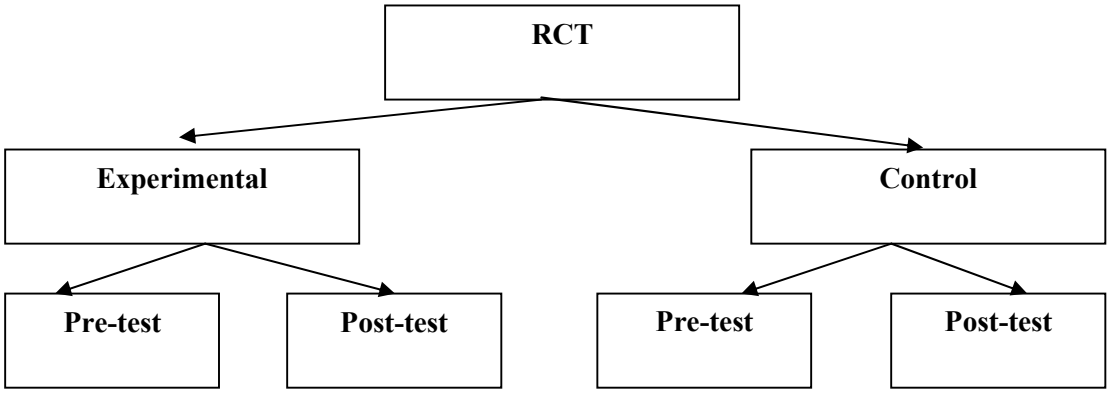
This research was a randomized controlled trail (RCT) design to evaluate the effectiveness of eccentric quadriceps strengthening exercise along with conventional physiotherapy for patients with knee osteoarthritis.

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.

Riddle et al. (2012) said in a same type of study that, key outcome variables were Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) physical function and pain change scores.

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

3.1 Study Design



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

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 Eccentric Quadriceps Strengthening exercise 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 (Yousif., 2012).
3. Age includes 35-70 years (Lester G, OAI Protocol).
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.
6. Age less than 35 and more than 70 (Felson., 2006).

3.8 Data Collection Procedure

The data collection procedure was carried away by an examiner who has no connection with this research. This procedure conducted through assessing the patient on the basis of inclusion and exclusion criteria, randomization through using Microsoft Office 2013 plus Excel, pretest data collection, 12 treatment sessions and final post test data collection.

After screening the patient at department and randomization, the patients were assessed and treated by the qualified physiotherapist. Twenty participants were chosen based on the inclusion criteria and they were given 12 session of treatments individually. The randomization procedure was carried out by the data collector using Microsoft Office 2013 plus Excel and grouping procedure also carried out by using the same manner. Code 1C (10) for the control group and Code 2E (10) for the experimental or trial group. Experimental group received conventional physiotherapy along with eccentric quadriceps strengthening exercise and the control group participants only received conventional physiotherapy according to their condition.
A pilot study was carried out prior to the main data collection procedure to determine the responsiveness and side effect of the exercise as it is applied to the osteoarthritis patients.

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. The researcher gave vague instruction to the data collector how to proceed with the questionnaire and the scales used in that. 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 data collector collected the data both in experimental and control group in presence of the qualified physiotherapist in order to reduce the biasness. The patient was totally blind about the procedure and the researcher has no connection

with the data collection procedure. The data collector only gave her the participants filled up questionnaires. At the end of the trail, specific test were 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 McCaffery 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 and Wilcoxon 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 Mann-Whitney U and Wilcoxon tests were used for the analysis after 6 session of treatment.

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.

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. This test can only be used with ordinal or interval/ ratio data.

Wilcoxon matched pair signed rank test was performed for the analysis of the pain and disability within group data.

When there are two measures to be compared from the same case and the data are not normally distributed, then *Wilcoxon test* is applied.

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 eccentric quadriceps exercise and only conventional physiotherapy group.

3.13 Ethical Consideration

A power point presentation was done for the approval of the research proposal in front of the teachers of BHPI, CRP and Institutional Review Board (IRB). After that presentation, a supervisor was selected to conduct this research under his close supervision and guideline. Again before beginning the data collection, researcher has obtained the permission from the concerned authorities ensuring the safety of participants. BMRC and WHO guideline had followed for this study. 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 Significant level

In order to find out the significance of the study, the researcher calculated the 'p' value. The p values refer the probability of the results for experimental study. The word probability refers to the accuracy of the findings. A p value is called level of significance for an experiment and a p value of <0.05 was accepted as significant result for health service research. If the p value is equal or smaller than the significant levels, the results are said to be significant.

Calculating the degree of freedom for the Mann–Whitney U test from the formula:

Degrees of freedom (*df*) = $(n_1-1) + (n_2-1) = (10-1) + (10-1) = 18$

df	.1	.05	.025	.01	.005	.0005
18	25.99	28.87	31.53	34.81	37.16	44.435

Table-1: Level of significance for one tailed hypothesis

3.15 Treatment Protocol

3.15.1 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

Table- 2. Control Group Treatment Protocol

3.15.2 Experimental Group Treatment Protocol

The first group was submitted to eccentric contraction exercises in form of active strengthening exercises with minimum resistance (10 repetitions with 3 sets) [23], starting from standing and asked the patient to sitting on chair slowly (90°), 6 seconds rest between each repetition and 1 minute rest between the sets. The resistance is progressed according to repetitions for the quadriceps muscles, with stretching hamstrings exercise (5 repetitions, 30 seconds in position of stretching, 30 seconds in position of relaxation) with postural instructions (avoid flexion more than 90°).

CHAPTER IV RESULT

In this research, 20 participants were participated in this study. 10 in the Eccentric Quadriceps Strengthening exercise 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 3: Mean age of the participants

Experimental Group		Control Group	
Subjects	**Age (Years)**	**Subjects**	**Age (Years)**
E1	52	C1	45
E2	38	C2	50
E3	62	C3	65
E4	48	C4	70
E5	50	C5	58
E6	58	C6	65
E7	47	C7	46
E8	51	C8	60
E9	59	C9	65
E10	45	C10	50
Mean Age 51±7.196 years		**Mean Age 57.40±9.021 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 51±7.196 and control group were 57.40±9.021.

4.1.2 Sex Ratio

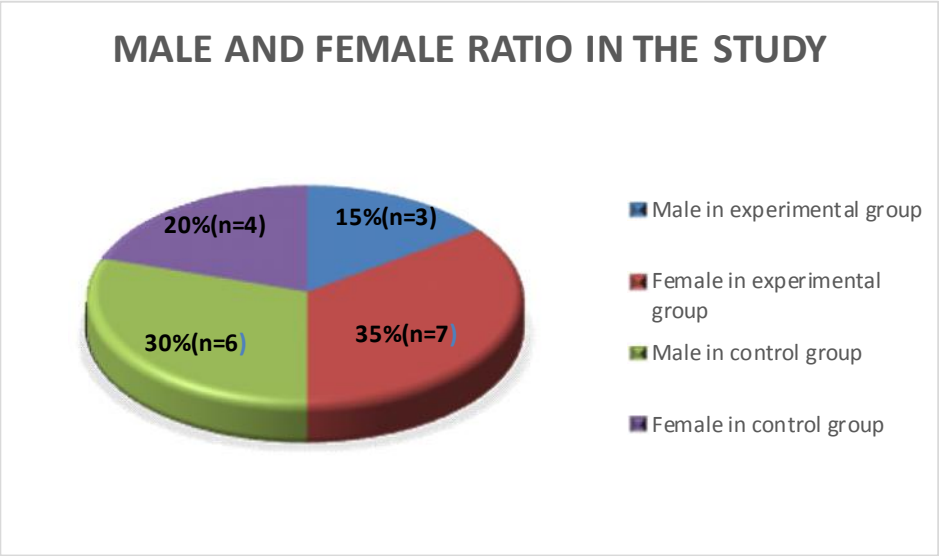


Figure 1: Sex ratio of the participants

20 participants with osteoarthritis were participated in this study where 7 participants were male and 13 participants were female. Among them, in experimental group 3 participants were male and 7 participants were female. On the other hand 4 participants were male and 6 participants were female in control group.

