

**EFFECTIVENESS OF CORE MUSCLES STRENGTHENING  
EXERCISES ALONG WITH CONVENTIONAL PHYSIOTHERAPY  
FOR THE TREATMENT OF PATIENTS WITH CHRONIC LOW  
BACK PAIN**

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

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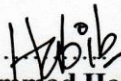
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**EFFECTIVENESS OF CORE MUSCLES STRENGTHENING EXERCISES  
ALONG WITH CONVENTIONAL PHYSIOTHERAPY FOR THE TREATMENT  
OF PATIENTS WITH CHRONIC LOW BACK PAIN**

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



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## DECLARATION

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

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## Acronyms

<b>ALL</b>	Anterior Longitudinal Ligament
<b>BHPI</b>	Bangladesh Health Professions Institute
<b>BMRC</b>	Bangladesh Medical Research Council
<b>CLBP</b>	Chronic Low Back Pain
<b>CRP</b>	Centre for the Rehabilitation of the Paralysed
<b>IASP</b>	International Association for the Study of Pain
<b>ICF</b>	International Classification of Functioning
<b>IRB</b>	Institutional Review Board
<b>LF</b>	Ligamentum Flavum
<b>ODI</b>	Oswestry Disability Index
<b>PLL</b>	Posterior Longitudinal Ligament
<b>RCT</b>	Randomized Control Trail
<b>SPSS</b>	Statistical Package for the Social Sciences
<b>SWD</b>	Short Wave Diathermy
<b>TENS</b>	Transcutaneous Electrical Nerve Stimulator
<b>WHO</b>	World Health Organization

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## Abstract

*Purpose:* To identify the effectiveness of core strengthening exercise along with conventional physiotherapy for chronic low back pain patients. *Objectives:* To explore socio-demographic (age, gender, educational status, occupation) characteristics of patients with chronic low back pain. To compare the rating of pain intensity before and after core strengthening exercise with conventional physiotherapy and conventional physiotherapy alone in patients with chronic low back pain. To compare the functional disability before and after core strengthening exercise with conventional physiotherapy and conventional physiotherapy alone in patients with chronic low back pain. *Methodology:* This study was conducted by Randomized Control Trail (RCT) in which a total 20 participants were selected randomly included 10 control group and 10 experimental group. Data was collected by using Oswestry Disability Index questionnaire to evaluate disability level and pain measured by Orebro Back Pain questionnaire. SPSS was used for data analysis which was displayed through table, pie chart, bar chart and parametric test- paired t-test and unpaired or unrelated t-test. *Results:* In this study, the result shows a significant improvement to reduction of pain and disability in experimental group by using core strengthening exercise along with conventional physiotherapy. *Conclusion:* The result of this study suggest that core strengthening exercise along with conventional physiotherapy was effective for chronic low back pain patients. This reduce pain as well as disability.

*Key words:* Chronic low back pain, Core strengthening exercise, Conventional Physiotherapy, Pain and Disability.

### **1.1 Background**

Low back pain is the most common musculoskeletal problems, carries a high individual, community and global socioeconomic burden (Hoy et al., 2012). Back pain is a major cause of disability, socioeconomic problems and loss of quality of life in developed countries, but its consequences have rarely been studied in other regions (Woolf & Pfleger, 2003).

In general, up to 84% of the population report a minimum of one episode of low back pain in their time period, and it'll relief inside a pair of 2 to 4 week (Hoy et al., 2012). It is one of the most common cause for activity limitation, doctor's visits and surgical procedures in USA (Apfel et al., 2010). It has become a major public health problem and is a frequent cause of absence in work place, for that reason it is called 20th century's disaster (Sparkes, 2005). (Tomita et al., 2010) mentioned that in Western country the lifetime prevalence of LBP is more than 70%. In Australia about 20% of the adult population experiences LBP at their life time (Alsaadi et al., 2011).

In the United States' chronic nature of low back pain is the number one cause of disability and studies have calculable that 149 million workdays square measure incomprehensible within the US each year as a result of low back pain (England, 2016). This point off work costs the United States an estimated \$100-\$200 billion dollars annually and the bulk of these costs return from decreased productivity, lost wages, and health care costs (England, 2016).

The prevalence of LBP symptoms peak between the ages of 40 and 69 is higher among females than males in all age groups and is more common in countries with high-income economies (Hoy et al., 2012). In Iran, a lifetime prevalence of LBP in nursing population and pregnant women was reported to be 62% and 84%, respectively and it was responsible for 33.7% of work absenteeism during past month in nurses (Mohseni-Bandpei et al., 2006). A high prevalence rate and high associated economic and social costs were reported in France due to LBP (Gourmelen et al., 2007). (Louw et al., 2007) stated that in Africa the prevalence of low back pain is 33% among adolescents and 50% among adults in one year.

World-wide estimates of lifetime prevalence of low back pain (LBP) vary from 50 to 84 percent. Occupational LBP relates to exposure to workplace hazards and incurs high costs to society in terms of health care, loss of productivity, workplace and family stress, as well as individual pain and suffering (Nyland & Grimmer, 2003).

Low Back pain may be define as overall pain from the second lumbar vertebra to the sacroiliac joints, and is a common lifetime health disorder (Hanney et al., 2016). Low back pain is classed as (a) acute pain i.e. pain lasting less than 6 weeks; (b) sub-acute pain i.e., pain that lasts for 6–12 weeks; and (c) chronic pain i.e., pain that persists for more than 12 weeks (Lee & Kang 2016). Back pain is not a disease but also constellation of symptoms and most of the cases, the origins remain unknown and low back pain affects people of all ages, from children to the elderly and is a very frequent reason for medical consultations (Vos et al., 2013).

Chronic low back pain can be define as the pain which is occur in the lower back region for more than three months and pain can be occur from a variety of factors but not limited to injury, disease, or different stressors on the body (Azevedo et al., 2015). It is the second most common cause for days of missed work (Baerga & Areu, 2005). Chronic low back pain can be classified as specific or non-specific and specific low back pain causation can be identified through a pathophysiological mechanism and major causes of specific low back pain are herniation of nucleus pulposus (with nerve root compromise), ankylosing spondylitis (inflammatory diseases), infection, osteoporosis, rheumatoid arthritis, fracture, or tumor (Azevedo et al., 2015). The pain is mainly felt in the low back region and it's may be sharp, dull, achy, burning, specific, or vague (Azevedo et al., 2015).

Though chronic low back pain is tenacious to treat, various predisposing factors have been identified. Physical predisposing factors include a genetic history of relatives with chronic low back pain and the patients who are overweight or are heavy smokers are shown to possess the next incidence of chronic low back pain (Tubach et al., 2002). The current evidences suggested that patients who are suffering from chronic low back pain (CLBP) they have scarcity in proprioception and trunk motor control. LBP is mainly ensue when spinal load can't undergo the tissues (Foster et al., 1999).

The “core” may be define as a muscular box with the abdominals in the front, paraspinals and gluteals in the back, the diaphragm as the roof, and the pelvic floor and hip girdle musculature as the bottom (Kumar et al., 2015). (Bergmark, 1989) who classified the trunk muscles into two groups – one group is local and another group is global system of muscles that is connected in the equilibrium of the lumbar spine (Kumar et al., 2015). Chronic low back pain (CLBP) is an intricate condition that (multifidus), abdominal (transversusabdominis) and hip (gluteusmaximus) muscles dysfunction along with reduced lumbar flexibility (Hides et al., 2011). Dysfunction of ventral and dorsal muscles of the trunk have been cultivated in low back pain and inadequacy of muscle function leads to trample and exceeding load on the joints and ligaments of the spine, because of inherent instability of the lumbar spine, dud of inter segmental rotation is essential to produce micro trauma of the structures of the lumbar spine (Lamba et al., 2013).

Conventionally many techniques are used for decreasing the pain and symptoms and improving the functional status of patient and medications such as pain killers, NSAIDS, naproxen ibuprofen, analgesics, opioids, muscle relaxants and steroids are used (Poitras & Brosseau, 2008). Other conventional modalities used are heat therapy, manual or mechanical traction, short wave diathermy (SWD), therapeutic ultrasound, transcutaneous electrical nerve stimulator (TENS), massage and therapeutic exercises (Poitras & Brosseau, 2008). Core strengthening exercises showed effectiveness in treating CLBP and the main goal of core strengthening exercises is to promote spinal stability, strength, endurance and function while decreasing pain (Kibler et al., 2006). Core muscles strengthening exercise play an important role in improving stability of spine and decreasing pain associated with instability and core strengthening exercises target on the stabilization of abdominal, paraspinal and gluteal muscles (Kibler et al., 2006). The core stability exercises are abdominal curls up, oblique curls up, side – bidge, quadruped exercises and then progression of these exercises (Kibler et al., 2006).

## **1.2 Rationale**

Day by day the recurrence of low back pain is increasing in our country. Common predisposing factors for low back pain are poor physical fitness, lack of regular exercise, habitual is poor posture and sedentary life style and most of the patients taking only medical treatment rather than physiotherapy. But Physiotherapy is the best treatment protocol for reducing the incidence of LBP and preventing complication associated with LBP.

Low back pain is a painful condition of lower back, which creates disturbance in functional activities. Literature suggests that pain and dysfunction is very common in low back pain which can interfere with the person's ability to function at work & recreation and imposes a financial cost on the community. So it is very important to manage the cases with low back pain. In Bangladesh, low back pain represents a challenge to the clinician, because considering the context of our country patients often struggle to follow the evidenced based treatment recommended for low back pain.

There are many physical therapy techniques exist for the treatment and rehabilitation of low back pain and some researches suggests that core strengthening is one of the important intervention for this condition which reduce the incidence of pain and improve functional status.

The purpose of this study is to compare the effectiveness of core strengthening exercise with conventional physiotherapy and conventional physiotherapy alone for the patient with chronic low back pain. There were some research articles published about physiotherapy intervention for patient with chronic low back pain but core strengthening exercise for chronic low back pain is not so focused among them and only a very few research articles published regarding core strengthening for chronic low back pain. However, research helps to improve the knowledge of health professionals, as well as develops the profession. The results of the study may help to guide physiotherapists to give best treatment in patient with chronic low back pain, which will be beneficial for both the patient with chronic low back pain and for developing the field of physiotherapy profession.

### **1.3 Objectives**

#### General Objective

- To identify the effectiveness of core muscle strengthening exercise along with conventional physiotherapy for the treatment of patients with chronic low back pain.

#### Specific objectives

- To explore socio-demographic (age, gender, educational status, occupation) characteristics of patients with chronic low back pain;
- To compare the rating of pain intensity before and after core strengthening exercise with conventional physiotherapy and conventional physiotherapy alone in patients with chronic low back pain;
- To compare the pain intensity during physical activity before and after core strengthening exercise with conventional physiotherapy and conventional physiotherapy alone in patients with chronic low back pain;
- To compare the functional disability before and after core strengthening exercise with conventional physiotherapy and conventional physiotherapy alone in patients with chronic low back pain.

## 1.4 Hypothesis

### Null Hypothesis

$H_0: \mu_1 - \mu_2 = 0$  or  $\mu_1 \geq \mu_2$ , where the experimental group and control group mean difference is equal or control group is higher than experimental group. That means null hypothesis is accepted and alternative hypothesis is rejected.

### Alternative Hypothesis

$H_a: \mu_1 - \mu_2 \neq 0$  or  $\mu_1 < \mu_2$ , where the experimental group and control group mean difference is not equal or experimental group is higher than control group. That means alternative hypothesis is accepted and null hypothesis is rejected.

Where,

$H_0$  = Null hypothesis

$H_a$  = Alternative hypothesis

$\mu_1$  = mean difference in initial assessment

$\mu_2$  = mean difference in final assessment



## **1.5 Operational definition**

### **Low Back Pain**

Low back pain (LBP) is a condition of localized pain to the lumbar spine with or without symptoms to the distal extremities whose etiology is commonly unknown.

### **Chronic Low Back Pain**

Chronic low back pain is an episode of low back pain which is last for 12 weeks or more.

### **Core Strengthening**

Core strengthening has referred to the active component to the stabilizing system including deep/local muscles that provide segmental stability (e.g. transversus abdominis, lumbar multifidus) and/or the superficial/global muscles (e.g. rectus abdominis, erector spinae) that enable trunk movement/torque generation and also assist in stability in more physically demanding tasks.

### **Pain**

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

**Conventional Physiotherapy:** Physiotherapy that is widely accepted and used by most Physiotherapy professionals. It is different from medical treatment. Examples of conventional physiotherapy for LBP include Mobilization, Manipulation, Soft tissue technique, radiation therapy.

### **Disability**

Disabilities is an umbrella term, covering impairments, activity limitations, and participation restrictions. An impairment is a problem in body function or structure; an activity limitation is a difficulty encountered by an individual in executing a task or action; while a participation restriction is a problem experienced by an individual in involvement in life situations.

Pain is a versatile experience which is spontaneously unpleasant and associated with injury and soreness. It may vary in intensity (mild, moderate, or severe), quality (sharp, burning, or dull), duration (transient, intermittent, or persistent), and referral (superficial or deep, localized or diffuse) (Woolf, 2004).

LBP is one of the commonest cause of disability in the working population. Disability due to LBP has been defined as restricted functioning, involving limitation of activities and restriction of participation in life situations. Disability usually accompanies LBP, varies in extent and will be temporary or perhaps permanent. (Waddel, 2004).

In the International Classification of Functioning (ICF), the emphasis was changed to activity and activity limitation meaning difficulty in the performance, accomplishment, or completion of an activity. Difficulty in the performing activities occur when there is a qualitative or quantitative alteration in the way in which activities are carried out. Difficulty encompass all the ways in which the doing of activity may be affected (WHO, 2001).

If the reason of LBP is often shown (e.g. infection, tumour, osteoporosis, ankylosing spondylitis, fracture, inflammatory process, radicular syndrome or cauda equine syndrome), and non-specific LBP if not attributed to recognizable, legendary pathology (Van et al., 2006).

