

# **EFFECTIVENESS OF NEURAL MOBILIZATION FOR THE TREATMENT OF RADIATING LOW BACK PAIN**

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

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

**EFFECTIVENESS OF NEURAL MOBILIZATION FOR THE  
TREATMENT OF RADIATING LOW BACK PAIN**

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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 of my Supervisor and Head of Physiotherapy Department, BHPI.

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## Acronyms

<b>ADL</b>	Activity of Daily Living
<b>BHPI</b>	Bangladesh Health Professions Institute.
<b>CRP</b>	Centre for the Rehabilitation of the Paralysed.
<b>DP</b>	Directional Preference
<b>LBP</b>	Low Back Pain
<b>MS</b>	Musculoskeletal
<b>NPRS</b>	Numeric Pain Measurement Scale
<b>NSAID's</b>	Non-Steroidal Anti-inflammatory Drugs
<b>ODI</b>	Oswestry Disability Index
<b>PT</b>	Physiotherapy
<b>RCT</b>	Randomized Control trail
<b>ROM</b>	Range of Movement
<b>SR</b>	Systematic Review
<b>USA</b>	United States of America
<b>WHO</b>	World Health Organization

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## Abstract

*Purpose:* The purpose of the study was to explore the efficacy of Neural Mobilization with conventional physiotherapy compare to only conventional physiotherapy for the treatment of radiating Low Back Pain. *Objectives:* To determine the socio-demography of Low Back Pain and to analyze the efficacy of Neural mobilization in reducing pain and improving function by reducing disability. *Methodology:* This study is an experimental design. Fourteen patients with radiating Low Back Pain were conveniently selected from musculo-skeletal outpatient unit, CRP and then 7 patients were randomly assigned to Neural Mobilization with conventional physiotherapy group and 7 patients to the only conventional physiotherapy group. Numeric Pain Rating Scale (NPRS) was used to measure pain and Oswestry Disability Index (ODI) was used to measure disability. Statistical analysis was done by using Mann- Whitney *U* test. *Results:* Mean difference of pain between pre-test and post-test of experimental group and control group were 4.28 and 2.27 and mean difference of ODI score between pre-test and post-test of experimental group and control group were 30.51 and 9.81. Following application of treatment the study found that the experimental group showed a significant improvement ( $p < .05$ ) in case of low back pain. *Conclusion:* This experimental study shows that Neural Mobilization with conventional physiotherapy is more effective than conventional physiotherapy alone for patients with radiating Low Back Pain.

**Keywords:** *Neural Mobilization, Conventional Physiotherapy, Radiating Low Back Pain.*

### 1.1 Background

Low Back Pain (LBP) is a widespread and costly problem in many countries (Mainiadakis & Gray, 2000). It is a common musculoskeletal disorder causing pain in the lumbosacral area. It could be acute, sub-acute and chronic in its clinical presentation. It affects 80% of people at some point in their lives (Srivastava, 2013). In Bangladesh, the number of people complaining low back pain is increasing and is a matter of concern.

Bangladesh is one of the highly populated developing countries in the world (Sarkar & Rahman, 2007). According to World Health Organization statistics, 10% of population in Bangladesh is disabled (Hossain, 2001). Low back pain is one of the most common causes of disability and the burden for the individual, society and as well as the National Health Service in the world (McKenzie, 1995). Low back pain is the most common condition in the developed Western countries (Doherty, 2002). Approximately 80% of all human beings experience LBP in their lives (Hills, 2006). It is the number one most common cause of activity limitation, the second most frequent cause of doctor's visit and the third most common cause of surgical procedure in USA (Apfel et al., 2010).

Low back pain may be radiated to the lower limb. The prevalence of leg pain, as a referred symptom associated with back pain has been shown to be approximately 35%, while true prevalence of sciatica is 2-5% (Nachemson et al., 2000).

According to Hoy et al (2012) Low Back Pain is the global cause of personal, community and financial burden as it is one of the most common health problems. LBP is of significant socioeconomic relevance because it may lead to a temporary loss of productivity, enormous medical and indirect costs, or even permanent disability (Apfel et al., 2010).

LBP is one of the commonest causes of disability in the working population. Self-rated disability at work was strongly associated with the presence of musculoskeletal disorders or other musculoskeletal diseases (Miranda et al 2010). Employees who are

unable to work due to back pain spend a significant amount of time on sick leave, which impacts on productivity in the work place (Johanning, 2000)

The incidence of LBP peaks in middle age and the most common age range is between 35 to 55 years, but it declines in older age. Men and women are equally affected but after 60 year often women report more low-back syndromes than men (Wheeler, 2007).

Another research shows that prevalence of Low Back Pain is higher among female than male in all age groups. And the incidence of Low Back Pain is more frequently occur in age group of 40-69 (Hoy et al., 2012).

Pain in the low back area is a common phenomenon. Mechanical problems are the most common cause (around 90%) and a majority (70% to 85%) does not have a specific cause identified. Any injury to one of the intervertebral discs (disc tear, disc herniation), ligament and joint also causes pain (Manusov, 2012). The cause of LBP depends on different factors. Hills (2006) mention that the mechanical low back pain is the most common cause of work related occupational disability. Low back pain also aggravated by poor sitting posture in both sedentary and manual workers (McKenzie, 1995). Traumatic or degenerative conditions of the spine are the most common cause of low back pain although disk protrusion and herniation have been popularized as cause of LBP (Wheeler, 2007).

## **1.2 Rationale**

Low back pain is not only a disabling condition but also has significant impact on the sufferer. So, various systems of medicine are trying their best to give maximum functional recovery within short time. The various treatments used for non-radicular pain are little different from the radicular type of pain. The non-radicular pains are treated with conservative medical management procedure such as Short Wave Diathermy (SWD), Microwave Diathermy (MWD), Ultrasound Therapy (UST), Interferential Therapy (IFT), Transcutaneous Electrical Nerve Stimulation (TENS), manual therapy, ergonomics, postural education, neural mobilization etc. The principles of treating a radicular pain includes rest, anti-inflammatory medication such as NSAIDs, lumbar traction, superficial and deep heating modalities, manual therapy, neural mobilization principles, orthotics, ergonomics etc.