4.1.3 Occupation

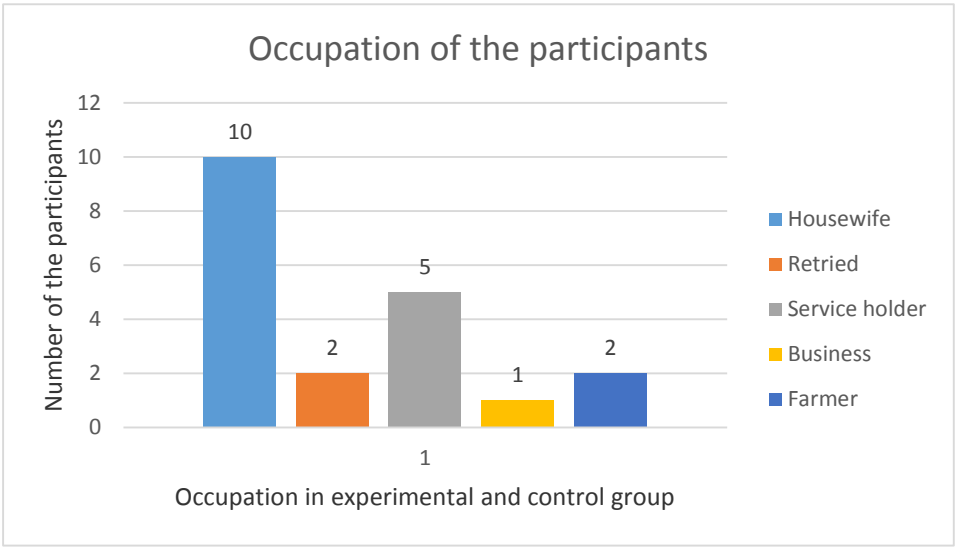


Figure 2: Occupation of the participants

Among the 20 participants, there were 5 kinds of occupation. Most of them are house wife (50%, n=10) and rest of them are retried, service holder, farmer and buainessman.

4.1.4 Marital status

Table 4: Marital status of the participants

Marital status	Experimental group	Control group	Total Number of the participants
Married	10	8	18
Unmarried	0	2	2

The table shows that, among the 20 participants most were married (90%, n= 18) and few of them were unmarried (10%, n= 2). Among them 10 participants in experimental group and 8 participants in control group were married and 2 participants in control group were unmarried. No participant in experimental group was unmarried.

4.1.5 Duration of pain

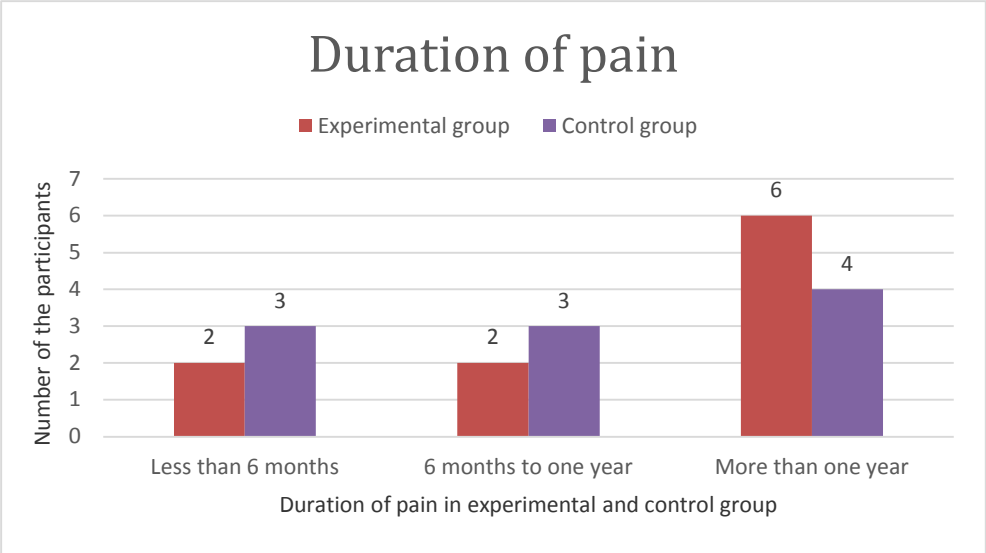


Figure 3: Duration of pain of the participants

It shows that, among the 20 participants the majority are suffering for the problem for more than one year (50%, n= 10), while 25% are suffering for less than 6 months (5 in experimental group and 5 in control group) and rest of the 25% are suffering for 6 months to 1 year (5 in experimental group and 5 in control group).

4.1.6 Side Involvement

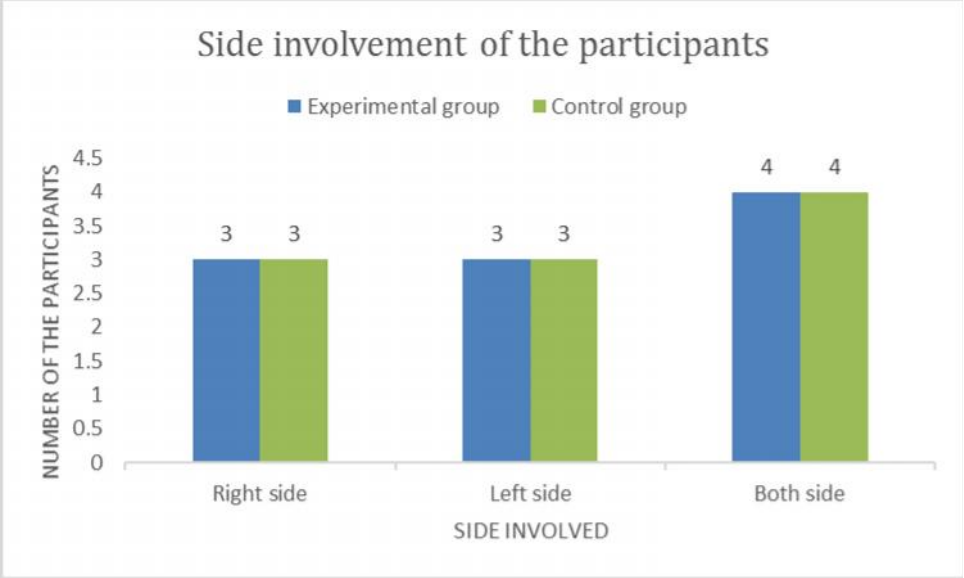


Figure 4: Side involvement of the participants

Among the 20 participants, the majority are suffering from both knee OA (40%, n= 8) where 4 participants were in experimental group and 4 participants were in control group, while 30% (n=6) are suffering from right sided OA where 3 participants were in experimental group and 3 participants were in control group. Rest of the 30% (n=6) are suffering from left sided OA where 3 participants were in experimental group and 3 participants were in control group.