According to the European guidelines for management of acute nonspecific back pain in primary care defined LBP is a pain and discomfort localized below the costal margin and above the inferior gluteal folds, with or without leg pain (Kuritzky & Samraj, 2012). The lumbar spine consists of five vertebrae. These vertebrae have heavy thick bodies to support the greater stress and weight as they serve as major load bearing portion of the vertebrae. Biomechanical functions of these spines are transmitting forces (weights), bending moments to the pelvis, allowing motions and protecting the spinal cord (Lee, 2006). The ligaments of lumbar spine are anterior longitudinal ligament (ALL), posterior longitudinal ligament (PLL), interspinous ligament, intertransverse ligament and ligamentum flavum

(LF). The ALL maintains the stability of the joints and limits extension. The PLL limits flexion except at the lower lumbar spine where it is narrow and weak. The intertransverse ligament resists lateral bending of the trunk. During flexion ligament becomes stretched and during extension it becomes contracted. As a whole ligament permit sufficient physiologic movements, protect the spinal cord and provide stability to the spine (Lee, 2006). The spinal cord is enclosed within the spinal canal. The spinal canal works as follows: when the spine is extended it decreases in length and increased when the spine is flexed. Small nerve roots branch off from the spinal cord through spaces called neural foramen (Lee, 2006). Lumbar Spinal pain has been defined as pain perceived as arising from anatomical areas of the region bounded laterally by the lateral border of the erector spine, superiorly by an imaginary transverse line through the T12 spinous process and inferiorly by a line through the S1 spinous process. Sacral spinal pain is outlined as pain perceived within a region overlying the sacrum, delimited laterally by imaginary vertical lines through the posterior superior and posterior inferior iliac spines, superiorly by a transverse line through the S1 spinous process and inferiorly by a transverse line through the posterior sacrococcygial joints (Kilpikoski, 2010).

The symptoms of low back pain includes pain or deep ache may on the low back or buttocks, burning or tingling sensation of the leg or foot. These symptoms may be continuous or intermittent which worsened by activity and improved partially by rest. Physical activity, significantly bending, extending, twisting and lifting, unremarkably aggravates the symptoms, whereas restriction of pain-producing activities leads to improvement at least temporarily. Typical physical findings are nonspecific, including restricted range of motion of the spine, tight hamstring muscles, paravertebral muscle spasms, Muscular trigger points, tenderness and aggravation of symptoms on flexion or extension and straight leg raising tests (Alemo & Sayadipour, 2008).

Depending on the duration of pain LBP is categorized as- acute pain that lasts less than 6 weeks, sub-acute pain lasts up to 6 to 12 weeks and chronic pain that lasts more than 3 months. Recurrence of LBP is common. If recurrence occur in less than 6 months is considered as exacerbation of chronic LBP. There is sometimes a very short hyper acute period that lasts for 24–48 hours. During this period there is pain and intense spasm in

which sufferers are immobilized and motion is prevented. Fortunately very few patients experiences this period and usually resolves within 24–48 hours (Kuritzky & Samraj, 2012).

Risk factors for LBP have not been completely elucidated. The most frequently reported risk factor for LBP is heavy physical workload such as lifting, awkward posture, and whole body vibration. Life style is also considered a risk factor of LBP. Smoking behavior, lack of physical exercise, and short sleep hours increase the risk of LBP. A systematic review showed that there was no evident relationship between alcohol consumption and LBP. An association between LBP and psychosocial factors has also been reported. Food processing workers are known to be a high risk population for LBP because they work in awkward postures, with lifting and manual handling of heavy materials, on the wet floor, and in hard temperature (Tomita et al., 2010).

Two major contributors to LBP are poorly coordinated muscles around the spine and weakness in the core (Kline et al., 2013). Lack of core strength may lead to excessive anterior pelvic tilt, with increased stress on facet joints and tightness in the thoracolumbar fascia or to excessive posterior tilting, which may reduce shock absorption in the low back region and lower extremity strength, especially in the gluteus maximus and hip external rotator muscles (Kline et al., 2013).

A study done by Kallewaard and colleagues found that 40% of low back pain is due to a discogenic cause (Kallewaard et al., 2010). The main cause of discogenic back pain is a disc herniation. A herniated disk is degeneration, tearing, or cracking found in the annulus fibrosus that causes a bulging of the disk that lies between the vertebral bodies. Research has found that when the annular tears occur the bodies healing mechanisms create blood vessels and nociceptors around and inside the annulus. The nociceptors can then become sensitive by various inflammatory repair mechanisms leading to chronic low back pain (Kallewaard et al., 2010).

Discs are used for shock absorption and padding between the vertebral bodies (Prentice, 2015). When this bulging occurs it can protrude into the spinal canal causing radicular pain into the back, buttocks, and leg. There is usually sharp, centrally located pain near the spinal cord that radiates down a dermatomal pattern. Since a herniated disc affects the

nervous system, patients will often report numbness, tingling, or weakness down into their leg (Prentice, 2015). For the low back, specifically, these discs are found between the lumbar vertebrae (Simon et al., 2014). The disks most often affected are the L4-L5 and the L5-S1. The cause of a herniated disc is usually forward bending with twisting that places a large amount of force on the lumbar vertebrae (Prentice, 2015).

Overtime the annulus fibrosis degenerates. The proteoglycan fibers are replaced with collagen fibers in the disc. This decreases the water binding ability making the disc less effective at shock absorption; therefore, increased forces are placed throughout the spine and low back. If it becomes weaker the chance for a disk herniation becomes higher (Peng et al., 2004). This explains why the older population is more likely to suffer from low back pain. The severity of a tear to the annulus fibrosis can be divided into IV grades. Grade I being the least severe and grade IV being the most severe. Each grade is linked to the percentage of the annulus fibrosis that has been torn. Patients typically become symptomatic at a grade III rupture (Simon et al., 2014). Once there is a tear in the annulus fibrosis, cytokines are introduced to the area for healing purposes. However, these cytokines also disrupt the chemical balance of the nucleus causing decreased oxygen diffusion, increased local lactate levels, and increased pH level. All of this leads to pain in the disc. The second major cause of low back pain that is sacroiliac (SI) joint dysfunction. A study done by Simon et al found that 13-48% of all low back pain was caused by the sacroiliac joint (Madani et al., 2013). The sacroiliac is the joint formed by the sacrum and the ilium. It is connected by many strong ligaments that allow a small amount of motion to take place (Prentice, 2015).

The SI joint is responsible supporting the entire weight of the axial body and upper extremities. Since the SI joint is a synovial joint: inflammation, sprains, hypermobility, and hypomobility may occur. All of these may cause pain in the lower back. Many recent studies have stated that SI joint asymmetries and sacrum hypomobility may be a precursor to pain in the lumbar region. Asymmetries in the SI joint may also lead to spasms in the piriformis, a small band like muscle that runs along the buttocks. The sciatic nerve runs through the piriformis. As a result, any spasms caused by the piriformis will irritate the sciatic nerve causing low back pain, pain in the buttocks, and pain running down the leg.

Often times SI joint dysfunction will occur along with a lumbar discogenic pathology (Madani et al., 2013).

SI joint sprain may occur with falls from a height, downhill running, and repetitive unilateral activities such as golf, dancing, punting, hurdling, or gymnastics (Prentice, 2015). Any of these mechanisms may cause lengthening and irritation of the sacrotuberous and sacrospinous ligaments. Also these unilateral forces may also cause an asymmetry to one side of the pelvis. This asymmetry may cause pain and neurological deficits as previously discussed. As can be seen, the SI joint is one of the most complex joints of the body. It is very difficult to diagnose the exact cause of the dysfunction making it a very difficult area to treat. The third and final form of chronic low back pain that will be discussed is nonspecific chronic low back pain. Nonspecific chronic low back pain is pain in the lower back that persists for longer than three months. An exact pathology cannot be diagnosed through imaging or special tests. The nonspecific group contains 90% of all chronic low back patients (Azevedo et al., 2015).

The thoracolumbar fascia works as “nature’s back belt.” It works like a retinacular strap of the muscles of the lumbar spine. The thoracolumbar fascia consists of three layers: the anterior, middle, and posterior layers. Of these layers, the posterior layer has vital role in supporting the lumbar spine and abdominal musculature. The transversus abdominis has massive attachments to the middle and posterior layers of the thoracolumbar fascia. The posterior layer consists of two lamina: a superficial lamina with fibers passing downward and medially and a deep lamina with fibers passing downward and laterally. The aponeurosis of the latissimus dorsi muscle makes the superficial layer. In essence, the thoracolumbar fascia makes a connection between the lower limb and the upper limb with contraction of the muscular structures, the thoracolumbar fascia acts as an activated proprioceptor, like a back belt providing recompose in lifting activities (Akuthota, and Nadler, 2004).

Chronic Low Back Pain (CLBP) is a very common and widespread health problem. Eighty percent of the world’s population experiences it, at least once in their lifetime (Stankovic, 2012). Besides pain and functional disability, CLBP is characterized by psychological and socio-economic aspects. Although the treatment requires a multidisciplinary approach and

it should be directed not only to reduce pain, but also to improve quality of life parameters (Brox, 2005).

The diagnosis of CMLBP is entirely clinical but imaging studies could show degenerative spondylosis. Like asymptomatic individuals with lumbar disk herniation and spinal stenosis on imaging studies, there are individuals with imaging abnormalities consistent with excessive motion in dynamic flexion/extension who do not have clinical symptoms referable to those abnormalities. Nowadays, the surgical management of CMLBP is arthrodesis of symptomatic vertebral motion segments in well selected patients. However, a premature decision for surgical treatment inflicts additional soft tissue injury, aggravating the primary condition and subjects the patient to unnecessary complication (Resnik et al., 2005).

To provide an adequate therapy for CLBP, it is necessary to establish the pain intensity and patient's functional status. Before deciding the exercise program to apply, it is important to check for any restrictions in mobility and pain occurrence during the execution of several selected basic stabilization exercises and also investigate whether there are some limitations in activities of daily living (Stankovic, 2012). Significant effects of exercise therapy on pain and functionality in patients with CLBP had been proven by clinical practice and numerous studies (Hyden, 2005).

Therapeutic exercise is a common conservative intervention used by clinicians to decrease pain, improve disability, and restore muscular function (Bromitt et al., 2013). Core stability exercises have become a popular form of therapeutic exercise and are seen as a critical component to restoring proper kinetic function (Huxel & Anderson, 2013). (Wang et al., 2012) found that core exercises produced better outcomes than general exercise during the initial 3 months of intervention for LBP (Wang et al., 2013).

Consecutive exercise programs for Chronic low back pain include strengthening and stretching of the large superficial back and abdominal muscles, without stabilization exercises program and formation of the protective lumbar muscle corset. As the lack of such programs is unable to activate the deepest layer of back muscles, as well as inadequate pelvis immobilization, which may cause injuries during exercise (Caims et al., 2006).

First stabilization exercise program was expressed by Richardson et al. in 1999 and they emphasized the need for special exercise program, which would enable activation of particular muscles of the lower back in order to stabilize lumbar region and decrease pain and disability (Stankovic, 2012). This specific exercise program, known as segmental stabilization exercises, does not repel the need for strengthening and stretching aerobic exercises. Applying alone, is not enough for any lumbar stabilizing maneuver function and reduction of pain but it can be an indispensable addition to any traditional exercise program (Stankovic, 2012).

Core training is the widely used therapeutic exercise treatment option for chronic low back pain. The definition of core training has changed over the years. Core training in the past is defined as the practice that was essential to training the athlete. Core training can be divided into four major areas. These four areas are core control, core stability, core strength, and core function. For the treatment of a patient with chronic low back pain, four areas must be developed. In General core control refers to when lower abdominal, low back and pelvic muscles work together to stabilize the lumbar spine in order to protect it from non-functional motions. It is also used to build a strong base for all movements of the extremities (Rubenstein, 2005).

Core strength, as the name implies, involves strengthening the major group of muscles that perform movements of the lumbar spine and pelvis. These exercises create a visible movement because of the strong contraction of prime movers. These exercises may be progressed as the patient's strength (Prentice, 2011).

Hamburg-van (Reeneen et al., 2007) have been found strong evidence that there is no association between trunk muscle endurance and the risk for LBP but they found indecisive evidence for association between trunk muscle strength or mobility of lumber spine and the risk factor for LBP. However, lifestyle-related causes such as smoking and obesity have shown risk factor for LBP (Shiri et al., 2010a, Shiri et al., 2010b). (Shiri et al., 2007) also identified the risk of lumber radicular pain (sciatica) among the people with overweight or long smoking history and high physical activity. The risk for occurring recurrent back pain episode was twice as high once a history of the condition had been established (Hestbaek, 2003). Standing or walking, sitting, sports or total leisure- time physical activities were no



risk factors for LBP (Bakker et al., 2009). (Chen et al., 2009) confirmed that sedentary lifestyle by itself is not associated with LBP (Chen et al., 2009).

CLBP is a multifactorial phenomenon where physiotherapy plays an important role in the treatment of it. The aim of treatment includes- decreasing pain, increasing strength, normalizing somatosensory deficits, improve functional activity and quality of life (Geletka et al., 2012).

The recommended physiotherapy management for LBP comprises a wide range of treatment strategies, including electrotherapy, manual therapy, cognitive behavioral therapy, and exercise (Hayden et al., 2012). Exercise has also been widely applied by physiotherapists in clinical settings to treat LBP (Ishak et al., 2016). To encourage self-care management, which emphasizes a patient's active participation and efforts to manage LBP (Keller, 2006). Moreover, exercise therapy focuses on the prescription of muscular contraction and body movement to improve overall health. Therefore, exercise may protect and improve mobility and function, which help maintain the body functions of the elderly. Several exercise types, including Pilates, stretching, aerobics, and strengthening exercise, have been addressed among the elderly with LBP. However, strengthening exercises have been a major concern among clinicians and researchers because this type of exercise has been included in their exercise program because it improves the muscle strength of the elderly with LBP (Ishak et al., 2016).

(Shnayderman & Katz-leurer, 2013) revealed that strengthening exercise is more effective than aerobic exercise for chronic LBP. Recent study shows that early activity, specific core stabilization exercises, ergonomic and postural advices are effective for LBP management (Shnayderman & Katz-leurer, 2013).

Exercise therapy seems to be an effective treatment to relieve the pain and to improve the functional status of patients with chronic LBP in most clinical practice guidelines (Hyden et al., 2005). Core stability training has become a popular fitness trend that has begun to be applied in rehabilitation programs (Akuthota et al., 2008).