In this area of neural mobilization there are few researches published and in Bangladesh, no research has been published yet to find out the efficacy of neural mobilization along with conventional physiotherapy comparing with only conventional physiotherapy.

The study is designed to investigate the efficacy of Neural Mobilization for the treatment of Low Back Pain.

The study will help other physiotherapist to know the actual effectiveness of this treatment approach.

### **1.3 Hypothesis**

Neural mobilization along with conventional physiotherapy is more effective than only conventional physiotherapy for the management of patient with radiating Low Back Pain.

### **1.4 Null Hypothesis**

Neural mobilization along with conventional physiotherapy is not effective than only conventional physiotherapy for the management of patient with radiating Low Back Pain.

### **1.5 Aim of the study**

The aim of the study is to find out the effectiveness of neural mobilization along with conventional physiotherapy for the management of patient with radiating Low Back Pain.

### **1.6 Objectives of the study**

#### **General Objectives**

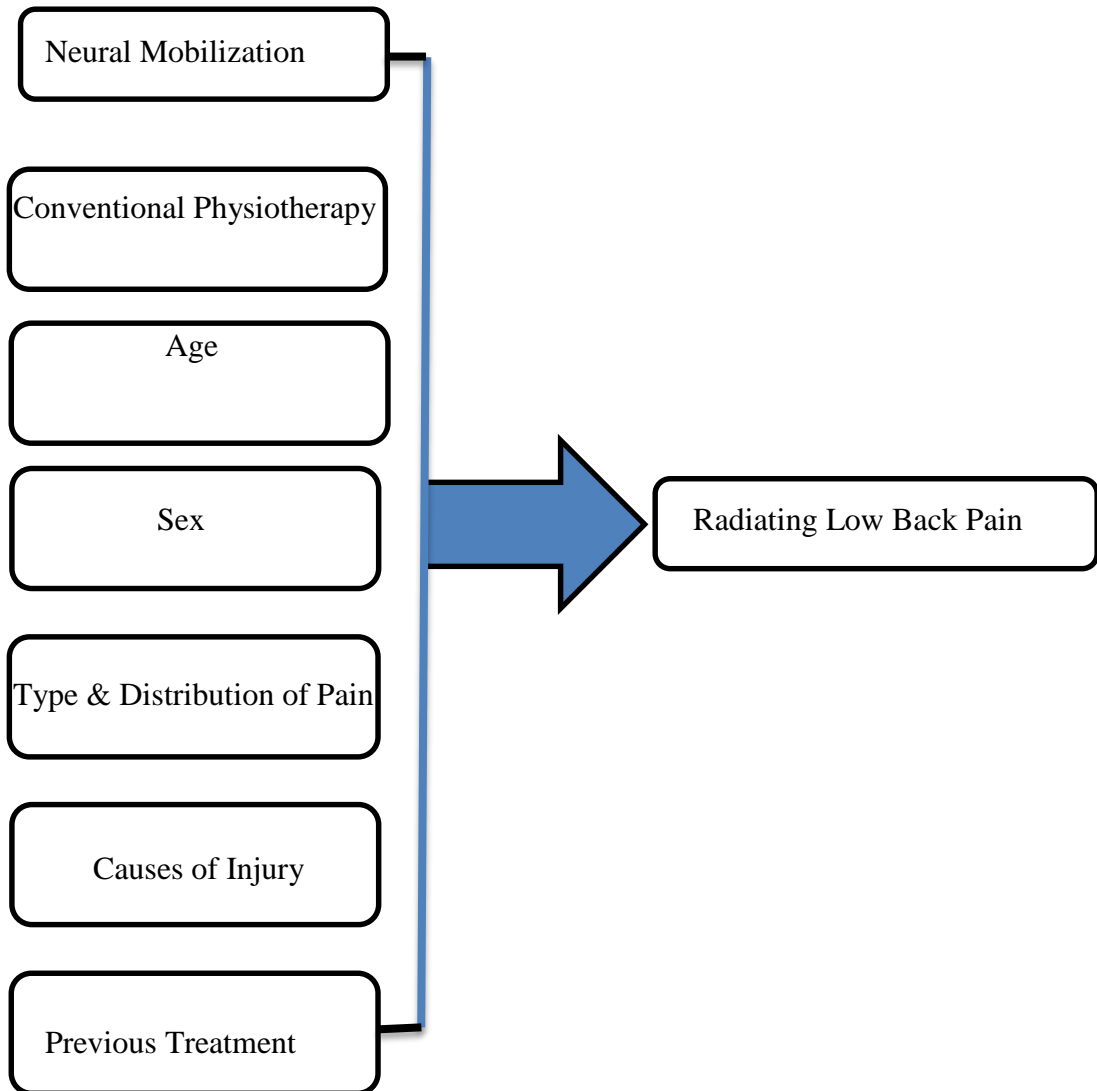
- To identify the therapeutic effectiveness of neural mobilization for the treatment of radiating Low Back Pain.

#### **Specific Objectives**

- To determine the socio-demography of Low Back Pain.
- To analyze the efficacy of Neural mobilization in reducing pain of the patients with radiating Low Back Pain
- To identify the effectiveness of Neural mobilization in reducing disability and improving functional ability of the patient with radiating Low Back Pain
- To formulate a recommendation on treatment guideline for LBP patients evaluating the result of the study.

## 1.7 Conceptual Framework

### Independent variables





## **1.8 Operational Definition**

### **Radiating Low back pain**

Pain in the lumbosacral area of the spine surrounding the distance from the 1<sup>st</sup> lumbar vertebrae to the 1<sup>st</sup> sacral vertebrae (12th rib to the inferior gluteal fold) and its radiation towards lower limb.

### **Neural mobilization**

Neural mobilization is a gentle movement technique used by the physiotherapists to move the nerves. It is an oscillatory stretching of nerve roots that works on stimulating mechanical receptors, micro lengthening, and improving neural circulation at root level to reduce the edema and hence reduce lumbar pain and radicular symptoms.