4.1.7 Height-Weight (BMI)

Table 5: BMI of the participants

Classification (BMI)	Number of the participants
Malnutrition (<18)	0
Underweight (18-20)	0
Within limit/ Normal (20-25)	5
Obesity (25-30)	11
Over-weight (>30)	4

Among the 20 participants, maximum participants (55%, n=11) were obese, while 25% (n=5) participants were within normal limit and rest of 20% (n=4) participants were over-weight.

4.2 Pain and Disability Related Information

4.2.1 Comparison of Pain

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

Table-6: 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+1.174	13.25	22.500	0.001
	Experimental	10	4.40+2.221	7.75		
	Total	20				

From this 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 = .001).

An examination of the findings in Table shows that the results of the Mann Whitney U test applied to the posttest pain score of the participants in the experimental and control groups revealed a statistically significant difference at the level of (p=.001. The rank average of the posttest pain scores of the experimental group participants was 7.75, while participants in the control group had a posttest pain score rank

average of 13.25. The analyses had shown rank averages of the posttest trail and control group pain scores demonstrates that the participants in the experimental group had reduced pain sensation score on the Numerical Pain Rating Scale (NPRS) than those in the control group. This result indicates that the experimental group participants who have received Eccentric Quadriceps Strengthening Exercise along with conventional physiotherapy attained higher success at the pain reduction score when compared to the participants of the control group who have received only conventional physiotherapy.

Statistical difference of pain in experimental group

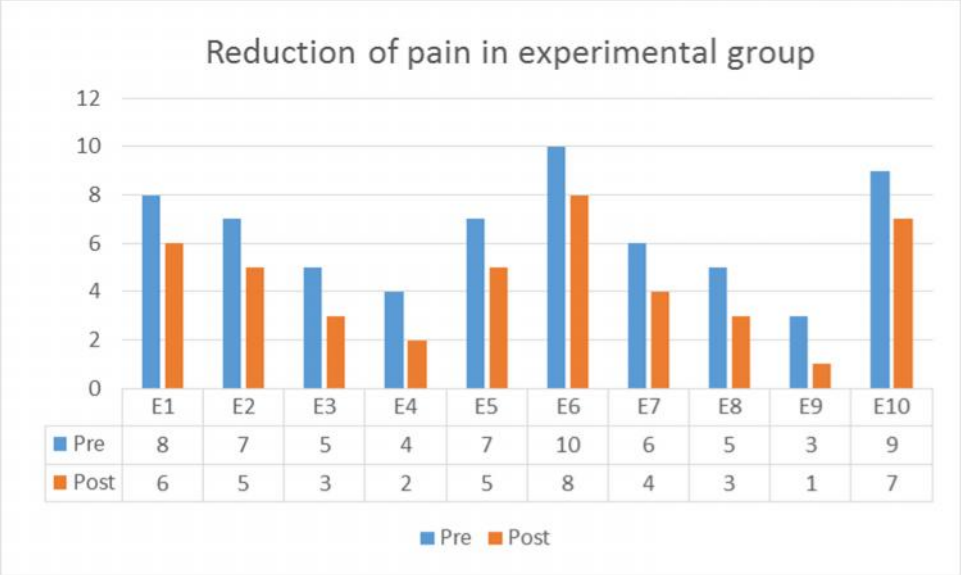


Figure-5: Reduction of pain in experimental group

Statistical difference of pain in control group

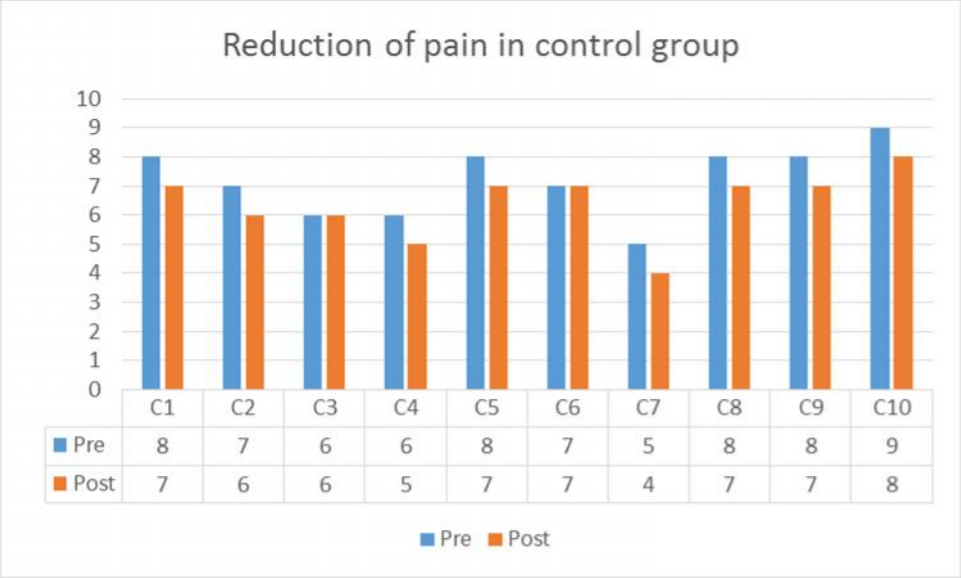


Figure-6: Reduction of pain in control group

Patient rated general pain within the experimental group.

Table-7: Rank and test statistics of patient rated general pain in the experimental group

Pain at resting position (cm) post-test - Pain at resting position (cm) post-test	N	Mean Rank	Sum of Ranks	Test Statistics (Wilcoxon Signed-Rank Test)	
				Based on positive ranks Z	P
Positive rank	0	0.00	0.00		
Negative rank	10	5.50	55.00	-2.972	0.003
Ties	0				
Total	10				

Table described the comparison of the participants before (pretest) and after (post-test) pain score. The table's legend displayed that in the control group none of the

participant's experienced increased pain after Eccentric Quadriceps Strengthening Exercise along with conventional physiotherapy given to them.10 participants of experimental group had higher score before the intervention and the pain score reduced after the application of the Eccentric Quadriceps Strengthening Exercise along with conventional physiotherapy. In addition, no participant has experienced increase of pain after the treatment session in experimental group so the positive rank numbers zero. The point 'ties' indicate that no patient's pain score remained same as the pretest score. P value is <0.01 which that there is less than a 1% chance that the results are due to random error and it is significant. Therefore it is can be said that, the hypothesis is accepted and the null hypothesis is rejected.