Many studies have shown that core stability exercise is an important component of rehabilitation for LBP (Desai & Marshall, 2010). Panjabi (1992) proposed a well-known

model of the spine stability system that consists of three subsystems: the passive subsystem (which includes bone, ligament and joint capsule), the active subsystem (which includes muscle and tendons), and the neural subsystem (which consists of the central nervous system and peripheral nervous system (Panjabi, 1992). According to this model, these three subsystems work together to provide stabilization by controlling spinal movement. Thus, an effective core stability exercise should consider the motor and sensory components of the exercise and how they relate to these systems to promote optimal spinal stability (Hodges, 2003).

### **3.1 Study design**

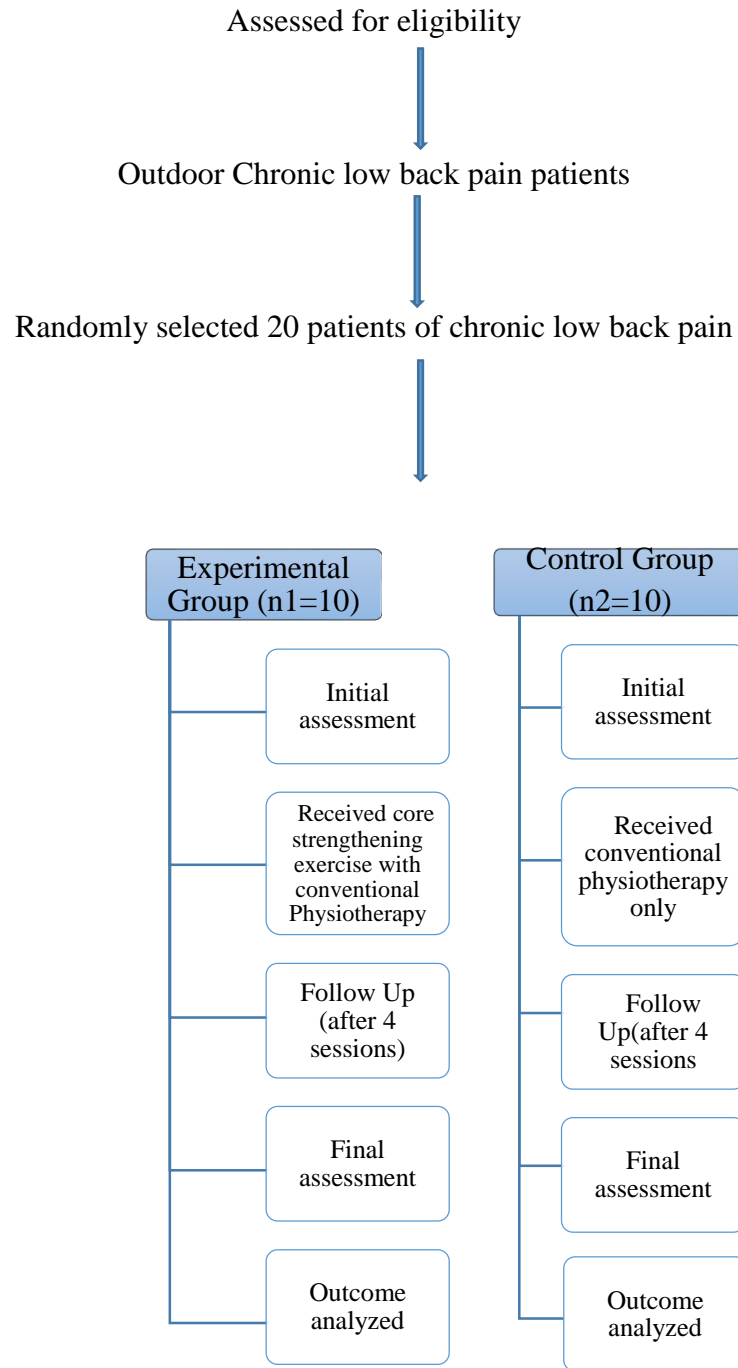
The aim of this study was to find out the effectiveness of core muscle strengthening exercise along with conventional physiotherapy for the treatment of Chronic LBP patients attended at musculoskeletal unit at CRP-Savar. Experimental design of quantitative research which was Randomized Controlled Trail (RCT) sign was chosen because the experimental study was the best way to find out the effectiveness of the study.

A pre-test (before intervention) and post-test (after intervention) was administered with each subject of both groups to compare the pain effects before and after the treatment. The design could be shown by-

r o x o (experimental group)

r o o (control group)

## Flowchart of the phases of randomized controlled trial



A flowchart for a randomized controlled trial of a treatment program including conventional physiotherapy with core strengthening exercise for patient with chronic low back pain.

### **3.2 Study area**

Data was collected from the outpatient, Musculoskeletal Physiotherapy unit of Centre for the Rehabilitation of the Paralysed (CRP), Savar. Because these patients are come to CRP from all over the Bangladesh from all economic groups for comprehensive rehabilitation, so it reflects the entire population.

### **3.3 Study Population**

A population refers to the entire group of people or items that meet the criteria set by the researcher. The populations of this study were chronic low back pain patients.

### **3.4 Sampling Technique**

Simple random sampling technique was used for this study. Subjects, who meet the inclusion criteria were taken as sample in this study. 20 patients with Low Back Pain were selected then 10 patients were randomly assigned to Experimental group comprising of treatment approaches of core strengthening along with other Physiotherapy treatment and 10 patients to the only other Physiotherapy treatment for this study. The study was a single blinded technique.

### **3.5 Inclusion criteria**

- Patients with non- specific chronic low back pain (duration of 3 months or more).
- Age group: 20-60 years (both male and female).
- Willingness of participant.

### **3.6 Exclusion Criteria**

- Patients with neurological deficit such as paresthesia, numbness and weakness in lower limb.
- Spondylolysis or any defect or stress fracture in the pars interarticularis of the vertebral arch.
- Spondylolisthesis or any displacement of vertebra.
- Spinal fracture or any trauma in spinal column.
- Spinal tumors (both primary and metastatic tumor).

- Spinal surgery such as lumbar decompression surgery, lumbar fusion surgery, artificial disc replacement surgery.
- Pregnancy.
- Disc prolapsed such as protrusion, prolapse, extrusion and sequestration.
- Any spinal curvature defect.
- Receiving steroid injection within previous 3 months.
- History of systemic disorder and malignancy.

### **3.7 Sample size**

Researcher was taken 20 participants as sample. Due to time limitation the researcher has to choose 20 participants to conduct this study; within the short time it could not be possible to conduct the study with a large number subjects.

### **3.8 Randomization**

20 patients with chronic low back pain was select from outdoor musculoskeletal physiotherapy department of CRP (Savar) and then 10 patients with chronic low back pain was randomly assigned to core strengthening exercise with conventional physiotherapy group and 10 patients to the only conventional physiotherapy group for this randomized control trial study. When the samples was collected, the researcher randomly assigned the participants into experimental and control group, because it improves internal validity of experimental research. The samples was given numerical number C1, C2, C3 etc for the control and E1, E2, E3 etc for experimental group. The experimental group was received core muscle strengthening exercise with conventional physiotherapy and control group was received conventional physiotherapy only.

### 3.9 Method of data collection

To conduct this study, the researcher was collected data through using different types of data collection tools. The researcher was used Orebro back pain Questionnaire for pain and functional activity measurement. Oswestry Low Back Pain Disability Questionnaire was used for disability measurement.

#### 3.9.1 Treatment Protocol

Core strengthening exercise will be applied by a graduate qualified physiotherapist who was expertized in this technique to the patients of experimental group and home advice given to the patients. Both group received treatment weekly two days in two weeks.

**Table -1: Experimental Group Treatment Protocol**

<b>Treatment Option</b>	<b>Duration/Repetition</b>
Core muscles strengthening exercises	10 minutes in each session
Lumber Mobilization (Maitland mobilization)	Grade-II,III in each session
McKenzie Approach (Directional Preference)	10 repetition in each session
Soft tissue technique	3 minutes
PNF	3 minutes
IRR	10 minutes in each session

**Table - 2: Control Group Treatment Protocol**

<b>Treatment options</b>	<b>Duration/Repetition</b>
Lumber Mobilization (Maitland mobilization)	Grade-II,III in each session
McKenzie Approach (Directional Preference)	10 repetition in each session
Soft tissue technique	3 minutes
PNF	3 minutes
IRR	10 minutes in each session

### **3.9.2 Data collection tools**

The organized material was questionnaires, consent forms, paper, pen & a pencil. All questionnaires designed to conduct the interviews.

### **3.9.3 Data collection procedure**

The study procedure was conducted through assessing the patient, initial recording, treatment and final recording. After screening the patient at department, the patients were assessed by qualified physiotherapist. Four sessions of treatment was provided for every subject. Twenty subjects were chosen for data collection according to the inclusion criteria. The researcher divide all participants into two groups and coded C1 (10) for control group and E1 (10) for experimental group. Experimental group received conventional physiotherapy with core strengthening exercise and control group received only conventional physiotherapy.

Data was gathered through a pre-test, intervention and post-test and the data was collected by using a written questionnaire form which was formatted by the researcher. Pre- test was performed before beginning the treatment and the intensity of pain and disability score on questionnaire form. The same procedure was performed to take post-test at the end of four session of treatment. Researcher gave the assessment form to each subject before starting treatment and after four session of treatment and instructed to put mark on the Orebro rating number according to their frequency of pain and functional ability. The researcher collected the data both in experimental and control group in front of the qualified physiotherapist in order to reduce the biasness. At the end of the study, specific test was performed for statistical analysis.

## **3.10 Measurement tools**

### **3.10.1 Questionnaire**

The questionnaire was developed under the advice and permission of the supervisor following certain guidelines. There were twenty close ended questions with numeric pain rating scale with some objective questions which were measured by examiner and each



question was formulated to identify the pain with functional ability and Oswestry Disability Index Questionnaire for measures disability score.

### **3.10.2 Orebro Back Pain Questionnaire**

The Orebro Back Pain Questionnaire has 20-item instrument to assess pain and functional ability. The inverting of some items such as chance working, light work, walk, household work, shopping and sleep that higher ratings always indicate higher levels of risk. Consequently, outcome for pain was assessed with items Average of pain and Frequency or episodes of pain. The outcome of function was assessed using the 5 activity items light work, walk, household work, Shopping and sleep. The each item was scored with 0-10. This questionnaire slightly modified for suitable this study. Scale extremities are labeled with specific words. For every specific question, the patient marks the point on the scale which represents his/her condition.

### **3.10.3 Oswestry disability Index**

Oswestry disability index (ODI) was included 10 sections of questions. The ODI was domains the following: pain intensity, personal care, lifting, walking, sitting, standing, sleeping, Travelling and social life, Employment/Homemaking. Each section has six statements that were scored from 0 (minimum degree of difficulties in that activity) to 5(maximum 20 degree of difficulty). If more than one statement was marked in each section, the height score should be taken. The total score is obtained by summing up the scores of all sections, giving a maximum of 50 points.

### **3.11 Ethical Considerations**

The whole process of this research project was done by following the Bangladesh Medical Research Council (BMRC) guidelines and World Health Organization (WHO) Research guidelines. The proposal of the dissertation including methodology was approved by Institutional Review Board (IRB) and obtained permission from the concerned authority of ethical committee of Bangladesh Health Professions Institute (BHPI). Again before the beginning of the data collection, the researcher obtained the permission ensuring the safety of the participants from the concerned authorities of the clinical setting and was allotted

with a witness from the authority for the verification of the collected data. The researcher strictly maintained the confidentiality regarding participant's condition and treatments.

### **3.12 Informed Consent**

The researcher obtained consent to participate from every subject. A signed informed consent form was received from each participant. The participants were informed that they have the right to meet with outdoor doctor if they think that the treatment is not enough to control the condition or if the condition become worsen. The participants were also informed that they were completely free to decline answering any question during the study and were free to withdraw their consent and terminate participation at any time. Withdrawal of participation from the study would not affect their treatment in the physiotherapy department and they would still get the same facilities. 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.

### **3.13 Data analysis**

Statistical analysis was performed by using Microsoft Office Excel 2013 and scientific calculator. Data was analyzed by using SPSS version 20.00 to compute the descriptive statistics using pie chart, bar chart and also percentage and parametric tests were conducted using paired t-test and unrelated t-test. The researcher had calculated the variables mean, mean difference, standard deviations, standard error, degree of freedom and significant level to show that experimental group and control group mean difference in within group was significantly different than the standard table values. In the between group, the data shows that the mean difference was greater than the control group. The researcher had tested mean variables stating problem to test using t statistic, which is paired t-test and also unrelated t-test.

#### **3.13.1 Statistical Test**

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 with statistical analysis.

All participants were code according to group to maintain participant's confidentiality. All subjects of both experimental and control group score their frequency of pain, average of pain, feelings of pain and functional ability on Orebro back pain scale before starting treatment and after completing treatment. Reduction of frequency of pain, average of pain, feelings of pain for both groups and reduction of disability or functional ability are the differences between pre-test and post-test score.

According to Hicks (2009), experimental studies with the different subject design where two groups are used and each tested in two different conditions and the data is interval or ratio should be analyzed with unrelated t test. This test is used when' the experimental design compares two separate or different unmatched groups of subjects participating in different conditions. When calculating the unrelated t test, you find the value called 't' which you then look up in the probability tables associated with the t test to find out whether the t value represents a significant difference between the results from your two groups.

### **Paired t-test**

A paired t-test is used to compare two population means where you have two samples in which observations in one sample can be paired with observations in the other sample.

Formula of paired t-test-

$$t = \frac{\bar{d}}{SE(\bar{d})} = \frac{\bar{d}}{\frac{SD}{\sqrt{n}}}$$

Where,

$\bar{d}$  = mean of difference (d) between paired values,

$SE(\bar{d})$  = Standard Error of the mean difference,

SD= standard deviation of the differences d, and

n= number of paired observations.

Calculation of paired t value of the rating of pain intensity as below-

$$t = \frac{\bar{d}}{\frac{SD}{\sqrt{n}}} = \frac{1.6}{\frac{0.699}{\sqrt{10}}} = \frac{1.6}{0.219} = 7.236$$

### 3.13.2 Level of Significant

In order to find out the significance of the study, the “p” value was calculated. The p values refer to 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 level, the results are said to be significant.