### **Conventional physiotherapy**

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

Pain is a normal protection mechanism and physiological reaction of the body to an abnormal stimulus and the main presenting symptom of patients with low back trouble. Although the symptoms of pins and needles, numbness, weakness, stiffness and instability are common, the most important symptom is pain. Pain has been defined by the International Association for the Study of Pain (IASP) as ‘an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage’ (Merskey & Bogduk, 1994)

Low back pain is often described as sudden, sharp persistent or dull pain felt below the waist. It is difficult to describe low back pain. It may refer to complex symptoms in which pain is either localized to the lumbar spine or referred to the legs or feet and where other specific conditions causing such pain have been excluded (Hoque, 2005).

Low back pain defined as tiredness, discomfort or pain, in the low back area (between the bottoms of ribs, at the back, top of the lower limb) with or without radiating pain on the legs.

According to Manusov (2012), Low back pain can be classified in two categories based on signs and symptoms:

- Nonspecific – the most common type of diffuse pain that does not change in response to particular movements, is localized & non-radiating.
- Radicular – pain which radiates down the leg below the knee may be unilateral or bilateral and changes in intensity in response to particular positions or maneuvers. The most common radicular pain is due to sciatica.

LBP is specific if its cause can be shown (e.g. infection, tumor, osteoporosis, ankylosing spondylitis, fracture, inflammatory process, radicular syndrome or cauda equine syndrome) and non-specific LBP if not attributed to recognizable, known specific pathology (van Tulder et al., 2006).

LBP may or may not refer to the lower limb and into the groin or perineum. Radiating pain means that the pain experienced in a part of the body by the patient may be situated

far away from the diseased or injured area. Pain in the lower limb associated with LBP is either somatic referred pain or radicular pain. Pain extending across a relatively wide region and felt deeply, in a relatively constant or fixed location is somatic referred pain. Pain that travels along the length of the lower limb, along a narrow band is radicular pain. Pain in the buttock or proximal thigh extending below the knee is not necessarily radicular pain. Deep aching pain indicates somatic referred pain and Lancinating or shooting pain refers to radiating pain (Bruehl et al., 2002).

LBP is one of the commonest causes of disability in the working population. Disability due to LBP has been defined as restricted functioning, involving limitation of activity and restriction of participation in life situations. Disability often accompanies LBP, varies in extent and may be temporary or even permanent (Waddell, 2004). In the International classification of functioning, disability and health (ICF), the emphasis was changed to activity and activity limitation meaning difficulty in the performance, accomplishment or completion of an activity. Difficulties in performing activities occur when there is a qualitative or quantitative alteration in the way in which activities are carried out. Difficulty includes all the ways in which the doing of the activity may be affected.

The duration of LBP according to tissue healing may be described as acute pain lasts up to 7 days, sub-acute pain more than 7 days but less than 7 weeks and chronic pain lasts more than 7 weeks. As the key feature of adult back pain have typical life time patterns of fluctuating symptoms of varying severity, a patient who suffers recurrent episodes of pain, each of which is separated by a pain-free period of at least 3 months, each new episode satisfies the definition of acute LBP (Bogduk & McGuirk, 2002).

The lumbar vertebral column is made of five vertebrae and in between two vertebrae there are intervertebral discs. The intervertebral discs play a vital role in the functioning of the spine. The motions permit between vertebral bodies are (1) Translational motion in the long axis of the spine (2) Rotary motion about a vertical axis (3) Antero-posterior bending and (4) Lateral bending. The orientation of zygapophyseal facets from L1 to L4 limits lateral flexion and rotation (Srivastava et al., 2013). When the lumbar spine is flexed, the Range Of Motion in rotation is less than when the lumbar spine is in the neutral position. The orientation of the lumbar zygapophyseal facets favors forward flexion and backward extension. The amount of

flexion varies at each inter-space of the lumbar vertebrae, but most of the flexion takes place at the lumbo-sacral joint. The average range of flexion is 80 degree at L1/L2, 90 at L2/L3 and 120 at L3/L4 and L5/ S1 (Srivastava et al., 2013).

The pathophysiology of LBP is usually indeterminate. In fact one of the defining features of this disorder is non-specific etiology. Pain arises from a number of sites, including the vertebral column, surrounding muscles, tendons, ligaments and fascia. Stretching, tearing or contusion of these may result in low back pain (Freeman et al, 2005).

Any of the structures of the lumbar spine that receives innervation could be a source of LBP. Thus pain could arise from the ligaments, muscles, tendons, fasciae, joints, vertebral bodies, nerves, dura or discs of the lumbar spine. (Bogduk & McGuirk, 2002).

Radicular pain may be occur by inflammation of nerve root, by compression of the dorsal root ganglion or its blood supply or by microscopic damage to the nerve root (Karppinen, 2007).

McKenzie (1995) mentioned that mechanical pain occurs when the joint between two bones placed in opposition. When surrounding ligaments and other soft tissues are over stretched the patient will initially feel major discomfort but as the time passes pain will eventually develop. Mechanical low back pain classified as in three relatively simple categories that are postural syndrome, dysfunction symptom and derangement syndrome.

Freeman et al (2005) proposed that there are several possible non-mechanical causes of low back pain such as small fracture to the spine from osteoporosis, low back pain from pelvic and low abdominal organs which include bladder infection, kidney stone, endometriosis, ovarian cancer or cyst and testicular torsion. McKenzie (1995) reported that rheumatoid arthritis, ankylosing spondylitis and other bacterial infections may lead to non-mechanical low back pain. In some cases psychological factors can lead to low back pain.

There are numerous risk factors assumed to be related to LBP. Epidemiological studies have generally divided these factors into three dimensions: individual and life style factors, physical or biomechanical factors and psychosocial factors (Ferguson &

Marras, 1997). Individual factors such as age, gender, anthropometric measures and muscle strength and flexibility have been considered as possible risk factor for LBP. Factors related to lifestyle such as smoking and obesity have been shown to be risk factors for LBP (Shiri et al, 2010). Physical and biomechanical factors including postural stress (high spinal load or bad posture), whole body vibration, heavy work, frequent lifting and prolonger or repeated bending, driving, sitting and twisting have been considered to be associated with back pain and disc prolapse (Vingard et al, 2000). In addition people dissatisfied with their work, low social support, low job control and low supervisor support in workplace are more likely to report LBP (Kaila-Kangas et al, 2004).