Patient rated general pain within the control group

Table- 8. Patient rated general pain within the control group

Pain at resting position (cm) post-test - Pain at resting position (cm) post-test	**N**	**Mean Rank**	**Sum of Ranks**	**Test Statistics (Wilcoxon Signed-Rank Test)**	
				Based on positive ranks Z	**P**
Positive rank	**0**	**0.00**	**0.00**		
Negative rank	**6**	**3.50**	**21.00**	**-2.449**	**0.014**
Ties	**4**				
Total	**10**				

Table described the comparison of the participants before (pretest) and after (post-test) pain score. The table's legend displayed that in the control group none of the participant's experienced increased pain after only physiotherapeutic intervention (conventional physiotherapy) is given to them. 6 participants of control group had higher score before the intervention and the pain score reduced after the application of the conventional physiotherapy. In addition, no participant has experienced increase of pain after the treatment session in control group so the positive rank numbers zero. The point 'ties' indicate that 4 patient's pain score remained same as the pretest score. P value is <0.01 which that there is less than a 1% chance that the results are due to

random error and it is significant. Therefore it is can be said that, the hypothesis is accepted and the null hypothesis is rejected.

4.2.2 Comparison of Disability

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

Table-9: 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+7.550	15.25	2.500	0.000
	Experimental	10	21.90+8.034	5.75		
	Total	20				

The above mentioned tabulated data, it can be concluded that disability reduction score on the Numerical Pain Rating Scale (NPRS) in experimental group was statistically significantly higher than the control group ($U = 2.500$, $p = 0.000$).

An examination of the findings in Table shows that the results of the Mann Whitney U test applied to the post-test disability score in WOMAC of the participants in the experimental and control groups revealed a statistically significant difference at the level of p=0.000. The rank average of the posttest disability scores of the experimental group participants was 5.75, while participants in the control group had a posttest pain score rank average of 15.25. The analyses had shown rank averages of the posttest experimental and control group disability scores in WOMAC demonstrates that the participants in the experimental group had reduced disability level score on WOMAC than those in the control group. This result indicates that the experimental group participants who have received Eccentric Quadriceps Strengthening Exercise along with conventional physiotherapy attained higher success at the disability reduction score when compared to the participants of the control group who have received only conventional physiotherapy.

Statistical difference of disability in experimental group

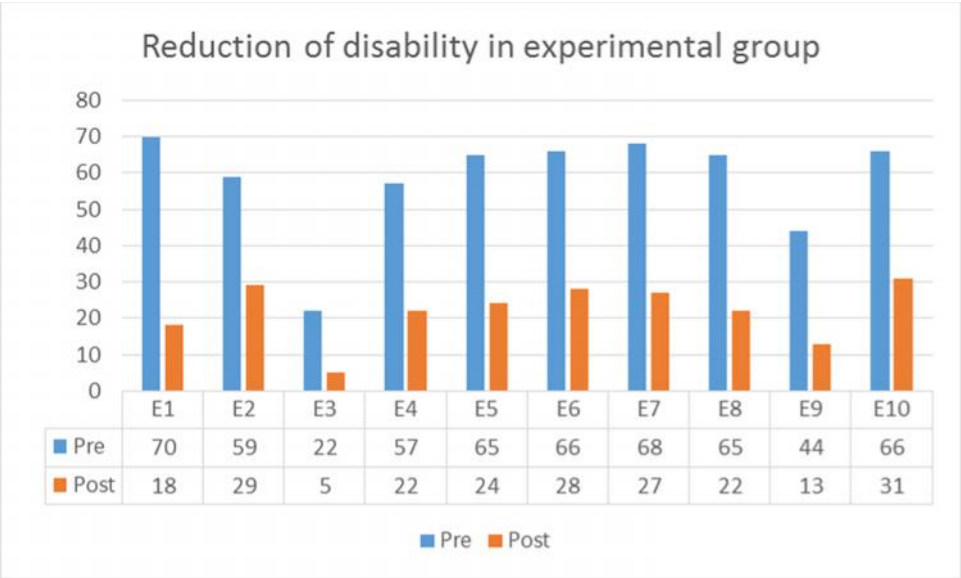


Figure-7: Reduction of disability in experimental group

Statistical difference of disability in control group

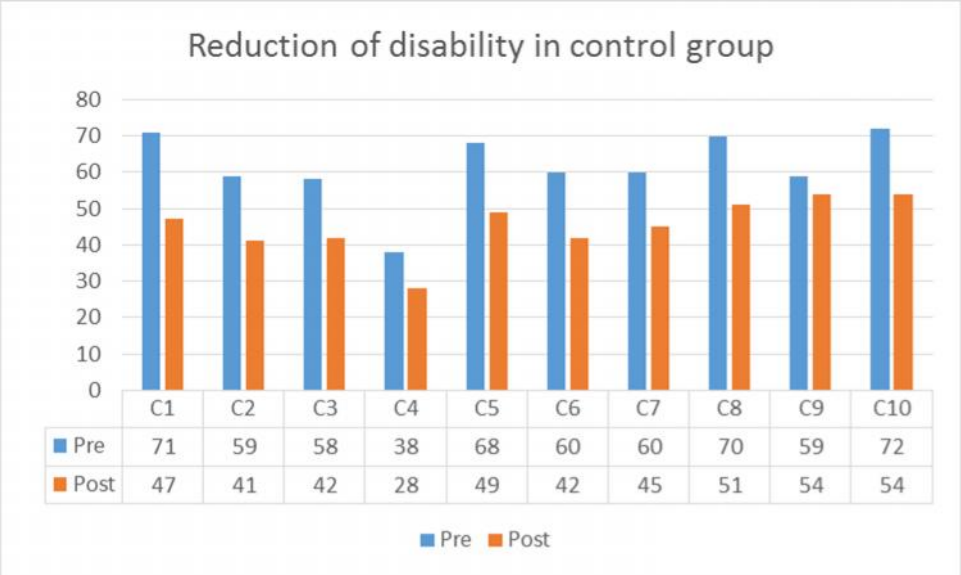


Figure-8: Reduction of disability in control group

Table 11: Rank and test statistics of patient rated general disability in WOMAC within the experimental group

Patient rated general disability in WOMAC within the experimental group.

Disability score in WOMAC at post-test - Disability score in WOMAC at pre test	N	Mean Rank	Sum of Ranks	Test Statistics (Wilcoxon Signed-Rank Test)	
				Based on positive ranks Z	P
Positive rank	0	0.00	0.00		
Negative rank	10	5.50	55.00	-2.807	0.005
Ties	0				
Total	10				

Table described the comparison of the participants before (pretest) and after (post-test) disability score in WOMAC. The table's legend displayed that in the control group none of the participant's experienced increased disability level or score after the Eccentric Quadriceps Strengthening Exercise along with conventional physiotherapy given to them. 10 participants of experimental group had higher score in WOMAC before the intervention and the disability score reduced after the application of the Eccentric Quadriceps Strengthening Exercise along with conventional physiotherapy. In addition, no participant has experienced increase of disability level after the treatment session in trial group so the positive rank numbers zero. The point 'ties' indicate that no patient's disability score in WOMAC remained same as the pretest score. P value is <0.01 which that there is less than a 1% chance that the results are due to random error and it is significant. Therefore it is can be said that, the hypothesis is accepted and the null hypothesis is rejected.

Table 12: Rank and test statistics of patient rated general disability in WOMAC within the control group.

Patient rated general disability in WOMAC within the control group.