In this way researcher had calculated paired t-value and significant level and have presented in the following tables-

**Table - 3: Orebro back pain Questionnaire (Initial and Final assessment paired t-test)**

Serial no	Variables	Experimental			Control		
		t	Sig. level	df	t	Sig. level	df
Pair 1	How would you rate that you have had during the past week?-Pre - How would you rate that you have had during the past week?-Post	7.236	0.000*	9	5.014	0.001*	9
Pair 2	How often would you say that you have experience pain episodes?-Pre - How often would you say that you have experience pain episodes?-Post	2.714	0.024*	9	3.674	0.005*	9
Pair 3	How much are you able to decrease your pain?-Pre -	1.048	0.322	9	0.688	0.509	9

	How much are you able to decrease your pain?-Post						
Pair 4	How large is the risk that your current pain may become persistent?-Pre - How large is the risk that your current pain may become persistent?-Post	1.714	0.121	9	3.674	0.005*	9
Pair 5	Physical activity makes my pain Worse-Pre - Physical activity makes my pain Worse-Post	13.500	0.000*	9	5.014	0.001*	9
Pair 6	I should stop what I am doing until the pain increase-Pre - I should stop what I am doing until the pain increase-Post	11.000	0.000*	9	3.674	0.005*	9
Pair 7	I should not do my normal work with my present pain-Pre - I should not do my normal work with my present pain-Post	6.708	0.000*	9	2.236	0.052*	9
Pair 8	I can do light work for an hour-Pre - I can do light work for an hour-Post	3.087	0.013*	9	.688	0.509	9
Pair 9	I can walk for an hour-Pre - I can walk for an hour-Post	4.118	0.003*	9	4.333	0.002*	9
Pair 10	I can do ordinary household work-Pre - I can do ordinary household work-Post	3.881	0.004*	9	6.000	0.000*	9

Pair 11	I can do the weekly shopping-Pre - I can do the weekly shopping- Post	6.000	0.000*	9	6.708	0.000*	9
Pair 12	I can sleep at night-Pre - I can sleep at night-Post	4.272	0.002*	9	2.753	0.022*	9

\*Significant

**Table - 4: Oswestry Disability Index (Initial and final paired t-test)**

Serial no	Variable	Experimental			Control		
		t	Sig. level	df	t	Sig. level	df
Pair 1	ODI(%) initial-final	3.000	0.015*	9	2.449	0.037*	9

\*Significant

### Unpaired t-test

Unpaired t-test was used to compare difference between two means of independent variables. Selection of test of hypothesis was two independent mean differences under independent t distribution. Formula: test statistic t is follows:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{S \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

Where,

$\bar{x}_1$  = Mean of the Experimental Group,

$\bar{x}_2$  = Mean of the Control Group,

$n_1$  = Number of participants in the Experimental Group,

$n_2$  = Number of participants in the Control Group, and

S = Combined standard deviation of both groups.

Calculation of Un-paired t value of the rating of pain intensity as below-

$$t = \frac{\bar{x}_1 - \bar{x}_2}{s \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} = \frac{4.80 - 6.40}{0.882 \sqrt{\frac{1}{10} + \frac{1}{10}}} = \frac{-1.6}{0.882 \times 0.447} = -4.058$$

**Table - 5: Orebro back pain Questionnaire (Final Un-paired t-test)**

Serial no	Variables	t	df	Sig. level
1	Rating of pain	4.058	18	0.001*
2	Experience of pain episodes	0.983	18	0.339
3	Ability to decrease pain	0.667	18	0.513
4	Risk of persistent current pain	0.721	18	0.480
5	Pain intensity during physical activity	2.309	18	0.033*
6	Stop the doing work until pain decrease	1.282	18	0.216
7	Pain intensity during normal work	1.922	18	0.071
8	Pain intensity during light work	0.983	18	0.339
9	Pain intensity during walk for an hour	0.287	18	0.778
10	Pain intensity during ordinary household work	2.327	18	0.032*
11	Pain intensity during weekly shopping	0.509	18	0.617
12	Pain intensity during sleep at night	0.120	18	0.906

\*Significant

**4.1: Socio-Demographical variables****4.1.1. Mean age of the participants**

In this study among the participants mean age of experimental group was 35.7 years and control group mean age was 46.4 years.



#### 4.1.2 Gender of the participants

Among all participants 75% was male and 25% was female. 80% male and 20% female in experimental group. 70% male and 30% female in control group.

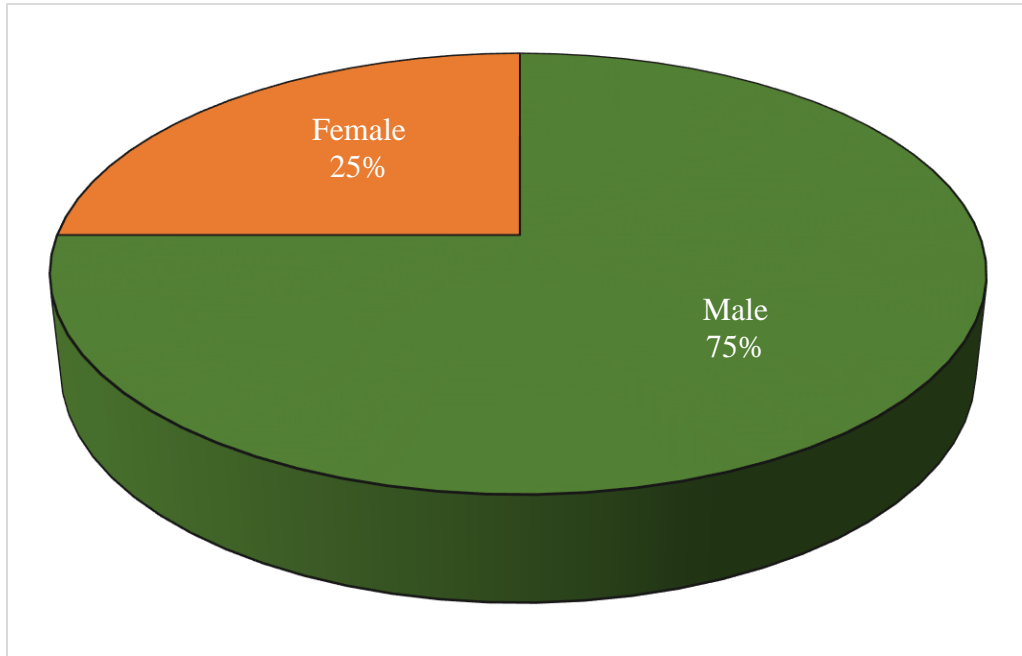


Figure-1: Gender of participations

### 4.1.3 Educational status of the participants

In this study 35% was illiterate, 5% was finish primary school, 25% was completed secondary school, 25% was completed S.S.C and 10% was completed bachelor.

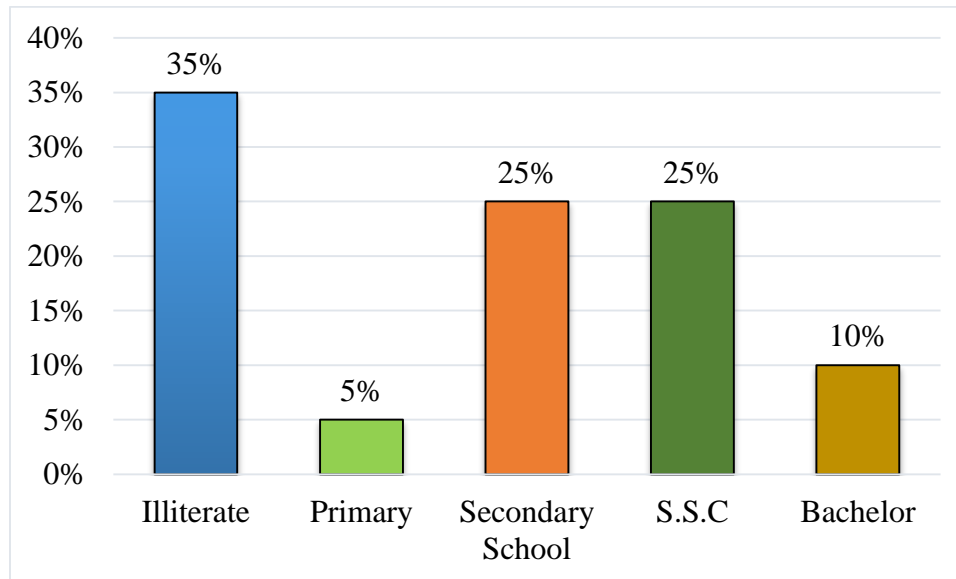


Figure-2: Educational status of the participant

#### 4.1.4 Occupation of the participants

In this study seven class peoples were participate. Here service holder was 10%, farmer was 10%, businessmen was 30%, housewife was 20%, teacher was 5%, student was 10% and others was 15%.

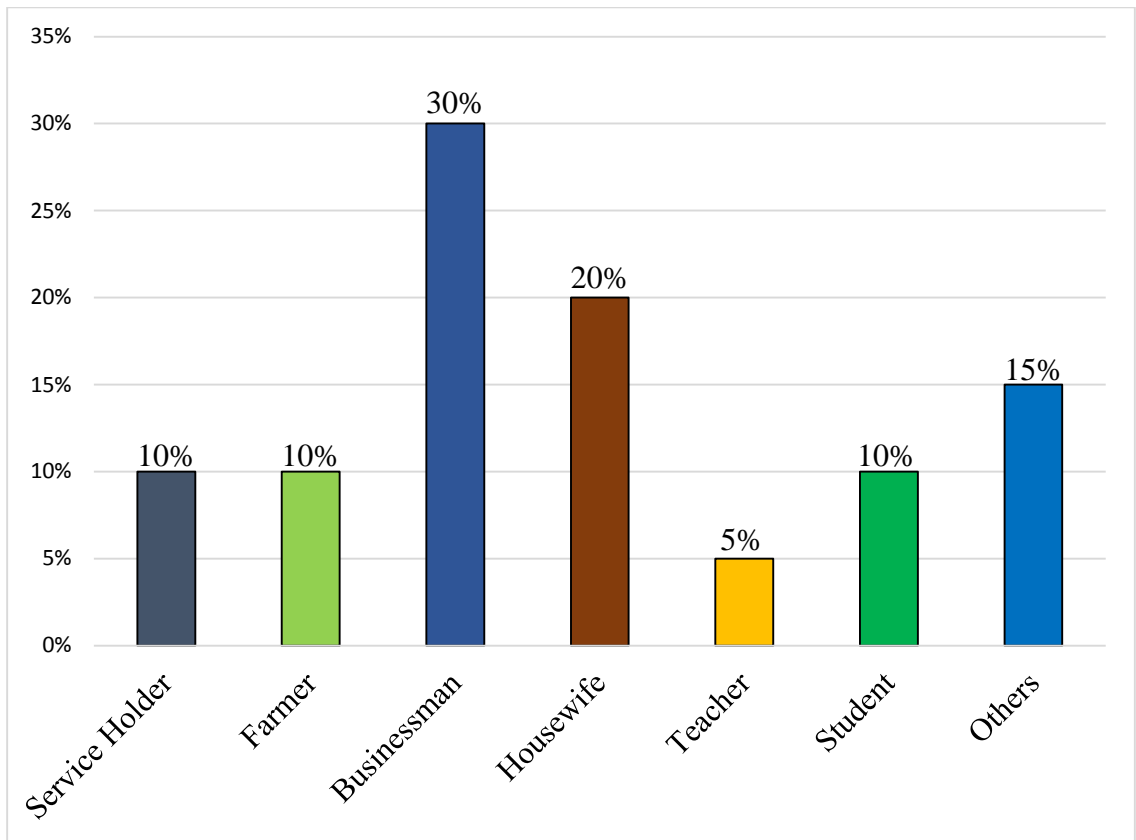


Figure-3: Occupation of the Participants

## 4.2 Oswestry disability index questionnaire

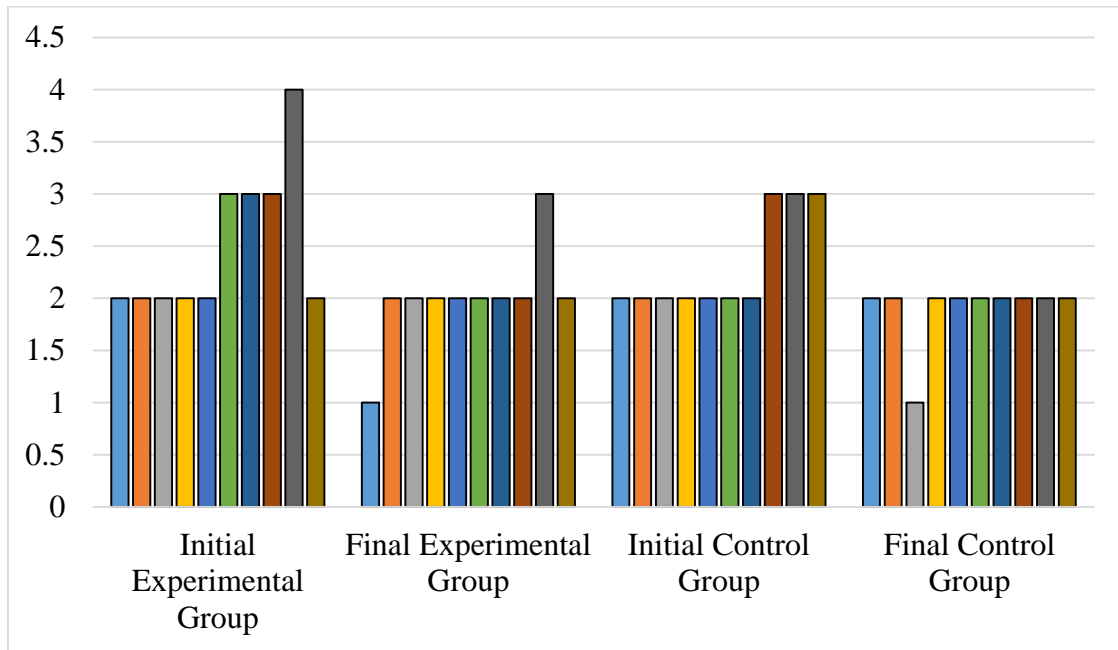


Figure-4: Disability among the participants.