Symptoms of low back pain depend on the cause. In case of back sprain or strain Muscle spasms, cramping, and stiffness, Pain in the back and buttocks. Certain movements make it worse, and resting makes it feel better. The worst pain usually lasts 48 to 72 hours and may be followed by days or weeks of less severe pain. In case of Nerve-root pressure if leg pain extends below the knee, it is more likely to be due to pressure on a nerve than to a muscle problem. Most commonly, it's a pain that starts in the buttock and travels down the back of the leg as far as the ankle or foot. In case of nerve-related problems, such as tingling, numbness, or weakness in one leg or in the foot, lower leg, or both legs. Tingling may begin in the buttock and extend to the ankle or foot. Weakness or numbness in both legs, and loss of bladder and/or bowel control, are symptoms of cauda-equina syndrome, which requires immediate medical attention (Sultana, 2012).

Although there is technological advances have been made in recent years, specialists are still unable to identify the specific origin of acute back pain in the majority of patients. It has been argued that less than 15% of back pain sufferers can be given a clinically relevant specific diagnosis based on LBP history, clinical examination, neurophysiological and radiological studies (Nachemson, 2000).

The treatment most commonly prescribed for back pain is medication; particularly non-steroidal anti-inflammatory drugs (NSAIDs), muscle relaxants, and narcotic analgesics. In one longitudinal study of primary care patients with low back pain, 69% were prescribed non-steroidal anti-inflammatory drugs, 35% muscle relaxants, 12% narcotics, and 4% acetaminophen; 20% received no medications. For Pain relief

from acute LBP, the guidelines recommended paracetamol as a first choice and NSAIDs as a second choice. If paracetamol or NSAIDs fail to reduce pain a short course of muscle relaxants alone or in addition to NSAIDs can be considered (van Tulder et al, 2006).

Lumbar supports (braces or orthoses) are used to prevent back injuries and also as a treatment for people with low back pain. Several potential mechanisms of action of lumbar supports are reported in the literature that may support their use in the treatment of low back pain. They are supposed to: (1) correct deformity; (2) limit spinal motion; (3) stabilize the lumbar spine; (4) reduce mechanical loading; and (5) provide miscellaneous effects such as massage, heat or placebo (Calmels, 2009)

Exercise therapy was defined as any program in which, during the therapy sessions, the participants were required to carry out repeated voluntary dynamic movements or static muscular contractions (in each case, either “whole-body” or “region-specific”; and either with or without external loading), where such exercises were intended as a treatment for low back pain. The exercise was to have been supervised or “prescribed” (Koes et al 2006). A recent study examined systematic reviews provided strong evidence that exercise programs reduce pain and disability in people with non-specific LBP (Swinkels et al, 2009).

Spinal manipulation is defined as a high velocity thrust to a joint beyond its restricted range of movement. The European guidelines proposed considering referral for spinal manipulation (a small amplitude high velocity single thrust passive movement up to the end of the available range of motion) for patients who fail to return to normal activities as non-surgical management of acute and chronic LBP (van Tulder et al., 2006), Spinal mobilization involves low-velocity, passive movements within or at the limit of joint range (Brox et al., 2006). Most studies do not make a clear distinction between these two, because in clinical practice these two techniques are part of a “spinal manipulation package” that is often referred to as manual therapy (Bekkering et al., 2003).

Lumbar traction is applied by putting a harness around the lower rib cage and a second one around the iliac crest, and applying a force aiming at separating both harnesses. The applied force must be at least 25% of the body weight (weaker forces

are considered as placebo). The duration and level of exerted traction can be varied in a continuous or intermittent mode (van der Heijden et al., 1995).

Massage can be defined as soft tissue manipulation using the hands or a mechanical device (Furlan et al., 2002). Different techniques can be used, such as: effleurage, petrissage, friction, kneading, or hacking. Either a classical approach is used, or an approach in which the rules of massage from physical medicine are combined with those of acupuncture from neural therapy (treats one unique point with a special vibrating instrument that stimulates the acupuncture point superficially (but not with needle insertion)). In clinical practice, massage is often applied in combination with other therapies such as exercises and other interventions but sometimes also as a sole treatment.

The application of heat is thought to have beneficial effects on blood circulation and muscle stiffness. By these mechanisms it may result in relaxation, pain relief and improvement in functional disability.

The cognitive behavioral therapy approach to pain has been conceptualized as a way of enhancing treatment by addressing relevant negative (emotions and thoughts) and behavioral (altered activity and medication-taking) aspects. It offers an educational concept whereby positive coping strategies are taught to enhance recovery (Linton & Ryberg, 2001). The approach seemed to be an effective treatment for patients with chronic LBP, but it is unknown what type of patients benefit from what type of behavioral treatment (van Tulder et al, 2006).

In McKenzie method the therapy of Low Back Pain patients consist of an educational component, supported with advice from the book “Treat Your Own Back” and an active therapy component along with instructions in postural control and directional specific exercise repeated several times a day according to the principle of the syndrome (McKenzie & May 2003).

Neural mobilization is a gentle movement technique used by the physiotherapists to move the nerves.

Neural mobilization of the nervous system, was described by Maitland in 1985, Elvey in 1986 and refined by Butler in 1991, is an addition to assessment and treatment of neural pain syndromes including lumbar spinal syndromes (Butler, 2000).

Nee & Butler (2006) proved that the neurodynamic technique can be effective in addressing musculoskeletal presentation of neuropathic pain. The study included that the peripheral neuropathic pain is because of injury to root or peripheral nerve trunk by mechanical or chemical stimuli. Clinical manifestation includes positive and negative symptoms. Positive symptoms reflect an abnormal level of exhibitions in the nervous system and include pain, paraesthesia, and dyesthesia. Negative symptoms indicate reduced impulse conduction in the neural tissue and hypoesthesia or anaesthesia and weakness.

Neural mobilization is a part of manual therapy that has been reported to be an effective intervention for certain condition including low back pain, sciatica and piriformis syndrome (Kutty et al., 2014).