Disability score in WOMAC at post-test - Disability score in WOMAC at pre test	N	Mean Rank	Sum of Ranks	Test Statistics (Wilcoxon Signed-Rank Test)	
				Based on positive ranks Z	P
Positive rank	0	0.00	0.00		
Negative rank	10	5.50	55.00	-2.812	0.005
Ties	0				
Total	10				

Table described the comparison of the participants before (pretest) and after (post-test) disability score in WOMAC. The table's legend displayed that in the control group none of the participant's experienced increased disability level or score after only physiotherapeutic intervention (conventional physiotherapy) given to them. 10 participants of control group had higher score in WOMAC before the intervention and the disability score reduced after the application of the only conventional physiotherapy. In addition, no participant has experienced increase of disability level after the treatment session in control group so the positive rank numbers zero. The point 'ties' indicate that no patient's disability score in WOMAC remained same as the pretest score. P value is <0.01 which that there is less than a 1% chance that the results are due to random error and it is significant. Therefore it is can be said that, the hypothesis is accepted and the null hypothesis is rejected.

CHAPTER V DISCUSSION

The objective of this study was to evaluate whether isometric quadriceps exercise has beneficial effect in patients with knee osteoarthritis. The results of this study demonstrated that isometric quadriceps exercise brought significant improvements in all the parameters after the 6 session training program.

The demographic details including age, weight, height, and body mass index (BMI) showed no significant difference between the two groups ($p>0.05$) which was also recorded in Anwer et al. (2014) randomized control trail.

The results of the study demonstrated that isometric quadriceps exercises brought significant gains in strength of the quadriceps muscle in the experimental group after the 6 session training program. In the between-group analysis, the improvement in strength 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 Eccentric quadriceps strengthening exercise 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 eccentric quadriceps strengthening exercise 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 , so was used by Jegu et al.(2014) and Anwer et al.(2014). 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 so was used by Jegu et al.(2014) and Anwer et al.(2014). In here, subjects sored in between 0-96 in the WOMAC score. The mean difference of the WOMAC score was 23.4. The functional level of the patient was increased and the disability caused by osteoarthriis was significantly reduced. The disability scored reduced in both groups but the experimental group shows promising result.

Our findings concur with those obtained in previous studies that have demonstrated the benefits of isometric exercise in strength training. Uganet Hernández Rosa et al. (2012) compared the effect of isokinetic versus isometric exercise in patients with osteoarthritis of the knee. They reported that both groups showed significant improvement in muscle strength at the end of the trial. However, the isokinetic exercise group showed slightly greater improvement compared with the isometric exercise group.

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 quadriceps strength and therefore increase stability of the knee joint.

Further study done by Boon Whatt LIM et al. (2008) concluded that quadriceps strengthening has beneficial effect on pain and function in patients with OA knee. The study done by Shreyasee Amin et al. (2009) reported that subjects having stronger quadriceps strength had less knee pain and better physical function as compared with those with the least strength. Strong muscles stabilize the joints in a proper alignment, attenuate shocks that are transmitted to the joints and minimize the effect of impact by spreading the forces out over a greater area so it may be hypothesized that improvement in muscle strength is one of the main causes of reduced pain and disability. In the present study, the reduction in pain and disability in the experimental group may be attributed to increased quadriceps muscle strength and thereby improved stability, which leads to reduction of pain and disability.

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.

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 35-70year, 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 was no available researches representing effectiveness of this intervention.

CHAPTER VI CONCLUSION AND RECOMMENDATION

^

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

Eccentric quadriceps exercise 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 eccentric quadriceps exercise with conventional physiotherapy as intervention for reducing the features of osteoarthritis. From this research the researcher wishes to explore the effectiveness of eccentric quadriceps exercise 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 eccentric quadriceps exercise 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.

Referencing

Berenbaum, F., (2013). Osteoarthritis as an inflammatory disease (osteoarthritis isnotosteoarthritis!.Osteoarthritis and Cartilage, 21:16-21.

Brandt, K.D., (2004). Non-surgical treatment of osteoarthritis: a half century of "advances".AnnalsRhumatic Diseases,63(2): 117–122.

Busija, L.,Bridgett, L.,Williams, S.R., Osborne, R.H., Buchbinder, R., March, L., Fransen, M., (2010). Osteoarthritis. Best Practice & Research Clinical Rheumatology, 24(6):757-68.

Carmen, S., Rodriguez, (2002).Pain measurement in the elderly: A review. Available:[Accessed on 25 May 2002].

Coggon, D., Reading, I., Croft, P., McLaren, M., Barrett, D., Cooper, C., (2001).Knee osteoarthritis and obesity. International Journal of Obesity and Related Metabolic Disorders, 25 (5): 622–7.

Cyrus, C.,Kassim, J., (2014). Epidemiology of Osteoarthritis. Available: https://books.google.ca/books?id=qT1FBgAAQBAJ&pg=PA21#v=onepage&q&f=false[access date]

Dąbrowski, M.,Szymańska-Garbacz, E., Miszczyszyn, Z., Dereziński, T., Czupryniak, L., (2016). Risk factors for cancer development in type 2 diabetes: A retrospective case-control study. BioMed Cancer,16:785.

Dannaway, J., New, C.C., New, C.H., Maher,C.G., (2016). Aquatic exercise for osteoarthritis of the knee or hip (PEDro synthesis). British Journal of Sports Medicine, page

DePoy, E., Gitlin, L.N., (2013). Introduction to research: Understanding and applying multiple strategies. USA: Elsevier Health Sciences.

Deyle, G,D., Allison, S.C., Matekel, R.L., Ryder, M.G., Stang, J.M., Gohdes, D.D., Hutton, J.P., Henderson, N.E., Garber, M.B.,(2005). Physical therapy treatment effectiveness for osteoarthritis of the knee: A randomized comparison of supervised

clinical exercise and manual therapy procedures versus a home exercise program. Physical Therapy, 85(12):1301-1317.

Duncan A Reid, Geoffrey Potts, Mark Burnett, Ben Konings, 2013, Physiotherapy management of knee and hip osteoarthritis: a survey of patient and medical practitioners' expectations, experiences and perceptions of effectiveness of treatmentNEW ZEALAND JOURNAL OF PHYSIOTHERAPY, Health and Rehabilitation Research Institute (HRRI) AUT University Auckland, New Zealand

Eapen, C., Nayak, C.,Zulfeequer, C.P.,(2011).Effect of Eccentric Isotonic Quadriceps Muscle Exercises on Patellofemoral Pain Syndrome: An Exploratory Pilot Study, Asian Journal of Sports Medicine,2(4) : 227–234.https://www.ncbi.nlm.nih.gov/pmc/issues/206037/

Figueiredo, EC., Figueiredo,GC.,Dantas, RT.,(2011). Influência de elementosmeteorológicosnador de pacientes com osteoartrite: Revisão da literatura" [Influence of meteorological elements on osteoarthritis pain: a review of the literature].RevistaBrasileiradeReumatology, 51 (6): 622–8.

Fransen, M., McConnell, S., Harmer, A.R., Van der E.M., Simic, M., Bennell, K.L., (2015). Exercise for osteoarthritis of the knee (Review). The Cochrane collaboration, 1: CD004376.

French, H.P., Brennan, A., White, B., Cusack, T., (2011).Manual therapy for osteoarthritis of the hip or knee — a systematic review. Manual Therapy,16 (2): 109–117.

Glyn-Jones, S., Palmer, A.J., Agricola, R., Price, A.J., Vincent, T.L., Weinans, H., Carr, A.J., (2015).Osteoarthritis. Lancet,386: 376–87.