Here.....

1 - Minimal disability
2 - Moderate disability
3 - Severe disability
4 - Crippled
5 - Bed bounded

In this study, among the participants experimental group (n=10) and control group (n=10). In initial assessment among the experimental group 60% patient was moderate disability, 30% was severe disability and 10% was crippled. In initial assessment among the control group 70% patient was moderate disability and 30% patient was 30%. In final assessment among the experimental group 10% patient was minimal disability, 80% patient was moderate disability and only 10% patient was found severe disability. In final assessment among the control group 10% patient was minimal disability and 90% patient was moderate disability.

### 4.3 Mean disability among the participants

In this study initial assessment of control group mean disability 40.20% and experimental group mean disability 40.40%. In final assessment mean disability of control group 33.80% and experimental group 31.80%.

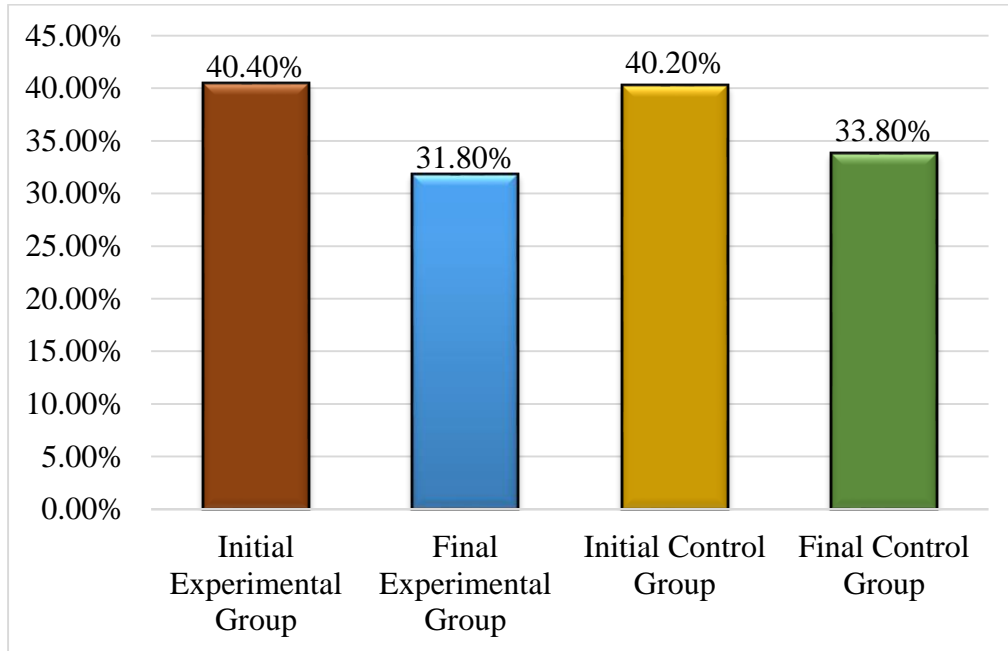


Figure-5: Mean disability among the participants

#### 4.4 Orebro back pain Questionnaire

##### 4.4.1 Missed of work day percentage among the participants due to pain

In this study 10% was missed work for 1-2 days, 5% was missed work for 3-7 days, 10% was missed work for 8-14 days, 20% was missed work for 15-30 days, 10% was missed work for 1 month, 15% was missed work for 2 months and 25% was missed work for 3-6 months and 5% was missed work for over 1 year.

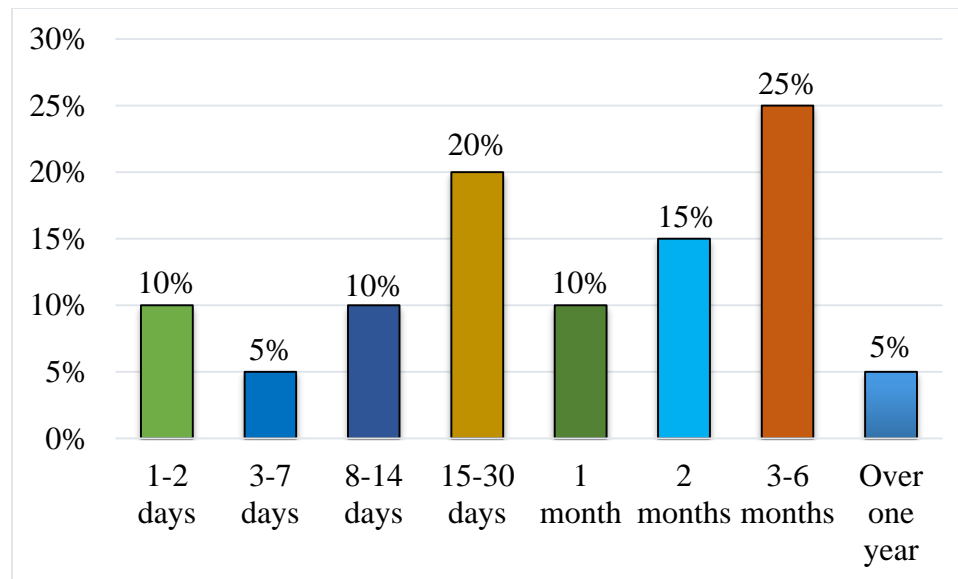


Figure-6: Missed of work day's percentage due to pain among the participants

#### 4.4.2 Duration of pain

In this study among the participants 45% was suffering from pain for 3-6 months, 5% was suffering for 6-9 months and 50% suffering for over one year.

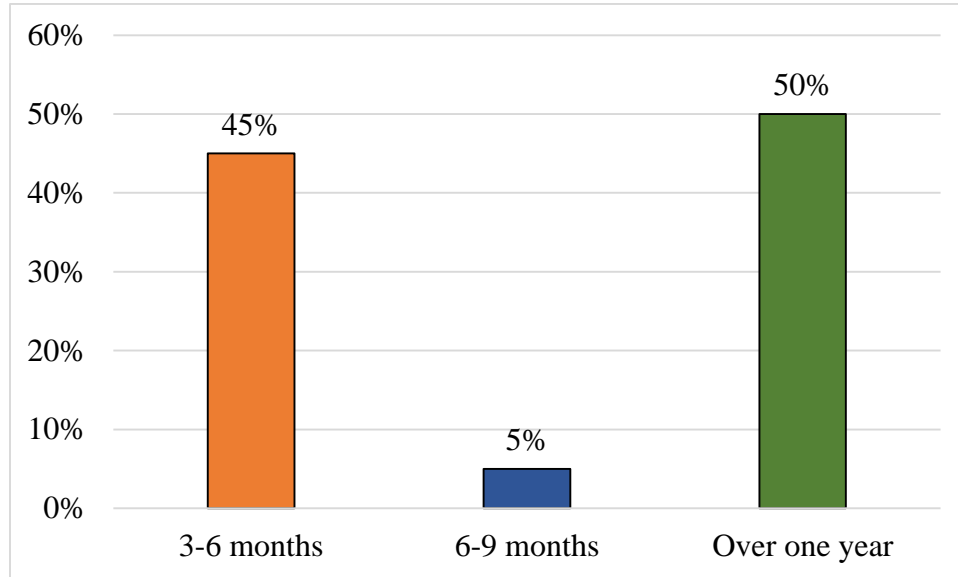


Figure-7: Duration of current pain problem among the participants

#### **4.4.3 Rating of pain intensity**

This study found that in the rating of pain intensity, observed t value was 7.236, mean difference was 1.6, standard deviation was  $\pm 0.699$  in the experimental group at two tailed paired t test while this same variable for control group observed t value was 5.014, mean difference was 0.9, standard deviation was  $\pm 0.568$  in within group. 5% level of significant at 9 (nine) degrees of freedom standard t value was 2.262 and observed t value in the rating of pain intensity in both groups which were greater than standard t value that mean null hypothesis was rejected and alternative hypothesis was accepted in the within group. Both groups in aspect of rating pain intensity were statistically significant at 0.000% and 0.001% level but the mean difference of the experimental group was greater than the control group that means core strengthening exercise along with conventional physiotherapy was more effective than conventional physiotherapy alone. The Unpaired/independent t-test in between group at 5% level of significant and 18 degrees of freedom standard table value was 2.101 and at the same significant level and same degree of freedom observed t value was 4.057. The observed t value was greater than the table value that indicate null hypothesis was rejected and alternative hypothesis was accepted that means core strengthening exercise along with conventional physiotherapy is more effective to reducing the pain rather than conventional physiotherapy alone.

#### **4.4.4 Experience of pain episodes**

This study found that in the experience of pain episodes, observed t value was 2.714, mean difference was 0.6, standard deviation was  $\pm 0.699$  in the experimental group and same variable for control group observed t value was 3.674 and mean difference was 0.6, standard deviation was  $\pm 0.516$  in within group. 5% level of significant at 9 (nine) degrees of freedom standard t value was 2.262 and observed t value in the experience of pain episodes for both groups which were greater than standard t value that means null hypothesis was rejected and alternative hypothesis was accepted in the within group. Both groups in aspect of experience of pain episodes were significant at 0.024% and 0.005% level, but the significant level and mean difference of the control group was greater than experimental group that means in aspect of experience of pain episodes conventional physiotherapy was more effective than core strengthening exercise along with conventional



physiotherapy. The Unpaired/independent t-test in between group at 5% level of significant and 18 degrees of freedom standard table value was 2.101 and at the same significant level and same degree of freedom observed t value was 0.983. The observed t value was less than the table value that means null hypothesis was accepted and alternative hypothesis was rejected that means core strengthening exercise along with conventional physiotherapy was not effective than conventional physiotherapy alone.

#### **4.4.5 Ability to decrease pain intensity**

This study found that in the ability to decrease pain, observed t value was 1.580, mean difference was 0.5, standard deviation was  $\pm 1.509$  in the experimental group and control group observed t value was 0.688, mean difference was 0.2, standard deviation was  $\pm 0.919$  in within group. 5% level of significant at 9 (nine) degrees of freedom standard t value was 2.262 and observed t value in the ability to decrease pain for both groups which were less than standard t value that means null hypothesis was accepted and alternative hypothesis was rejected in the within group. Both groups in aspect of ability to decrease pain intensity were significant at 0.024% and 0.005% level, but the significant level and mean difference of the experimental group was greater than experimental group that means core strengthening exercise along with conventional physiotherapy was more effective than conventional physiotherapy alone. The Unpaired/independent t-test in between group at 5% level of significant and 18 degrees of freedom standard table value was 2.101 and at the same significant level and same degree of freedom observed t value was 0.667. The observed t value was less than the table value that means null hypothesis was accepted and alternative hypothesis was rejected that means core strengthening exercise along with conventional physiotherapy was not more effective than conventional physiotherapy alone.

#### **4.4.6 Risk of persistent current pain**

This study found that the risk of persistent current pain, observed t value was 1.714, mean difference was 0.8, standard deviation was  $\pm 1.509$  in the experimental group and control group observed t value was 3.674, mean difference was 0.6, standard deviation was  $\pm 0.516$  in within group. 5% level of significant at 9 (nine) degrees of freedom standard t value was 2.262 and observed t value of experimental group is less than standard t value that means

null hypothesis was accepted and alternative hypothesis is rejected . The p value of control group was statistically significant at the level of 0.005% that means conventional physiotherapy was more effective than core strengthening exercise along with conventional physiotherapy. The Unpaired/independent t-test in between group at 5% level of significant and 18 degrees of freedom standard table value was 2.101 and at the same significant level and same degree of freedom observed t value was 0.721. The observed t value was less than the table value that indicate null hypothesis was accepted and alternative hypothesis was rejected that means core strengthening exercise along with conventional physiotherapy was not more effective than conventional physiotherapy alone.

#### **4.4.7 Pain intensity during Physical activity**

This study found that during physical activity, observed t value was 13.500, mean difference was 1.8, standard deviation was  $\pm 0.422$  in the experimental and control group observed t value was 5.014, mean difference was 0.9, standard deviation was  $\pm 0.568$  in within group. 5% level of significant at 9 (nine) degrees of freedom standard t value was 2.262. The observed t value of both groups was greater than standard t value that means null hypothesis was rejected alternative hypothesis was accepted. But the mean difference of experimental group was higher than control group that means core strengthening exercise along with conventional physiotherapy was effective for chronic low back pain rather than conventional physiotherapy alone. The Unpaired/independent t-test in between group at 5% level of significant and 18 degrees of freedom standard table value was 2.101 and at the same significant level and same degree of freedom observed t value was 2.309. The observed t value was higher than the table value that meant null hypothesis was rejected and alternative hypothesis was accepted that means core strengthening exercise along with conventional physiotherapy was more effective than conventional physiotherapy alone.

#### **4.4.8 Stop doing work until the pain decrease**

This study found that to stop doing work until the pain decrease, observed t value was 11.000, mean difference was 1.1, standard deviation was  $\pm 0.316$ , p value was 0.000% in the experimental group and control group observed t value was 3.774, mean difference was

0.6, standard deviation was  $\pm 0.516$ , p value was 0.005% in within group. 5% level of significant at 9 (nine) degrees of freedom standard t value was 2.262. The observed t value of both groups was greater than standard t value that means null hypothesis was rejected alternative hypothesis was accepted. But the mean difference of experimental group was greater than control group that means core strengthening exercise along with conventional physiotherapy was more effective for chronic low back pain rather than conventional physiotherapy alone. The Unpaired/independent t-test in between group at 5% level of significant and 18 degrees of freedom standard table value was 2.101 and at the same significant level and same degree of freedom observed t value was 1.282. The observed t value was less than the table value that indicate null hypothesis was accepted and alternative hypothesis was rejected that means core strengthening exercise along with conventional physiotherapy was not more effective than conventional physiotherapy alone.