Neural mobilization technique often used clinically to restore nerve mobility and decrease pain (Kumar, 2013)

Shacklock (1995) stated that the neuraxis, meninges and spinal canal forms a mechanical triad. The nervous system as a whole is a mechanically and physiologically continuous structure from the brain to the distal end of the peripheral nerves therefore, movement at one end affects the whole system and concluded that movement at the ankle joint helped in mobilizing the sciatic nerve proximally at lumbosacral level.

Butler (1991) stated that the neural system is a dynamic organ spanning the entire body. The mobility of this system is such that it can act dependently or independently of the structures it spans .When changes imparted in one area of the neural system it may affect the whole system.

Butler (2000) stated that clinicians use neural mobilization for the treatment of nerve root and peripheral nerve related symptoms in the low back and the lower extremity pain.

Neural mobilization has a great role in management of low back pain with radiculopathy and has long term effects for patient with non-specific low back pain (McCracking, 2008).



Traditional exercise therapy program for lumbar pain focuses on pain relief but neural mobilization viewed as another form of manual therapy that restore the mechanical function of impaired neural tissue. (Kutty et al., 2014).

Sahar (2011) found that neural mobilization in treatment of low back dysfunctions is effective in improving pain, reducing short term disability and promoting centralization of symptoms rather than lumbar mobilization treatment with exercise therapy.

Patients treated with neural mobilization and lumbar stabilization showed better VAS scores and Straight Leg Test scores compared to patients treated with active range of motion exercises and lumbar stabilization. (Colakoviæ & Avdiæ, 2013)

Butler (1991) stated that distal mobilization of the sciatic nerve affects the nerve roots at lower lumbo-sacral level.

Xavier and Farrel (1990) studied the effects of neural mobilization of sciatic nerve in 21 subjects, and concluded that treatment of the distal portion of nerve by neural mobilization relieved distal pain and score of Visual analog scale (VAS) was decreased to 70%.

The study of single-blind randomized controlled trial of thirty subjects (male 10, Female 20) by Allison et al. (2002) clearly demonstrated significant improvements in pain and disability in both experimental and control group. The Neural Mobilization group had significantly lower pain levels by compared to the articular mobilization treatment group.

Neural mobilization along with conventional treatment was found to be more effective for sciatica in relieving pain ( $t = 7.643$ ) as well as improving the range of SLR ( $t = 5.848$ ) than conventional treatment alone. (Sarkari, 2007).

This research was an experimental design to evaluate the effectiveness of physiotherapy techniques combining Neural Mobilization along with other physiotherapy treatment and also to compare their effectiveness with other physiotherapy alone for the management of pain and improvement of different functional activities of the patients with radiating Low Back Pain. To identify the effectiveness of this treatment regime, Numeric Pain Rating Scale (NPRS) and Oswestry Disability Index (ODI) were used as measurement tools for measuring the pain intensity and how the pain affect different functional abilities to manage in everyday life.

### 3.1 Study Design

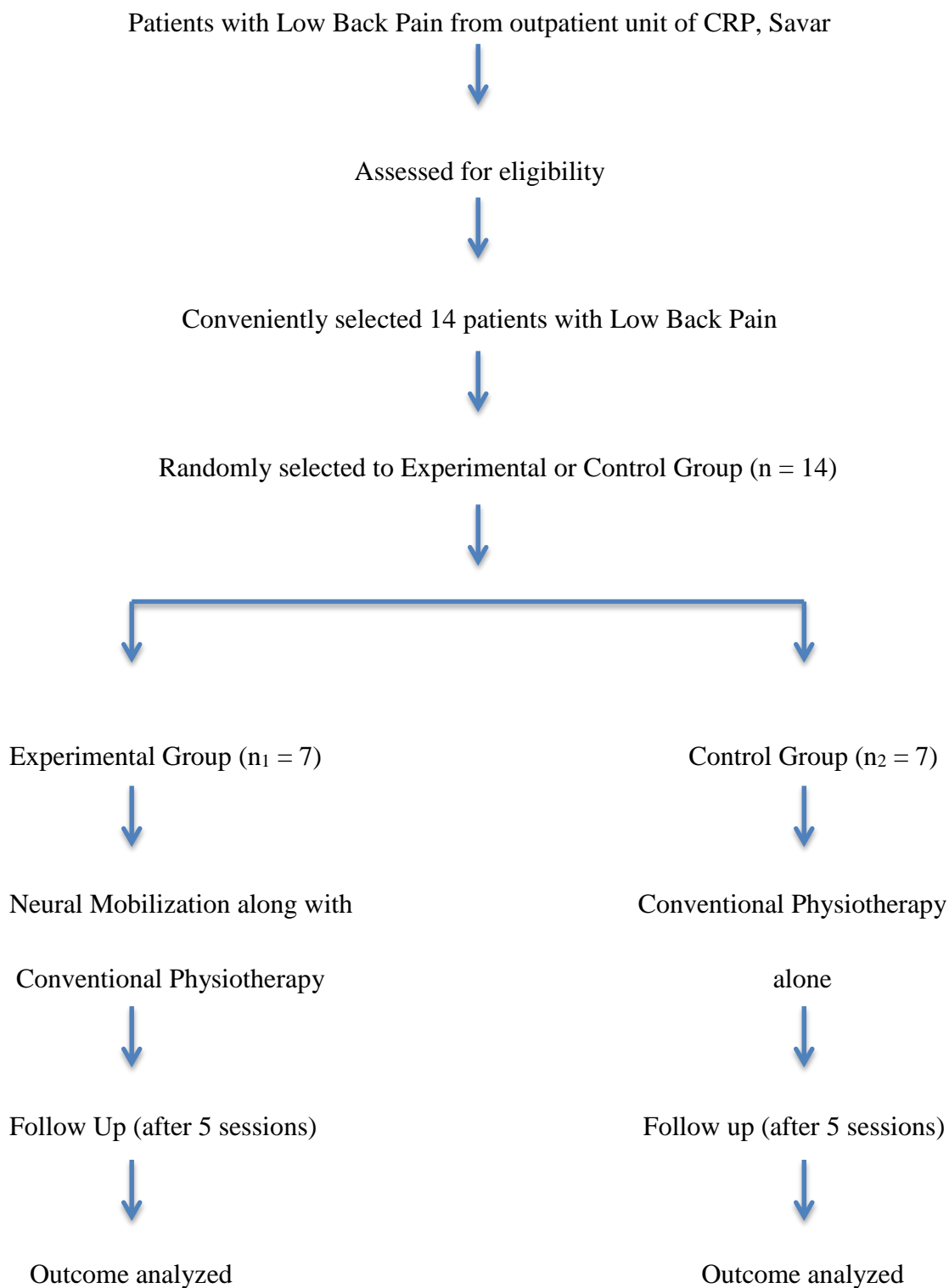
The study was designed using an experimental design quantitative research. According to DePoy & Gitlin (2013) the design could be shown by:

Experimental Group	:	R	O <sub>1</sub>	X	O <sub>2</sub>
Control Group	:	R	O <sub>1</sub>		O <sub>2</sub>

The study was an experimental between two subject designs. Neural Mobilization and other Physiotherapy treatment were applied to the experimental group and only other Physiotherapy treatment was applied to the control group.

A pre-test (before intervention) and post-test (after intervention) was administered with each subject of both groups to compare the pain and functional ability of the subject before and after the treatment.

### Flow-chart of the phases of Randomized Controlled Trial



### 3.2 Study Area

Musculo-skeletal Unit of Physiotherapy Department at CRP, Savar, Dhaka.

### 3.3 Study Population

The study population was the patients diagnosed with radiating Low Back Pain attended in the Musculo-skeletal Unit of Physiotherapy Department at CRP, Savar, Dhaka.

### 3.4 Sample Size

The equation of the sample size calculation are given below-

$$n = \left\{ \frac{z(1-\frac{\alpha}{2})}{d} \right\}^2 \times pq$$

Here,

$$z \left( 1 - \frac{\alpha}{2} \right) = 1.96$$

$p = 0.80$  (Here  $p =$  prevalence and  $p = 80\%$ )

$$q = 1 - p$$

$$= 1 - 0.80$$

$$= 0.20$$

$$d = 0.05$$

Now,

$$\begin{aligned} n &= \left\{ \frac{1.96}{.05} \right\}^2 \times (.80 \times .20) \\ &= 246 \end{aligned}$$

The actual sample size for this study was calculated as 246, but as the study was performed as a part of academic research project and there were some limitations. So that 14 samples was selected conveniently according to inclusion and exclusion criteria for this study. 7 participants were in experimental group and 7 participants in control group.

### **3.5 Sampling Technique**

Simple random sampling technique was used for this study.

Subjects, who met the inclusion criteria, were taken as sample in this study. 14 patients with radiating Low Back Pain were selected from outpatient musculoskeletal unit of physiotherapy department of CRP, Savar and then 7 patients were randomly assigned to Experimental group comprising of treatment approaches of Neural Mobilization along with other Physiotherapy treatment and 7 patients to the only other Physiotherapy treatment for this study. The study was a single blinded technique. When the samples were collected, the researcher randomly assigned the participants into experimental and control group, because it improves internal validity of experimental research. The samples were given numerical number C1, C2, C3 etc. for the control group and E1, E2, E3 etc. for experimental group. Total 14 samples were included in this study, among them 7 patients were selected for the experimental group [received Neural Mobilization along with conventional physiotherapy treatment] and rest 7 patients will be selected for control group (receive only conventional Physiotherapy treatment)]

### **3.6 Inclusion criteria**

- Mechanical cause of Low Back Pain and its radiation to the lower limb.
- Age group:18-60 year (McKenzie, 1990)
- Both sex

### **3.7 Exclusion Criteria**

- Patients with clinical disorder where Neural Mobilization is contraindicated
- Acute disc prolapse patient
- Diagnosis of secondary complications such as tumour, TB spine, fracture, dislocation and severe osteoporosis, Paget's disease.
- All sorts of infection, Rheumatoid Arthritis, Ankylosing Spondylitis
- History of any malignant disease

- Cauda-equina lesions, Cord signs & Syndrome, Transverse myelitis.
- Surgery to the lumbar spine.
- Pregnant women
- Mentally retarded patient
- Patients those are taking pain killer

### **3.8 Data Processing**

#### **3.8.1 Data Collection Tools**

- Record or Data collection form
- Consent Form
- Structured questionnaire. (Both open ended and close ended questionnaire)
- Numeric Pain Rating Scale – for measuring pain.
- Oswestry Disability Index (ODI)
- Pen, Papers

#### **3.8.2 Measurement Tools**

**Numeric Pain Rating Scale (NPRS):** McCaffery et al. (1999) used a numeric scale to rate the pain status experienced by patients. It is known as Numeric Pain Rating Scale. The scale is a 10cm long scale ranging from 0-10. Here a zero (0) means no pain, 1-3 indicates mild pain, 3-5 indicates that pain is in moderate state and 6-10 is worst possible pain feeling experienced by patients.

**Oswestry Disability Index (ODI):** This is a set of questionnaire that has been designed to provide information regarding how the patient's back pain affects his/her ability to manage in everyday life.

### **3.8.3 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 a qualified physiotherapist. 5 sessions of treatment were provided for every subject. 14 subjects were chosen for data collection according to the inclusion criteria. The researcher was divide all participants into two groups and was code C1, C2, C3, C4, C5, C6, C7 for control group and E1, E2, E3, E4, E5, E6, E7 for experimental group.

Data was gathered through a pre-test, intervention and post-test and the data was collected by using a written questionnaire form which it formatted by the researcher. Pre-test was performed before beginning the treatment and the intensity of pain was noted with NPRS score and functional ability with ODI questionnaire form. The same procedure was performed to take post-test at the end of 5 sessions of treatment. Researcher provided the assessment form to each subject before starting treatment and after 5 sessions of treatment patient was instructed to put mark on the line of NPRS according to their intensity of pain. 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 done for statistical analysis.

### **3.9 Data Analysis**

Statistical analysis was performed by using Microsoft Office Excel 2013 and scientific calculator.