Gossec, L., Paternotte, S., Maillefert, J.F., Combescure, C., Conaghan, P.G., Davis, A.M., Gunther, K.P., Hawker, G., Hochberg, M., Katz, J.N., Kloppenburg, M., Lim, K., Lohmander, L.S., Mahomed, N.N., March, L., Pavelka, K., Punzi, L., Roos, E.M., Sanchez-Riera, L., Singh, J.A., Suarez-Almazor, M.E., Dougados, M., (2011). The role of pain and functional impairment in the decision to recommend total joint replacement in hip and knee osteoarthritis: an international cross-sectional study of 1909 patients. Report of the OARSI-OMERACT Task Force on total joint replacement. Osteoarthritis Cartilage, 19(2):147-54.

Hafez, A.R.,Zakaria, A.,Buragadda, S., (2012). Eccentric versus concentric contraction of quadriceps muscles in treatment of chondromalaciapatellae.World Journal of Medical Sciences, 7 (3): 197-203.

Hagen, K.B., Dagfinrud, H., Moe, R.H., Østerås, N., Kjeken, I., Grotle, M., Smedslund, G., (2012)."Exercise therapy for bone and muscle health: an overview of systematic reviews". BioMed Central Medicine,10: 167.

Hunter, D.J., Niu, J, Felson, D.T., (2007). Knee alignment does not predict incident osteoarthritis: The framingham osteoarthritis study. Arthritis Rheumatology, 56(4):1212-1218.

Joshua, N., Farr, Scott, B., Going, Patrick, E., McKnight, Kasle, S., Ellen, C.,Cussler, (2016). Progressive Resistance Training Improves Overall Physical Activity Levels in Patients With Early Osteoarthritis of the Knee: A Randomized Controlled Trial. Journal of TheAmerical Physical Therapy Association,90(3): 356–366.

Juhl, C., Christensen, R., Roos, E.M., Zhang, W., Lund, H., (2014). "Impact of exercise type and dose on pain and disability in knee osteoarthritis: a systematic review and meta-regression analysis of randomized controlled trials." Arthritis & Rheumatology.66 (3): 622–36.

Katz, J.N., Brownlee, S.A., Jones, M.H., (2014). "The role of arthroscopy in the management of knee osteoarthritis." Best practice & research. Clinical rheumatology, 28 (1): 143–56.

King, K.B., Rosenthal, A.K., (2015). The adverse effects of diabetes on osteoarthritis: update on clinical evidence and molecular mechanisms. Osteoarthritis Cartilage, 23 (6): 841–50.

Lawrence, R.C., Felson, D.T., Helmick, C.G., Arnold, L.M., Choi, H., Deyo, R.A., Gabriel, S., Hirsch, R., Hochberg, M.C., Hunder, G.G., Jordan, J.M., Katz, J.N., Kremers, H.M.,Wolfe, F., (2008). Estimates of the Prevalence of Arthritis and Other Rheumatic Conditions in the United States, Part II.Arthritis Rheumatology,58(1): 26–35.

Linn, S., Murtaugh, B., Casey, E., (2012)."Role of sex hormones in the development of osteoarthritis". Physical medicine and Rehabilitation, 4 (5 Suppl): S169–73.

Madry, H., Luyten,FP., Facchini, A., (2012). Biological aspects of early osteoarthritis. Knee Surg. Sports Traumatology Arthroscopy, 20 (3): 407–22.

McAlindon, T., Bannuru, R., Sullivan, M., Arden, F., Bierma-Zeinstra, S.,Berenbaum, F., Hawker G., Henrotin, Y., Hunter, D., Kawaguchi, H., Kwoh, K., Lohmander, S., Rannou, F., Roos, E. and Underwood, M., (2014). OARSI guidelines for the non-surgical management of knee osteoarthritis. Osteoarthritis and Cartilage, 22:363-388.

McCaffery, M. Beebe A, et al. (1989). Pain: Clinical manual for nursing practice, Mosby St. Louis, MORetrieved from www.rehabmeasures.org

McColl,G., (2005). Efficacy of physiotherapy management of knee joint osteoarthritis: a randomized, double blind, placebo controlled trial.Centre for Health, Exercise and Sports. AnnalsRhumatic Diseases,64:906–912.

Minns L.C.J., Barker, K.L., Dewey, M., Sackley, C.M., (2007). Effectiveness of physiotherapy exercise after knee arthroplasty for osteoarthritis: systematic review and meta-analysis of randomised controlled trials,335: 812.

National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS) Information Clearinghouse National Institutes of Health, 2016[Online]. Available: http:// https://www.niams.nih.gov/health_info/Osteoarthritis/default.asp

Page, C.J., Hinman, R.S., Bennell, K,L., (2011).Physiotherapy management of knee osteoarthritis. International Journal ofRheumatic Diseases,14(2):145-51.

Physical Therapy for Knee Osteoarthritis Strengthening Exercises and Other Osteoarthritis Treatments ByJoseph J. Ruane, DO, 2015

Riddle,D.L., Stratford,P.W., (2013)Body weight changes and corresponding changes in pain and function in persons with symptomatic knee osteoarthritis: a cohort study.Arthritis Care Res (Hoboken),65(1):15-22.

Sanchez-Adams, J., Leddy,H.A., McNulty, A.L., O'Conor,C.J.,Guilak. F., (2014).The mechanobiology of articular cartilage: bearing the burden of osteoarthritis.CurrRheumatol Rep. 16 (10): 451.

Spector, T.D., MacGregor, A.J., (2004).Risk factors for osteoarthritis: genetics.Osteoarthritis Cartilage, 12 Suppl A:S39-44.

WHO, (2016).Chronic diseases and health promotion [Online].World Health Organization. Available: http://www.who.int/chp/topics/rheumatic/en/ [accessed on 15 August 2016].

Wittenauer, R., Smith, L.,Aden, K.,(2013). Priority Medicines for Europe and the World"A Public Health Approach to Innovation", 6.12: 6.12-46

W-P.Michael, (2010). The Epidemiology, Etiology, Diagnosis, and Treatment of Osteoarthritis of the Knee.DeutschesÄrtzeblatt International,107(9): 152–162

Yousif, U.N., (2012). Demographic Study of osteoarthritis of knee joint in salahaldin governorate.Tikrit Medical Journal, 18(2):224-230.

Zhang, Y., Joanne, J.M.,(2010). Epidemiology of Osteoarthritis. Clinics in Geriatric Medicine, 26(3): 355–369.

Zhao, J., Seubsman, S., Sleigh, A., (2014). Timing of urbanisation and cardiovascular risks in thailand: evidence from 51936 members of the Thai Cohort Study, 2005–2009. Journal of Epidemiology, 24(6):484-493.

APPENDIX

BANGLADESH HEALTH PROFESSIONS INSTITUTE

বাংলাদেশ হেল্‌থ প্রফেশন্স ইনস্টিটিউট (বিএইচপিআই)

Bangladesh Health Professions Institute (BHPI)

(The Academic Institute of CRP)

Ref. CRP-BHPI/IRB/04/17/69

Date: 05/04/17

To
Mahmuda Rahman
Bachelor of Science in Physiotherapy (B.Sc PT)
Session: 2011-2012 DU Reg. No: 1722
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

Subject: Approval of the thesis proposal – Effectiveness of Eccentric Quadriceps Strengthening Exercise Along With Conventional Physiotherapy among Patients with Osteoarthritis.