#### **4.4.9 Pain intensity during normal work**

This study found that during normal work, observed t value was 6.708, mean difference was 1.50, standard deviation was  $\pm 0.707$ , p value was 0.000% in the experimental group and control group observed t value was 2.236, mean difference was 0.6, standard deviation was  $\pm 0.516$ , p value was 0.052%. 5% level of significant at 9 (nine) degrees of freedom standard t value was 2.262. The observed t value of experimental group is greater than standard t value but the observed t value control group was less standard t value which indicate null hypothesis was rejected and alternative hypothesis was accepted that means core strengthening exercise along with conventional physiotherapy was more effective than conventional physiotherapy alone. The Unpaired/independent t-test in between group at 5% level of significant and 18 degrees of freedom standard table value was 2.101 and at the same significant level and same degree of freedom observed t value was 1.922. The observed t value was less than the table value which indicate null hypothesis was accepted and alternative hypothesis was rejected that means core strengthening along with conventional physiotherapy was not more effective than conventional physiotherapy alone.

#### **4.4.10 Pain intensity during light work:**

This study found that during light work, observed t value was 3.087, mean difference was 1.2, standard deviation was  $\pm 1.229$ , p value was 0.013% in the experimental group and control group observed t value was 0.688, mean difference was 0.2, standard deviation was  $\pm 0.919$ , p value was 0.509% in within group. 5% level of significant at 9 (nine) degrees of freedom standard t value was 2.262. The observed t value of experimental group was greater than standard t value but the observed t value of control group was less than standard t value which indicate null hypothesis was rejected and alternative hypothesis was accepted that means core strengthening exercise along with conventional physiotherapy was more effective than conventional physiotherapy alone. Unpaired/independent t-test in between group at 5% level of significant and 18 degrees of freedom standard table value was 2.101 and at the same significant level and same degree of freedom observed t value was 0.983. The observed t value was less than the table value which indicate null hypothesis was accepted and alternative hypothesis was rejected that means core strengthening along with conventional physiotherapy was not more effective than conventional physiotherapy alone.

#### **4.4.11 Pain intensity during walk for an hour**

This study found that during walk for an hour, observed t value was 4.118, mean difference was 1.4, standard deviation was  $\pm 1.075$ , p value was 0.003% in the experimental group and control group observed t value was 4.333, mean difference was 1.3, standard deviation was  $\pm 0.949$ , p value was 0.002% in within group. 5% level of significant at 9 (nine) degrees of freedom standard t value was 2.262. The observed t value of both groups was greater than standard t value but the mean difference of experimental group was greater than control group which indicate null hypothesis was rejected and alternative hypothesis was accepted that means core strengthening exercise along with conventional physiotherapy was more effective than conventional physiotherapy alone. Unpaired/independent t-test in between group at 5% level of significant and 18 degrees of freedom standard table value was 2.101 and at the same significant level and same degree of freedom observed t value was 0.287. The observed t value was less than the table value which indicate null hypothesis was

accepted and alternative hypothesis was rejected that means core strengthening along with conventional physiotherapy was not more effective than conventional physiotherapy alone.

#### **4.4.12 Pain intensity during ordinary house hold work**

This study found that during ordinary household work, observed t value was 3.881, mean difference was 1.3, standard deviation was  $\pm 1.059$ , p value was 0.004% in the experimental group and control group observed t value was 6.000, mean difference was 0.80, standard deviation was  $\pm 0.422$ , p value was 0.000% in within group. 5% level of significant at 9 (nine) degrees of freedom standard t value was 2.262. The observed t value of both groups was greater than standard t value but the mean difference of experimental group was greater than control group which indicate null hypothesis was rejected and alternative hypothesis was accepted that means core strengthening exercise along with conventional physiotherapy was more effective than conventional physiotherapy alone. Unpaired/independent t-test in between group at 5% level of significant and 18 degrees of freedom standard table value was 2.101 and at the same significant level and same degree of freedom observed t value was 2.327. The observed t value was greater than the table value which indicate null hypothesis was rejected and alternative hypothesis was accepted that means core strengthening exercise along with conventional physiotherapy was more effective than conventional physiotherapy alone

#### **4.4.13 Pain intensity during weekly shopping**

This study found that during weekly shopping, observed t value was 6.000, mean difference was 1.20, standard deviation was  $\pm 0.632$ , p value was 0.000% in the experimental group and control group observed t value was 6.780, mean difference was 1.00, standard deviation was  $\pm 0.471$ , p value was 0.000% in within group. 5% level of significant at 9 (nine) degrees of freedom standard t value was 2.262. The observed t value of both groups was greater than standard t value but the mean difference of experimental group was greater than control group which indicate null hypothesis was rejected and alternative hypothesis was accepted that means core strengthening exercise along with conventional physiotherapy was more effective than conventional physiotherapy alone. Unpaired/independent t-test in between group at 5% level of significant and 18 degrees of

freedom standard table value was 2.101 and at the same significant level and same degree of freedom observed t value was 0.509. The observed t value was less than the table value which indicate null hypothesis was accepted and alternative hypothesis was rejected that means core strengthening along with conventional physiotherapy was not more effective than conventional physiotherapy alone

#### **4.4.14 Pain intensity during sleep at night**

This study found that during sleep at night, observed t value was 4.272, mean difference was 2.40, standard deviation was  $\pm 1.776$ , p value was 0.002% in the experimental group and control group observed t value was 2.753, mean difference was 0.80, standard deviation was  $\pm 0.919$ , p value was 0.022% in within group. 5% level of significant at 9 (nine) degrees of freedom standard t value was 2.262. The observed t value of both groups was greater than standard t value but the mean difference of experimental group was greater than control group which indicate null hypothesis was rejected and alternative hypothesis was accepted that means core strengthening exercise along with conventional physiotherapy was more effective than conventional physiotherapy alone. Unpaired/independent t-test in between group at 5% level of significant and 18 degrees of freedom standard table value was 2.101 and at the same significant level and same degree of freedom observed t value was 0.120. The observed t value was less than the table value which indicate null hypothesis was accepted and alternative hypothesis was rejected that core strengthening along with conventional physiotherapy was not more effective than conventional physiotherapy alone.

The purpose of this study was to identify the effectiveness of core strengthening exercise along with conventional physiotherapy and conventional physiotherapy alone in patients with chronic low back pain. In the study, a total of 20 patients were recruited and they were randomly assigned into 2 groups. Both groups were assessed to determine the intensity of pain, back pain related functional disability using the outcome measures. In the experimental group, patients were given core strengthening exercise along with conventional physiotherapy and for the patients in the control group, conventional physiotherapy alone was given.

The results in the Experimental group, had an initial mean values of Orebro back pain questionnaire of  $6.40 \pm 1.174$  had reduced to  $4.80 \pm 1.033$  after 4 sessions showing reduction in the rating of pain intensity. Initial mean values of Oswestry disability index Questionnaire of  $2.50 \pm .707$  had reduced to  $2.00 \pm .471$  showing the significant improvement in functional ability of the patient with experimental group. The control group had an initial mean value of Orebro pain questionnaire of  $7.30 \pm 0.949$  that reduced to  $6.40 \pm .699$  after 4 sessions showing reduction in the rating of pain intensity. Initial values of Oswestry disability index Questionnaire of  $2.30 \pm 0.483$  had reduced to  $1.90 \pm .316$ , showing a significant improvement in the functional ability of the patients in this group. In the Experimental group Orebro back pain questionnaire for rating pain intensity t-value was 7.236 and P value was 0.000 ( $P < 0.05$ ). For Oswestry Low Back Pain Disability Questionnaire t-value was 3.000 and P value was 0.015 ( $P < 0.05$ ). In the control group Orebro back pain questionnaire for rating pain intensity t-value was 5.014 and P value was 0.001 ( $P < 0.05$ ). For Oswestry Low Back Pain Disability Questionnaire t-value was 2.449 and P value was 0.037 ( $P < 0.05$ ). The mean age of the experimental group was 35.7 years and control group was 46.4 years. Age would be a factor for significant improvement in experimental group rather than control group.

This results show that there were more significant improvement in the rating of pain and in functional ability in Experimental group when compared with Control group. The results of present study proves that, Core strengthening exercise along with conventional

physiotherapy obtained significantly better improvement in pain levels and chronic back pain related functional disability when compared to conventional physiotherapy exercises alone.

Kumar et al. (2015) concluded that core muscle strengthening exercise along with lumbar flexibility and Gluteus maximus strengthening is an effective rehabilitation technique for all chronic low back pain patients irrespective of duration (chronicity) of their pain.

Shoukat et al. (2014) showed that the combination of interventions core stabilization along with conventional physiotherapy treatment proved to be as effective in decreasing pain and improving functional status of patient as conventional physiotherapy alone.

Stankovic et al. (2012) concluded that specifically designed stabilization exercises program in combination with strengthening and stretching aerobic exercises had positive effect on pain reduction, functionality and quality of life parameters in patients with CLBP. With high statistical significance, they showed that combined stabilization program was more effective in all tested aspects compared to the traditional exercises for CLBP. After the therapy, pain was successfully reduced in both experimental and control groups with higher statistical significance in the study group ( $p < 0.001$ ). Improvement in ODI score was statistically more significant in the experimental group compared to the control group ( $p < 0.001$ ).

The main limitation of this study was its short duration. Treatment session was small, only given 4 session. The study was conducted with 20 patients of low back pain which was a very small number of samples in both groups and was not sufficient enough for the study to generalize the wider population of this condition. The research was carried out in CRP Savar such a small environment, so it was difficult to keep confidential the aims of the study for blinding procedure. Therefore, single blind method was used in this study. There was no available research done in this area in Bangladesh. So, relevant information about low back pain patient with specific intervention for Bangladesh was very limited in this study.



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

Core strengthening exercise was used along with conventional physiotherapy that aims to reduce pain on lower back, to facilitate rehabilitation program. So it may become helpful for patients with chronic low back pain to determine core strengthening exercise with conventional physiotherapy as intervention for reducing the features of chronic low back pain. From this research the researcher wishes to explore the effectiveness of core strengthening exercise along with conventional physiotherapy to reduce the features of chronic low back pain, which will be helpful to facilitate in rehabilitation and enhance functional activities.

Despite the limitations of the study particularly small sample size, the results of the study give further motivation to controlled clinical trials with sufficient time and sample size. It could be suggested that for future study can be carried out with role of core strengthening exercise in athletic function as well as performance.

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## APPENDIX

### Consent Form

Assalamu-alaikum/ Namasker,

I am Md. Mustafizur Rahman Parag, 4th year student of B.Sc in Physiotherapy at Bangladesh Health Professions Institute. I am conducting a research and the title is- **“Effectiveness of core muscles strengthening exercises along with conventional physiotherapy for the treatment of patients with chronic low back pain”** which is included my course. For that I'm asking you to answer some questions, which will take 20-25 minutes. It also ensures that the information you provide will be kept confidential.

Participation here depends on your own will. If you want, you can skip your name from the list of participants at any time. In addition, if you have any questions as a participant in this study or if there is any problem, you can contact with me or my Supervisor Mohammad Anwar Hossain, Associate Professor, BHPI and Head of the Department, Department of Physiotherapy, CRP, Savar, Dhaka-1343.

Do you have any questions before starting the research?

Can I start this interview with your permission?

Yes:

No:

1. Signature of the Participant \_\_\_\_\_

2. Signature of the Interviewer \_\_\_\_\_

3. Signature of the Witness \_\_\_\_\_

## সম্মতিপত্র

আসসালামুয়ালাইকুম/ নমস্কার,

আমি মোঃ মোস্তাফিজুর রহমান পরাগ, ‘বাংলাদেশ হেলথ প্রফেশন্স ইনস্টিটিউট’ এর চতুর্থ বর্ষের একজন ছাত্র। আমি একটি গবেষণা করছি যার শিরোনাম হল “দীর্ঘস্থায়ী কোমর ব্যথা রোগীদের চিকিৎসার জন্য প্রচলিত ফিজিওথেরাপীসহ কোর পেশীসমূহের শক্তিশালীকরণ ব্যায়ামগুলোর কার্যকরিতা”, যেটা আমার অধ্যয়নের অন্তর্গত। এই জন্য আমি আপনার কাছে কিছু প্রশ্নের উত্তর জানতে চাচ্ছি, যেটাতে সর্বমোট ২০- ২৫ মিনিট সময় লাগবে। এটাও নিশ্চিত করছি যে আপনি যেসব তথ্য প্রধান করবেন তার গোপনীয়তা বজায় থাকবে।

এখানে অংশগ্রহন আপনার নিজের উপর নির্ভর করে। আপনি চাইলে যে কোন সময় কোন ফলাফল ছাড়াই চলে যেতে পারেন। এ ছাড়াও যদি আপনার এই গবেষণায় অংশগ্রহনকারী হিসেবে কোন প্রশ্ন থাকে তাহলে আপনি আমাকে অথবা আমার সুপারভাইজার মোহাম্মদ আনোয়ার হোসেন, সহযোগী অধ্যাপক, বিএইচপিআই এবং বিভাগীয় প্রধান, ফিজিওথেরাপী বিভাগ, সিআরপি, সাভার, ঢাকা-১৩৪৩ এর সহিত যোগাযোগ করতে পারেন।

সাক্ষাৎকার শুরু করার আগে কি আপনার কোন প্রশ্ন আছে ?

সুতরাং আমি আপনার অনুমতিতে এই সাক্ষাৎকার শুরু করতে পারি ?