#### **3.9.1 Statistical Test**

For the significance of the study, a statistical test was carried out. Statistical analysis refers to the well-defined organization and interpretations of the data by systemic and mathematical procure and rules (Depoy & Gitlin, 2013). The U test was done for the analysis of the balance after six session treatment of both control and tail groups.

Mann-Whitney U test is a non-parametric test that is simply compares the result obtained from the each group to see if they differ significantly. This test can only be used with ordinal or interval/ ratio data.

The formula of Mann-Whitney U test:

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

$n_1$  = the number of the subjects in trail group

$n_2$  = the number of the subject in control group.

$n_x$  = the number of the subjects of the group with larger rank total.

$T_x$  = the larger rank total.

### **3.9.2 Significant level**

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



### 3.10 Treatment Protocol

Neural mobilization was applied by a graduate qualified physiotherapist who is expertized in neural mobilization technique to the patients of experimental group.

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

Treatment option	Duration/Repetition
McKenzie Approach (Directional Preference)	10 repetition in each session
Lumber Mobilization (Maitland mobilization)	5 minutes in each session
IRR	10 minutes in each session
Soft tissue technique	3 minutes
Neural Mobilization	5 repetition in each session

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

Treatment option	Duration/Repetition
McKenzie Approach (Directional Preference)	10 repetition in each session
Lumber Mobilization (Maitland mobilization0	5 minutes in each session
IRR	10 minutes in each session
Soft tissue technique	3 minutes

## **McKenzie Approach (Directional Preference)**

According to McKenzie (1995) the treatment options are:

- Extension in lying
- Repeated extension in lying
- Extension in lying with self-overpressure
- Extension in lying with therapist-overpressure
- Sustained extension
- Extension in standing
- Extension mobilization
- Extension manipulation
- Rotation mobilization in extension
- Rotation manipulation in extension
- Sustained rotation
- Flexion in lying
- Flexion in standing

According to the directional preference these approaches were given to the patients. The patients who were given positive feedback in extension were given extension principle and the patient given positive feedback in flexion was given flexion principle.

Spinal Mobilization was given according to the Maitland Mobilization Grade in between Grade I-IV.

Soft tissue technique was given by Deep Transverse Friction Massage (DTFM), Stroking and Effleurage techniques.

### **Neural Mobilization Procedure**

Experimental group was given neural mobilization according to nerve involvement. Every patient of experimental group was given the sciatic nerve mobilization with the branch of tibial and peroneal nerve. Nerve mobilization techniques were performed with the patient in supine. The subjects remain relaxed and comfortable on the bed with feet uncrossed and arms at the side. The trunk and hips were in a neutral position.

**Table – 3: Neural Mobilization Procedure**

<b>Nerve Mobilization</b>	<b>Tibial Nerve</b>	<b>Peroneal Nerve</b>
<b>Hip</b>	Flexion with adduction and internal rotation	Flexion with adduction and internal rotation
<b>Knee</b>	Extension	Extension
<b>Ankle</b>	Dorsiflexion with eversion	Planter flexion with inversion

### **Tibial nerve Mobilization**

The therapist position was next to the patient's feet. The patient's feet was dorsiflexed and everted. Then dorsiflexion and eversion were maintained while applying overpressure to knee extension and the symptoms were noted. Dorsiflexion, eversion and keen extension were maintained while passively raising the leg into hip flexion until the therapist felt the tension. To introduce additional traction (i.e. sensitization) into the proximal aspect of the sciatic nerve, hip adduction and internal rotation were added to the Straight Leg Raise (Ahmed et al., 2013).



Starting position



Ending position

**Figure - 1: Tibial Nerve Mobilization**

## **Peroneal Nerve Mobilization**

The therapist position was next to the patient's feet. The patient's foot was plantar flexed and inverted. Then plantar flexion and inversion was maintained while applying overpressure to knee extension and the symptoms were noted. Plantar flexion, inversion and knee extension were maintained while passively raising the leg into hip flexion until the therapist felt the barrier i.e. the point at which tension is initially felt. To introduce additional traction (i.e. sensitization) into the proximal aspect of the sciatic nerve, hip addition and internal rotation were added to the SLR (Ahmed et al., 2013).



Starting position



Ending position

**Figure -2: Peroneal Nerve Mobilization**

### **3.11 Ethical Issues**

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 and obtained permission from the concerned authority of ethical committee of Bangladesh Health Professions Institute (BHPI). Again before the beginning of the data collection, researcher obtained the permission from the concerned authorities ensuring the safety of the participants. 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 had the right to meet with outdoor doctor if they think that the treatment was not enough to control the condition or if the condition become worsen. The participants were also being 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 Rigor of the study**

The rigorous manner was maintained to conduct the study. The study was conducted in a clean and systemic way. During the data collection it was ensured participants were not influenced by the data collector. The answer was accepted whether they were negative or positive impression. No leading questions were asked or no important questions were avoided. The participant's information was checked by the supervisor to eliminate any possible errors. In the result section, outcome was not influenced by showing any personal interpretation. During conduct the study every section of the study was checked and rechecked by the research supervisor.

For this study 14 patients with radiating Low Back Pain were taken as sample from Musculo-skeletal outpatient unit of Center for Rehabilitation of Paralyzed (CRP), Savar to explore the effectiveness of Neural Mobilization for the treatment of Low Back Pain.

In this study the results which were found have been shown in different bar diagrams, pie charts and tables.

### Age Range

The majority of the participants 46% (n=5) were in “38-47” years of age followed by 31% (n=4) were in “48-57” years, 15% (n=1) were in “18-27” years and 8% (n=2) were in “28-37” years of age range group.