Dear Mahmuda Rahman
The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application on February 17, 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 and consent form

Since the study involves answering a questionnaire that takes 20 to 30 minutes or measuring with measurement tool that takes 20 to 30 minutes, have no likelihood of any harm to the participants, the members of the Ethics committee has approved the study to be conducted in the presented form at the meeting held at 08:30 AM on February 25, 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

সিআরপি-চাপাইন, সাভার, ঢাকা-১৩৪৩, বাংলাদেশ, ফোন ঃ ৭৭৪৫৪৬৪-৫, ৭৭৪১৪০৪ ফ্যাক্স ঃ ৭৭৪৫০৬৯
CRP-Chapain, Savar, Dhaka-1343, Tel : 7745464-5, 7741404, Fax : 7745069, E-mail : contact@crp-bangladesh.org, www.crp-bangladesh.org

August 31, 2016

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

Through: Head, Department of Physiotherapy, BHPI.

Subject: Prayer for seeking permission to collect data for research project.

Dear Sir,

With due respect and humble submission, I beg most respectfully to state that I am Mahmuda Rahman, student of 4th Professional B. Sc. in Physiotherapy at Bangladesh Health Professions Institute (BHPI). I am seeking your permission to collect data at musculoskeletal outpatient physiotherapy unit of CRP, Savar for my research project in regards to the partial fulfillment of requirements for the Bachelor degree. My research project is entitled, **"Effectiveness of Eccentric Quadriceps Strengthening Exercise along with Conventional Physiotherapy among Patients with Knee Osteoarthritis"** under supervision of Mohammad Habibur Rahman, Assistant Professor, Department of physiotherapy, BHPI. Data will be collected before application of treatment and after completion of six treatment sessions. Data collector would be Physiotherapist who will deliver treatment to each patient. I hereby also assure you that during data collection procedure, any participant would not feel any disadvantage of regular service.

In the light of above circumstances, I favorably pray and hope that you would be kind enough to give me permission for data collection and oblige thereby.

Sincerely yours
Mahmuda Rahman.
Mahmuda Rahman
Student of 4th Professional B. Sc. in Physiotherapy
Class roll : 18 Session: 2011-2012
BHPI, CRP, Savar, Dhaka-1343.

Forwarded
Habib

Approved
31/08/16
Mohammad Anwar Hossain
Associate Professor &
Head of Physiotherapy Dept.
CRP, Chapain, Savar, Dhaka-1343

Recommended & Forwarded
31/08/16
Md. Obaidul Haque
Associate Professor & Head of the Department
Department of Physiotherapy
Bangladesh Health Professions Institute (BHPI)
CRP, Chapain, Savar, Dhaka-1343

CONSENT FORM (ENGLISH)

AssalamuAlaikum,

I am MahmudaRahman, a student of 4th Professional, B.Sc. in Physiotherapy, Bangladesh Health Professions Institute (BHPI),University of Dhaka. To obtain my Bachelor degree, I have to conduct a research project and it is a part of my study. My research title is **"Effectiveness of Eccentric Quadriceps Strengthening Exercise Along with Conventional Physiotherapy among the Patients with Knee Osteoarthritis.**" To fulfill my research project, I need some information from you to collect data. So, you can be a respected participant of this research and the conversation time will be 20-30 minutes. I would like to inform you that this is a purely academic study and will not to be used for any other purposes. I assure that all data will be kept confidential. Your participation will be voluntary. You may have the rights to withdraw consent and discontinue participation at any time of the study. You also have the right to reject a particular question that you don't like.

If you have any query about the study, you may contact with my supervisor Mohammad HabiburRahman, Assistant Professor, dept. of Physiotherapy, BHPI, CPR, Savar, Dhaka-1343.

Do you have any questions before start this session?

So, can I proceed with the interview?

☐Yes☐ No

Signature of the participant and Date …….

Signature of the researcher and Date …….

Signature of the Physiotherapist and Date ……

QUESTIONNAIRE (ENGLISH)

Questionnaire English

Title: Effectiveness of Eccentric Quadriceps Strengthening Exercise along with Conventional Physiotherapy among the Patients with Knee Osteoarthritis.

Instruction: Give a tick mark (√) to the correct answer.

Code …….. Date……..

Name ……. Mobile …….

Address ……. Reg. No ……

Part –I (Social and global information)

Question	Answer
1. Age	…… years
2. Sex	• Female • Male
3. Occupation	
4. Marital status	• Married • Unmarried

Part – II (Health related information)

Question	Answer
5. Duration of problem	…… year …… month
6. Side involvement	• Right ☐ Left ☐ Both
7. Weight (Kg)	
8. Height (cm)	
9. BMI (Kg/m^2)	

Questions before starting treatment:

Part –III (Pain related information)

Circle one number.

0 = None 10 = Extreme

10. How much pain you feel today?

0 1 2 3 4 5 6 7 8 9 10

Part – IV (Disability related information)

Western Ontario and McMaster Universities Osteoarthritis Index

11. **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:

11.1 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

11.2 Stiffness

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

11.3 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

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

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

Questions after completing treatment:

Part –III (Pain related information)

Circle one number.

0 = None 10 = Extreme

12. How much pain you feel today?

_____

0 1 2 3 4 5 6 7 8 9 10

Part – IV (Disability related information)

Western Ontario and McMaster Universities Osteoarthritis Index

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

1 = None1= Slight 2= Moderate 3= Very 4= Extremely

Circle one number for each activity:

13.1 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

11.2 Stiffness

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

11.3 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

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

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

সম্মতি পত্র

আসসালামুআলাইকুম,

আমি মাহমুদা রহমান, ৪র্থ পেশাগত, বি এস সি ইন ফিজিওথেরাপি বিভাগের, ঢাকা বিশ্ববিদ্যালয়ের অধিভুক্ত বাংলাদেশ হেলথ প্রফেশনস ইন্সটিটিউট (বিএইচপিআই) এর একজন ছাত্রী। আমার ব্যাচেলর ডিগ্রী প্রাপ্তির জন্য আমার একটি গবেষণা পরিকল্পনা পরিচালনা করতে হবে এবং এটা আমার পড়াশোনার একটি অংশ। আমার গবেষণা প্রকল্পটি হচ্ছে **" অষ্টিও আথ্রাইটিস রোগীদের মধ্যে প্রচলিত ফিজিওথেরাপির সাথে ইসেনট্রিক কোয়াড্রিসেপস স্ট্রেইনদেনিং এক্সাারসাইজ এর কার্যকারিতা"।** আমার গবেষণা প্রকল্পটি পূরণে আমার কিছু তথ্য সংগ্রহ করা প্রয়োজন । সুতরাং এই গবেষণার জন্য অংশগ্রহণকারীর সম্মতি প্রয়োজন এবং তথ্য সংগ্রহের জন্য গবেষক অংশগ্রহনকারীর কাছ থেকে ২০-৩০ মিনিট সময় নিবেন। আমি আপনাকে অবহিত করছি যে, এটি একটি একাডেমিক গবেষণা এবং অন্য কোন উদ্দেশ্যে ব্যবহৃত হবে না । আমি আশ্বস্ত করছি আপনার প্রদত্ত সংগৃহীত সব তথ্য গোপন রাখা হবে। অংশগ্রহণকারী যে কোন মুহূর্তে সম্মতি প্রত্যাহার করতে পারবেন। এ ছাড়াও আপনি যে প্রশ্নটি পছন্দ করেন না সেটি্র উত্তর না দেওয়ার অধিকার আছে।

শুরু করার আগে আপনার কি কোন প্রশ্ন আছে?