হ্যাঁ

না

১। অংশগ্রহনকারীর স্বাক্ষর ও তারিখ \_\_\_\_\_

২। উপাত্ত সংগ্রহকারীর স্বাক্ষর ও তারিখ \_\_\_\_\_

৩। সাক্ষীর স্বাক্ষর ও তারিখ \_\_\_\_\_

**Data Collection Form**  
**Questionnaire (English)**

Questionnaire sheet

**Code No:**

**Title: “Effectiveness of core muscles strengthening exercises along with conventional physiotherapy for the treatment of patients with chronic low back pain.”**

**Part-1: Patient’s identification (To be collected from medical record/respondent):**

1.1	Identification number:
1.2	Date of interview:
1.3	Name of respondent:
1.4	Address:  House number/Village:  P.O:  P.S:  District:
1.5	Contact number:
1.6	Place of data collection:
1.7	Consent taken:

**Part-2: Socio-demographic information (To be collected from medical record/respondent):**

Q.N	Question and filters	Response	Score
2.1	Age	.....years	
2.2	Sex	Male .....	01
		Female.....	02
2.3	Body weight	.....kg	
2.4	What is your marital status?	Married.....	01
		Unmarried .....	02
		Divorced .....	03
		Separated.....	04
2.5	What is your religion?	Islam .....	01
		Hindu.....	02
		Christian.....	03
		Buddha.....	04
		Others.....	05
2.6	What is your education status?	Illiterate.....	01
		Primary School.....	02
		Secondary School.....	03
		S.S.C.....	04
		H.S.C.....	05
		Bachelor or Above.....	06
2.7	What is your occupation?	Rickshaw puller.....	01
		Service holder.....	02
		Farmer.....	03
		Driver .....	04
		Businessman.....	05
		Day laborer .....	06
		Housewife .....	07
		Teacher .....	08
		Student .....	09

		Doctor .....	10
		Physiotherapist.....	11
		Others (specify).....	12
2.8	What is your residential area?	Urban.....	01
		Rural.....	02
2.9	Hobby	Sports.....	01
		Watching TV.....	02
		Roaming.....	03
		Reading Book.....	04
		Gardening.....	05
		Others.....	06
2.10	Personal Habit (Smoking /Betel leaf)	Yes.....	01
		No.....	02
2.11	Family Size	Nuclear Family.....	01
		Joint Family.....	02
2.12	Family Income	Monthly Income:	
		Yearly Income:	

**Part-3: Orebro Back pain related Questionnaire:**

<b>Q.N</b>	<b>Question and filters</b>	<b>Response</b>	<b>Score</b>
3.1	Where do you pain?	Neck	01
		Lower back	02
		Shoulder	03
		Leg	04
		Arm	05
		Upper back	06
		Other (state)	07
3.2	How many days of work have you missed because of pain during the past 18 months?	0 days	01
		1-2 days	02
		3-7 days	03
		8- 14 days	04
		15-30 days	05
		1 month	06
		2 months	07
		3-6 months	08
		6-12 months	09
		Over 1 year	10
3.3	How long have you had your current pain problem?	0-1 week	01
		1-2 weeks	02
		3-4 weeks	03
		4-5 weeks	04
		6-8 weeks	05
		9-11 weeks	06
		3-6 months	07
		6-9 months	08
		9-12 months	09
		Over 1 year	10

3.4	Is your work heavy or monotonous 0 1 2 3 4 5 6 7 8 9 10 Not at all Extremely	
3.5	How would you rate the pain that you have had during the past week? 0 1 2 3 4 5 6 7 8 9 10 No Pain Pain as bad as it could be	
3.6	In the past three months, on average, how bad was your pain on a 0-10 scale? 0 1 2 3 4 5 6 7 8 9 10 No Pain Pain as bad as it could be	
3.7	How often would you say that you have experience pain episodes, on average, during the past three months? 0 1 2 3 4 5 6 7 8 9 10 No Pain Always	
3.8	Based on all things you do to cope, or deal with your pain, on an average day, how much are you able to decrease it? 0 1 2 3 4 5 6 7 8 9 10 Can't decrease Can decrease	
3.9	How tense or anxious have you felt in the past week? 0 1 2 3 4 5 6 7 8 9 10 Absolutely relax Felt tense or anxious	
3.10	How much you have been bothered by feeling depressed in the past week? 0 1 2 3 4 5 6 7 8 9 10 Not at all Extremely	
3.11	In your view, how large is the risk that your current pain may become persistent? 0 1 2 3 4 5 6 7 8 9 10 Not risk Very large risk	
3.12	In your estimation, what are the chances that you will be able to work in the six months? 0 1 2 3 4 5 6 7 8 9 10 No chance Very large chance	
3.13	Physical activity makes my pain worse 0 1 2 3 4 5 6 7 8 9 10 Completely disagree Completely agree	
3.14	As increase in pain is an indication that I should stop what I'm doing until the pain decrease. 0 1 2 3 4 5 6 7 8 9 10 Completely disagree Completely agree	

3.15	I should not do my normal work with my present pain. 0 1 2 3 4 5 6 7 8 9 10 Completely disagree Completely agree	
3.16	I can do light work for an hour. 0 1 2 3 4 5 6 7 8 9 10 Can't do it Can do it	
3.17	I can walk for an hour 0 1 2 3 4 5 6 7 8 9 10 Can't do it Can do it	
3.18	I can do ordinary household work. 0 1 2 3 4 5 6 7 8 9 10 Can't do it Can do it	
3.19	I can do the weekly shopping. 0 1 2 3 4 5 6 7 8 9 10 Can't do it Can do it	
3.20	I can sleep at night. 0 1 2 3 4 5 6 7 8 9 10 Can't do it Can do it	



**Part-4: Oswestry Low Back Pain Disability Questionnaire:**

<b>Q.N</b>	<b>Question and filters</b>	<b>Response</b>	<b>Score</b>
4.1	Pain Intensity	I can tolerate the pain I have without having to use pain medication.	0
		The pain is bad but I manage without having to take pain medication.	1
		Pain medication provides me complete relief from pain.	2
		Pain medication provides me moderate relief from pain.	3
		Pain medication provides me little relief from pain.	4
		Pain medication has no effect on the pain.	5
4.2	Personal Care (Washing, Dressing, etc.)	I can take care of myself normally without causing increased pain.	0
		I can take care of myself normally but it increases my pain.	1
		It is painful to take care of myself and I am slow and careful.	2
		I need help but I am able to manage most of my personal care.	3
		I need help every day in most aspects of my care.	4
		I do not get dressed, wash with difficulty and stay in bed.	5
4.3	Lifting	I can lift heavy weights without increased pain.	0
		I can lift heavy weights but it causes increased pain.	1
		Pain prevents me from lifting heavy weights off the floor, but I can manage if weights are conveniently positioned, e.g. on a table.	2
		Pain prevents me from lifting heavy weights but I can manage light to medium weights if they are conveniently positioned.	3
		I can lift only very light weights.	4

		I cannot lift or carry anything at all.	5
4.4	Walking	Pain does not prevent me walking any distance.	0
		Pain prevents me walking more than 1 mile.	1
		Pain prevents me walking more than ½ mile.	2
		Pain prevents me walking more than ¼ mile.	3
		I can only walk using crutches or a cane.	4
		I am in bed most of the time and have to crawl to the toilet.	5
4.5	Sitting	I can sit in any chair as long as I like.	0
		I can only sit in my favorite chair as long as I like.	1
		Pain prevents me sitting more than 1 hour.	2
		Pain prevents me from sitting more than ½ hour.	3
		Pain prevents me from sitting more than 10 mins.	4
		Pain prevents me from sitting at all.	5
4.6	Standing	I can stand as long as I want without increased pain.	0
		I can stand as long as I want but increases my pain.	1
		Pain prevents me from standing for more than 1 hour.	2
		Pain prevents me from standing for more than ½ hour.	3
		Pain prevents me from standing for more than 10 mins.	4
		Pain prevents me from standing at all.	5
4.7	Sleeping	Pain does not prevent me from sleeping well.	0
		I can sleep well only by using pain medication.	1
		Even when I take pain medication, I sleep less than 6 hours.	2
		Even when I take pain medication, I sleep less than 4 hours.	3

		Even when I take pain medication, I sleep less than 2 hours.	4
		Pain prevents me from sleeping at all.	5
4.8	Social Life	My social life is normal and does not increase my pain.	0
		My social life is normal, but it increases my level of pain.	1
		Pain prevents me from participating in more energetic activities (e.g. sports, dancing etc).	2
		Pain prevents me from going out very often.	3
		Pain has restricted my social life to my home.	4
		I have hardly any social life because of my.	5
4.9	Traveling	I can travel anywhere without increased pain.	0
		I can travel anywhere but it increases my pain.	1
		Pain restricts travel over 2 hours.	2
		Pain restricts travel over 1 hour.	3
		Pain restricts my travel to short necessary journeys under ½ hour.	4
		Pain prevents all travel except for visits to the doctor/therapist or hospital.	5
4.10	Employment/Homemaking	My normal homemaking/job activities do not cause pain.	0
		My normal homemaking/job activities increase my pain, but I can still perform all that is required of me.	1
		I can perform most of my homemaking/job duties, but pain prevents me from performing more physically stressful activities (e.g. Lifting, vacuuming).	2
		Pain prevents me from doing anything but light duties.	3
		Pain prevents me from doing even light duties.	4
		Pain prevents me from performing any job/homemaking chores.	5
Total Oswestry disability percentage (%) =			

## প্রশ্নপত্র

কোড নং:

শিরোনামঃ “দীর্ঘস্থায়ী কোমর ব্যথা রোগীদের চিকিৎসার জন্য প্রচলিত ফিজিওথেরাপীসহ কোর পেশীসমূহের শক্তিশালীকরণ ব্যায়ামগুলোর কার্যকরিতা”।

**পর্ব-১। রোগীর সনাক্তকরণঃ(রোগীর তালিকা পুস্তক/রোগীর নিকট থেকে সংগৃহীত):**

১.১	সনাক্তকরণ নম্বরঃ
১.২	সাক্ষাৎকারের তারিখঃ
১.৩	উত্তরবাদীর নামঃ
১.৪	ঠিকানাঃ বাড়ী নং/গ্রামঃ ইউনিয়নঃ থানাঃ জেলাঃ
১.৫	যোগাযোগ নম্বরঃ
১.৬	উপাত্ত সংগ্রহের স্থানঃ
১.৭	সম্মতি গ্রহনঃ

পর্ব-২।রোগীর সামাজিক জনতাত্তিক তথ্যাবলী(রোগীর তালিকাপুস্তক/রোগীর নিকট থেকে সংগৃহিত):

প্রশ্ন নং	প্রশ্ন	উত্তর	স্কোর
২.১	বয়স	.....বছর	
২.২	লিঙ্গ	পুরুষ..... মহিলা.....	১ ২
২.৩	শরীরের ওজন	.....কেজি	
২.৪	আপনার বৈবাহিক অবস্থা কি?	বিবাহিত..... অবিবাহিত..... তালাকপ্রাপ্ত..... পৃথকীকৃত..... অন্যান্য.....	১ ২ ৩ ৪ ৫
২.৫	আপনার ধর্ম কি?	ইসলাম..... হিন্দু..... খ্রিস্টান..... বুদ্ধ..... অন্যান্য.....	১ ২ ৩ ৪ ৫
২.৬	আপনার শিক্ষা অবস্থা কী?	নিরক্ষর..... প্রাথমিক..... মাধ্যমিক..... এস.এস.সি..... এইচ.এস.সি..... স্নাতক/ স্নাতকোত্তর.....	১ ২ ৩ ৪ ৫ ৬
২.৭	আপনার পেশা কি?	রিকশাওয়ালা..... চাকরিজীবী..... কৃষক..... চালক..... ব্যবসায়ী..... দিনমজুর..... গৃহিনী..... শিক্ষক..... ছাত্র..... ডাক্তার..... ফিজিওথেরাপিস্ট..... অন্যান্য.....	১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০ ১১ ১২

২.৮	আপনার বসবাসের এলাকা কেমন?	শহর.....	১
		গ্রাম.....	২
২.৯	শখ	খেলাধূলা.....	১
		টিভি দেখা.....	২
		ঘুরতে যাওয়া.....	৩
		বই পড়া.....	৪
		বাগান করা.....	৫
		অন্যান্য.....	৬
২.১০	ব্যক্তিগত অভ্যাস (ধূমপান/পাণ খাওয়া)	হ্যাঁ.....	১
		না.....	২
২.১১	পরিবারের ধরন	একক পরিবার.....	১
		যৌথ পরিবার.....	২
২.১২	পরিবারের আয়	১। মাসিক আয়:	
		২। বাৎসরিক আয়:	

পর্ব-৩। অরৈত্রী কোমর ব্যথা সম্পর্কিত প্রশ্নসমূহঃ

প্রশ্ন নং	প্রশ্ন	উত্তর	স্কোর
৩.১।	আপনার ব্যথা কোথায়?	ঘাড়ে	১
		কোমরে	২
		কাঁধে	৩
		পায়ে	৪
		বাহুতে	৫
		পিঠে	৬
		অন্যান্য	৭
৩.২।	গত ১৮ মাসে ব্যথার জন্য কত দিন কাজ করতে পারেননি?	০ দিন	১
		১-২ দিন	২
		৩-৭ দিন	৩
		৮-১৪ দিন	৪
		১৫- ৩০ দিন	৫
		১ মাস	৬
		২ মাস	৭
		৩-৬ মাস	৮
		৬-১২ মাস	৯
		১ বছরের বেশি	১০
৩.৩।	আপনার ব্যথা কত দিন যাবত?	০-১ সপ্তাহ	১
		১-২ সপ্তাহ	২
		৩-৪ সপ্তাহ	৩
		৪-৫ সপ্তাহ	৪
		৬-৮ সপ্তাহ	৫
		৯-১১ সপ্তাহ	৬
		৩-৬ মাস	৭
		৬-৯ মাস	৮
		৯-১২ মাস	৯
		১ বছরের বেশি	১০
৩.৪।	আপনার কাজ কি খুব বেশি কঠিন বা একঘেয়ে? ০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০ না অনেক বেশি		
৩.৫।	গত সপ্তাহে আপনার ব্যথার মাত্রা কেমন ছিল?		

	<p>০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০</p> <p>কোন ব্যথা ছিল না <span style="float: right;">অনেক ব্যথা ছিল</span></p>	
৩.৬।	<p>গত ৩ মাসে, আপনার ব্যথার মাত্রা ০-১০ স্কেলে কত ছিল?</p> <p>০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০</p> <p>কোন ব্যথা ছিল না <span style="float: right;">অনেক ব্যথা ছিল</span></p>	
৩.৭।	<p>গত ৩ মাসে আপনার ব্যথা কি সবসময় ছিল?</p> <p>০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০</p> <p>কখনো না <span style="float: right;">সব সময়</span></p>	
৩.৮।	<p>সবকিছুর উপর ভিত্তি করে, আপনার ব্যথা কত টুকু কমেছে?</p> <p>০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০</p> <p>কমেনি <span style="float: right;">সম্পূর্ণ কমেছে</span></p>	
৩.৯।	<p>গত সপ্তাহে ব্যথা নিয়ে আপনি কি চিন্তিত ছিলেন?</p> <p>০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০</p> <p>চিন্তামুক্ত ছিলাম <span style="float: right;">খুব চিন্তিত ছিলাম</span></p>	
৩.১০।	<p>গত সপ্তাহে ব্যথা নিয়ে আপনি কি বিষন্নতায় ছিলেন?</p> <p>০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০</p> <p>বিষন্নতায় ছিলাম না <span style="float: right;">খুব বিষন্নতায় ছিলাম</span></p>	
৩.১১।	<p>আপনার দৃষ্টিতে ব্যথা ক্রমাগত হওয়ার ঝুঁকি আছে কি?</p> <p>০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০</p> <p>ঝুঁকি নেই <span style="float: right;">ঝুঁকি আছে</span></p>	
৩.১২।	<p>আপনার অনুমানে, আপনি কি ৬ মাসে সম্পূর্ণরূপে কাজ করতে সক্ষম হবেন?</p> <p>০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০</p> <p>সুযোগ নেই <span style="float: right;">সুযোগ আছে</span></p>	
৩.১৩।	<p>শারীরিক কাজকর্ম আমার ব্যথা বাড়ায়</p> <p>০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০</p> <p>সম্পূর্ণরূপে একমত না <span style="float: right;">সম্পূর্ণরূপে একমত</span></p>	
৩.১৪।	<p>ব্যথা বৃদ্ধি আমার কাজকে বন্ধ রাখে</p> <p>০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০</p> <p>সম্পূর্ণরূপে একমত না <span style="float: right;">সম্পূর্ণরূপে একমত</span></p>	
৩.১৫।	<p>আমার বর্তমান ব্যথা নিয়ে স্বাভাবিক কাজ করা উচিত না</p> <p>০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০</p> <p>সম্পূর্ণরূপে একমত না <span style="float: right;">সম্পূর্ণরূপে একমত</span></p>	
৩.১৬।	<p>আমি হালকা কাজ ১ ঘণ্টা করতে পার</p> <p>০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০</p> <p>ব্যথার জন্য করতে পারি না <span style="float: right;">ব্যথা ছাড়াই করতে পারি</span></p>	



৩.১৭।	আমি ১ ঘন্টা হাঁটতে পারি ০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০ ব্যথার জন্য হাঁটতে পারি না ব্যথা ছাড়াই হাঁটতে পারি	
৩.১৮।	আমি ঘরের কাজ করতে পারি ০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০ ব্যথার জন্য করতে পারি না ব্যথা ছাড়াই করতে পারি	
৩.১৯।	আমি সাপ্তাহিক বাজার করতে পারি ০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০ ব্যথার জন্য করতে পারি না ব্যথা ছাড়াই করতে পারি	
৩.২০।	আমি রাতে ঘুমাতে পারি ০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০ ব্যথার জন্য ঘুমাতে পারি না ব্যথা ছাড়াই ঘুমাতে পারি	

পর্ব-৪। অস-ওয়স্টি কোমর ব্যথায় অক্ষমতা সংক্রান্ত প্রশ্নাবলী:

প্রশ্ন নং	প্রশ্ন	উত্তর	স্কোর
8.১।	ব্যথার তীব্রতা	আমি ব্যথার ঔষধ ছাড়া ব্যথা সহ্য করতে পারি	0
		ব্যথা খারাপ কিন্তু আমি ব্যথার ঔষধ গ্রহন করা ছাড়া ব্যথা সহ্য করতে পারি	১
		ঔষধ ব্যথাকে সম্পূর্ণভাবে নিরাময় করতে পারে	২
		ঔষধ ব্যথাকে সীমিতভাবে নিরাময় করতে পারে	৩
		ঔষধ ব্যথাকে খুব অল্পভাবে নিরাময় করতে পারে	৪
		আমি ব্যথা নিরাময়ে ঔষধ ব্যবহার করি না	৫
8.২।	ব্যক্তিগত যত্ন (দ্বৈতকরণ, পরিধান ইত্যাদি)	আমি সাধারণত নিজেকে দেখাশুনা করতে পারি, ব্যথা ছাড়া	0
		আমি সাধারণত নিজেকে দেখাশুনা করতে পারি, কিন্তু এটা কিছুটা ব্যথাদায়ক	১
		নিজেকে দেখাশুনা করা ব্যথাদায়ক, কিন্তু আমি কিছুটা সতর্কতা অবলম্ব করি	২
		আমার কিছু সাহায্য প্রয়োজন হয়, কিন্তু অধিকাংশ কাজ আমি নিজে করতে পারি	৩
		আমার নিজের কাজকর্মের জন্য সারাদিনব্যাপী অন্যের সাহায্যের প্রয়োজন হয়	৪
		আমি কষ্ট করেও কাপড় পরিষ্কার করতে পারি না এবং বিশ্রামে থাকি	৫
8.৩।	উত্তোলন	আমি বর্ধিত ব্যথা ছাড়া ভারী ওজন উত্তোলন করতে পারি	0
		আমি ভারী ওজন উত্তোলন করতে পারি কিন্তু এটি ব্যথা বৃদ্ধি করে	১
		ব্যথা মেঝে থেকে ভারী ওজন উত্তোলনে আমাকে বাধা দেয় কিন্তু আমি পরিচালনা করতে পারি যদি ওজন সুবিধামত হয় (যেমন-টেবিল থেকে)	২
		আমি ব্যথার জন্য আমি ভারী ওজন উত্তোলন করতে পারি না কিন্তু আমি সুবিধামত স্থান থেকে অল্প অথবা মোটামুটি ওজন উত্তোলন করতে পারি	৩
		আমি খুবই অল্প ওজন উত্তোলন করতে পারি	৪
		আমি কোন ওজনই উত্তোলন অথবা বহন করতে পারি না	৫
8.৪।	হাঁটা	ব্যথা আমাকে যে কোন দূরত্বে হাঁটার ক্ষেত্রে বাঁধার সৃষ্টি করে না	0
		ব্যথা আমাকে এক মাইলের বেশি হাঁটতে বাঁধা সৃষ্টি করে	১
		ব্যথা আমাকে আধা মাইলের বেশি হাঁটতে বাঁধা সৃষ্টি করে	২

		ব্যথা আমাকে ১০০ গজের বেশি হাঁটতে বাঁধা সৃষ্টি করে	৩
		আমি শুধু লাঠি অথবা ক্রাচ ব্যবহার করে হাঁটতে পারি	৪
		আমি বেশিরভাগ সময় বিছানায় থাকি এবং হামাগুড়ি দিয়ে টয়লেটে যায়	৫
৪.৫।	বসা	আমি যে কোন চেয়ারে আমার নিজের ইচ্ছামত বসতে পারি	০
		আমি শুধুমাত্র আমার নিজের পছন্দের চেয়ারে ইচ্ছামত বসতে পারি	১
		আমি ব্যথার জন্য এক ঘন্টার বেশি বসতে পারি না	২
		আমি ব্যথার জন্য আধ ঘন্টার বেশি বসতে পারি না	৩
		আমি ব্যথার জন্য দশ মিনিটের বেশি বসতে পারি না	৪
		আমি ব্যথার জন্য সব সময় বসতে পারি না	৫
৪.৬।	দাঁড়ানো	আমি ব্যথা ছাড়া আমার ইচ্ছামত দাঁড়িয়ে থাকতে পারি	০
		আমি আমার ইচ্ছামত অনেকে দাঁড়িয়ে থাকতে পারি কিন্তু এটা কিছুটা ব্যথার সৃষ্টি করে	১
		আমি ব্যথার জন্য এক ঘন্টার বেশি দাঁড়িয়ে থাকতে পারি না	২
		আমি ব্যথার জন্য আধ ঘন্টার বেশি দাঁড়িয়ে থাকতে পারি না	৩
		আমি ব্যথার জন্য দশ মিনিটের বেশি দাঁড়িয়ে থাকতে পারি না	৪
		আমি ব্যথার জন্য সব সময় দাঁড়িয়ে থাকতে পারি না	৫
৪.৭।	ঘুমানো	ব্যথা আমার ঘুমের কোন সমস্যা সৃষ্টি করে না	০
		আমি একমাত্র বিছানায় ভালভাবে ঘুমাতে পারি	১
		আমি বিছানায় ছয় ঘন্টার কম ঘুমাতে পারি	২
		আমি বিছানায় চার ঘন্টার কম ঘুমাতে পারি	৩
		আমি বিছানায় দুই ঘন্টার কম ঘুমাতে পারি	৪
		আমি ব্যথার জন্য সব সময় ঘুমাতে পারি না	৫
৪.৮।	সামাজিক জীবন	আমার সামাজিক জীবন স্বাভাবিক এবং এটা কোন ব্যথা সৃষ্টি করে না	০
		আমার সামাজিক জীবন স্বাভাবিক কিন্তু এটা কিছুটা ব্যথা সৃষ্টি করে	১
		ব্যথা আমার সামাজিক জীবনে কোন প্রভাব ফেলে না কিন্তু উদ্দিপনামূলক কাজকর্ম থেকে বিরত রাখে (যেমন- খেলাধুলা, নাচ ইত্যাদি)	২
		ব্যথা আমার সামাজিক জীবনকে বাধাগ্রস্ত করে এবং বাইরে যেতে পারি না	৩
		ব্যথা আমার জীবনকে চার দেয়ালের মাঝে সীমাবদ্ধ করেছে	৪
		ব্যথার জন্য আমার কোন সামাজিক জীবন নেই	৫
	ভ্রমন	আমি ব্যথা ছাড়াই যে কোন জায়গায় ভ্রমন করতে পারি	০

8.৯।		আমি যে কোন জায়গায় ভ্রমণ করতে পারি কিন্তু এটা কিছুটা ব্যথা সৃষ্টি করে	১
		আমি ব্যথা নিয়ে দুই ঘন্টার বেশি ভ্রমণ করতে পারি না	২
		আমি ব্যথা নিয়ে এক ঘন্টার বেশি ভ্রমণ করতে পারি না	৩
		ব্যথার জন্যে আমি ত্রিশ মিনিটের বেশি ভ্রমণ করতে পারি না	৪
		ব্যথার জন্যে আমি চিকিৎসার প্রয়োজন ব্যতীত ভ্রমণ করতে পারি না	৫
8.১০	কর্মসংস্থান/গৃহকর্ম	আমার স্বাভাবিক গৃহকর্ম/ চাকরির কর্মকান্ড ব্যথা সৃষ্টি করে না	০
		আমার স্বাভাবিক গৃহকর্ম/ চাকরির কর্মকান্ড ব্যথা সৃষ্টি করে কিন্তু আমি এখনো আমার প্রয়োজন অনুযায়ী কাজ করতে পারি	১
		আমার স্বাভাবিক গৃহকর্ম/ চাকরির কর্মকান্ড করতে পারি কিন্তু ব্যথা আমাকে শারিরিকভাবে কষ্টকর কাজ করতে বাধা দেয়(যেমন- উত্তোলন, ভেকামিং)	২
		ব্যথা আমাকে যে কোন কাজ করতে বাঁধা দেয় কিন্তু হালকা কাজ করতে পারি	৩
		ব্যথা আমাকে হালকা কাজেও বাঁধা দেয়	৪
		ব্যথা আমাকে চাকরি/গৃহের যে কোন কাজে বাঁধা দেয়	৫
সর্বমোট অস-ওয়স্টি অক্ষমতার হার =			

April 26, 2017

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

**Subject: Application for permission to collect data.**

Dear Sir,

With due respect and humble submission to state that I am Md. Mustafizur Rahman Parag, student of 4<sup>th</sup> Professional B.Sc. in Physiotherapy at Bangladesh Health Professions Institute (BHPI). The ethical board of BHPI has approved my research project entitled on "Effectiveness of core muscles strengthening exercises along with conventional physiotherapy for the treatment of patients with chronic low back pain." To conduct this research, I want to collect data from the chronic low back pain patients who are taking treatment from Musculoskeletal Unit at CRP, Savar. So, I need your permission for data collection from your Department. I would like to assure that anything of my study will not be harmful for the participants.

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

Sincerely Yours,

Md. Mustafizur Rahman Parag  
Md. Mustafizur Rahman Parag

4<sup>th</sup> Professional B.Sc. in Physiotherapy  
Class Roll-05, Session: 2012-2013  
Bangladesh Health Professions Institute (BHPI)  
(An academic Institute of CRP)  
CRP, Chapain, Savar, Dhaka-1343.

*Approved*  
Please contact with M Hasan  
(Insan) as a counterpart of the  
data collection process.

*Attended*  
Mohammad Asif Hossain  
Associate Professor &  
Head of Physiotherapy Dept.  
CRP, Chapain, Savar, Dhaka-1343

*Seen*  
*26/04/17*

*Recommended & Forwarded*  
*26/04/17*

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



বাংলাদেশ হেল্থ প্রফেশন্স ইনস্টিটিউট (বিএইচপিআই)  
**Bangladesh Health Professions Institute (BHPI)**

(The Academic Institute of CRP)

Ref.

CRP-BHPI/IRB/04/17/95

Date: 16/07/17

To  
Md. Mustafizur Rahman Parag  
B.Sc. in Physiotherapy  
Session: 2012-2013, Student ID: 112120005  
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

**Subject: "Effectiveness of core muscles strengthening exercises along with conventional physiotherapy for the treatment of patients with chronic low back pain."**

Dear Md. Mustafizur Rahman Parag,

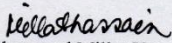
The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application on 14/08/2016 to conduct the above mentioned dissertation, with yourself, as the Principal investigator. The Following documents have been reviewed and approved:

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

Since the study involves "Orebro Back Pain" and "Oswestry Disability Index" questionnaire that takes 20 to 25 minutes and have no likelihood of any harm to the participants. The members of the Ethics committee have approved the study to be conducted in the presented form at the meeting held at 09:00 AM on August 17, 2016 at BHPI.

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

Best regards,

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

সিআরপি-চাপাইন, সাভার, ঢাকা-১৩৪৩, বাংলাদেশ, ফোন : ৭৭৪৫৪৬৪-৫, ৭৭৪১৪০৪ ফ্যাক্স : ৭৭৪৫০৬৯

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