সুতরাং, আমরা কি সাক্ষাতকারের দিকে এগিয়ে যেতে পারি?

☐ হ্যাঁ ☐ না

অংশগ্রহণকারীর স্বাক্ষর ও তারিখ.....

গবেষকের স্বাক্ষর ও তারিখ .....

ফিজিওথেরাপিস্টের স্বাক্ষর ও তারিখ .....

প্রশ্নাবলী – বাংলা

শিরনামঃ " **অষ্টিও আথ্রাইটিস রোগীদের মধ্যে প্রচলিত ফিজিওথেরাপির সাথে ইসেনট্রিক কোয়াড্রিসেপস স্ট্রেইনদেনিং এক্সারসাইজ এর কার্যকারিতা** ।

নির্দেশিকাঃ যে উত্তরটিকে আপনার সবচেয়ে সঠিক মনে হয় সেটিতে টিক চিহ্ন ( ) দিন ।

কোড ..... তারিখ .....

নাম ..... মোবাইল নাম্বার .....

ঠিকানা ..... রেজিস্ট্রেশন নাম্বার .....

পর্ব -১ (সামাজিক ও বৈষয়িক তথ্যাবলী)

প্রশ্ন	উত্তর
১. বয়স	..... বছর
২. লিঙ্গ	☐ নারী ☐ পুরুষ
৩. পেশা	
৪. বৈবাহিক অবস্থা	☐ বিবাহিত ☐ অবিবাহিত

পর্ব - ২ (স্বাস্থ্য বিষয়ক তথ্যাবলী)

প্রশ্ন	উত্তর
৫. কত সময় ধরে সমস্যা	..... বছর ..... মাস
৬. কোন পাশে সমস্যা	☐ ডান ☐ বাম ☐ উভয়
৭. ওজন (কেজি)	
৮. উচ্চতা (সেমি)	
৯. বি এম আই (কেজি / মি^{২})	

চিকিৎসা পূর্ববর্তী প্রশ্নাবলীঃ

পর্ব -৩ (ব্যথা সম্পর্কিত তথ্য)

যে কোন একটি সংখ্যায় গোল দাগ দিন।

০ = নাই ১০ = সর্বাধিক

১০. আজকে আপনার ব্যথা কতটুকু?

---

০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০

পর্ব - ৪ (শারীরিক অক্ষমতা সম্পর্কিত তথ্য)

ওয়েস্টার্ন অন্টারিও ও ম্যাকমাস্টার বিশ্ববিদ্যালয় অষ্টিও আথ্রাইটিস সুচিপত্র

১১. নির্দেশিকাঃ দয়া করে প্রত্যেক ধরনের কাজকে নিচের অসুবিধার মাপকাঠি অনুযায়ী নির্ধারণ করুন।

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

প্রত্যেক কাজের জন্য একটি সংখ্যায় গোল দাগ দিন।

১১.১ ব্যথা

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

১১.২ শক্ত হয়ে যায়

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

১১.৩ শারীরিক কাজ

১. সিঁড়ি দিয়ে নামতে	০ ১ ২ ৩ ৪
২. সিঁড়ি দিয়ে উঠতে	০ ১ ২ ৩ ৪
৩. বসা থেকে উঠার সময়	০ ১ ২ ৩ ৪

৪. দাড়িয়ে থাকার সময়	০ ১ ২ ৩ ৪
৫. আসন দিয়ে বসার সময়	০ ১ ২ ৩ ৪
৬. সমতলে হাঁটার সময়	০ ১ ২ ৩ ৪
৭. যানবাহনে উঠার সময় / নামার সময়	০ ১ ২ ৩ ৪
৮. কেনা কাটা করার সময়	০ ১ ২ ৩ ৪
৯. মোজা পড়ার সময়	০ ১ ২ ৩ ৪
১০. বিছানায় শুতে	০ ১ ২ ৩ ৪
১১. মোজা খোলার সময়	০ ১ ২ ৩ ৪
১২. শোয়া থেকে উঠার সময়	০ ১ ২ ৩ ৪
১৩. গোসলে যাওয়ার সময়	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 কাজগুলো করতে	০ ১ ২ ৩ ৪
১৭. বাসার হাল্কা কাজগুলো করতে	০ ১ ২ ৩ ৪

প্রতিটি প্রশ্নের মান ৪। মোট প্রশ্ন ২৪ টা । মোট নাম্বার ৯৬।

রোগীর চিকিৎসা পূর্ববর্তী নাম্বার _____ / ৯৬

চিকিৎসা পরবর্তী প্রশ্নাবলীঃ

পর্ব -৩ (ব্যথা সম্পর্কিত তথ্য)

১২. আজকে আপনার ব্যথা কতটুকু?

_____

০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০

পর্ব - ৪ (শারীরিক অক্ষমতা সম্পর্কিত তথ্য)

ওয়েস্টার্ন অন্টারিও ও ম্যাকমাস্টার বিশ্ববিদ্যালয় অষ্টিও আথ্রাইটিস সুচিপত্র

১৩. নির্দেশিকাঃ দয়া করে প্রত্যেক ধরনের কাজকে নিচের কাঠিন্যের মাপকাঠি অনুযায়ী নির্ধারণ করুন।

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

প্রত্যেক কাজের জন্য একটি সংখ্যায় গোল দাগ দিন।

১৩.১ ব্যথা

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

১৩.২ শক্ত হয়ে যায়

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

১৩.৩ শারীরিক কাজ

১. সিঁড়ি দিয়ে নামতে	০ ১ ২ ৩ ৪
২. সিঁড়ি দিয়ে উঠতে	০ ১ ২ ৩ ৪
৩. বসা থেকে উঠার সময়	০ ১ ২ ৩ ৪
৪. দাড়িয়ে থাকার সময়	০ ১ ২ ৩ ৪
৫. আসন দিয়ে বসার সময়	০ ১ ২ ৩ ৪
৬. সমতলে হাঁটার সময়	০ ১ ২ ৩ ৪
৭. যানবাহনে উঠার সময় / নামার সময়	০ ১ ২ ৩ ৪
৮. কেনা কাটা করার সময়	০ ১ ২ ৩ ৪
৯. মোজা পড়ার সময়	০ ১ ২ ৩ ৪
১০. বিছানায় শুতে	০ ১ ২ ৩ ৪
১১. মোজা খোলার সময়	০ ১ ২ ৩ ৪
১২. শোয়া থেকে উঠার সময়	০ ১ ২ ৩ ৪
১৩. গোসলে যাওয়ার সময়	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 কাজগুলো করতে	০ ১ ২ ৩ ৪
১৭. বাসার হাল্কা কাজগুলো করতে	০ ১ ২ ৩ ৪

প্রতিটি প্রশ্নের মান ৪। মোট প্রশ্ন ২৪ টা । মোট নাম্বার ৯৬।

রোগীর চিকিৎসা পরবর্তী নাম্বার _____ / ৯৬