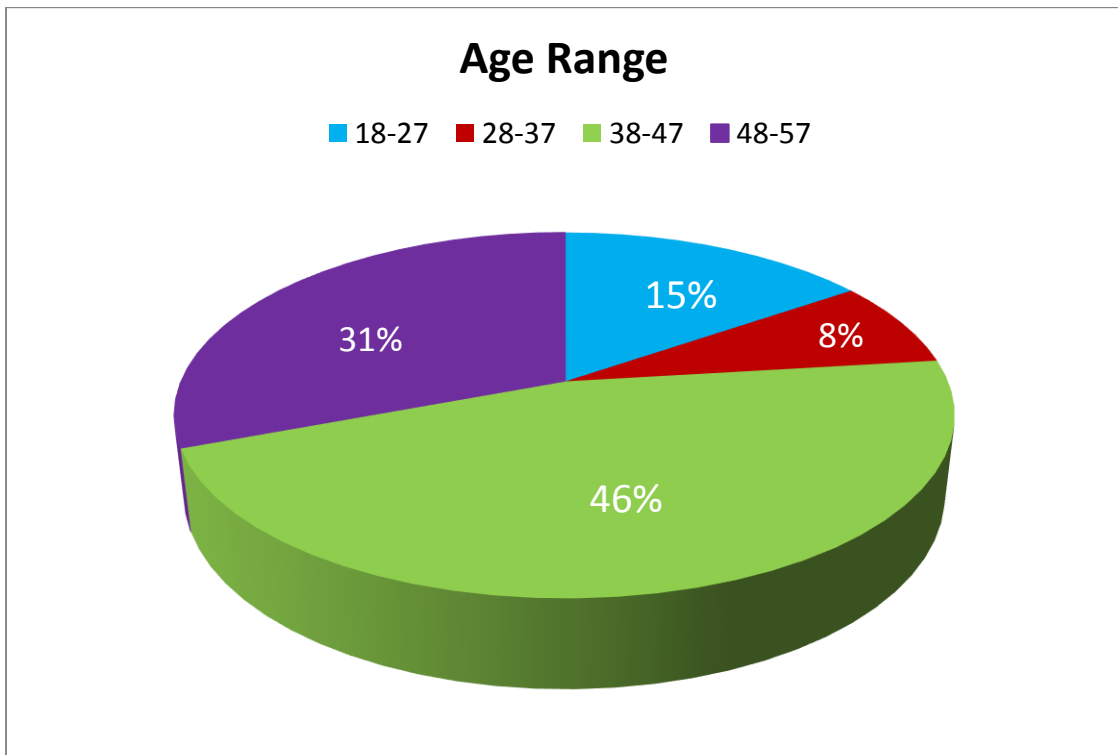


Figure -3: Age range

**Table – 4**

**Mean Age of the Participants**

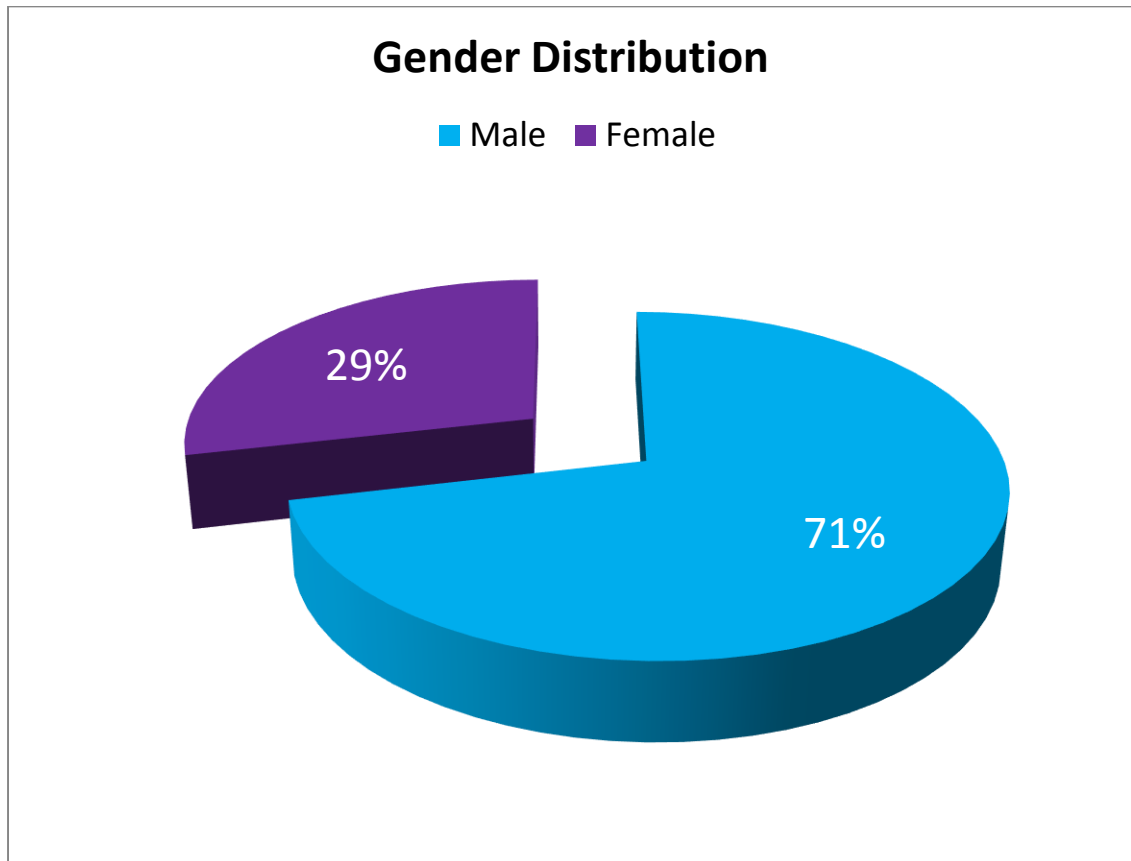
<b>Experimental Group</b>		<b>Control Group</b>	
<b>Subjects</b>	<b>Age (Years)</b>	<b>Subjects</b>	<b>Age (Years)</b>
E1	40	C1	48
E2	45	C2	25
E3	45	C3	53
E4	46	C4	46
E5	50	C5	55
E6	45	C6	55
E7	26	C7	35
<b>Mean Age</b>	<b>42 years</b>	<b>Mean Age</b>	<b>45 years</b>

In this study there were total 14 participants. Among them 7 were in experimental group and 7 were in control group. The mean age of experimental group is 42 years and the mean age of control group is 45 years.



## Sex of the Participants

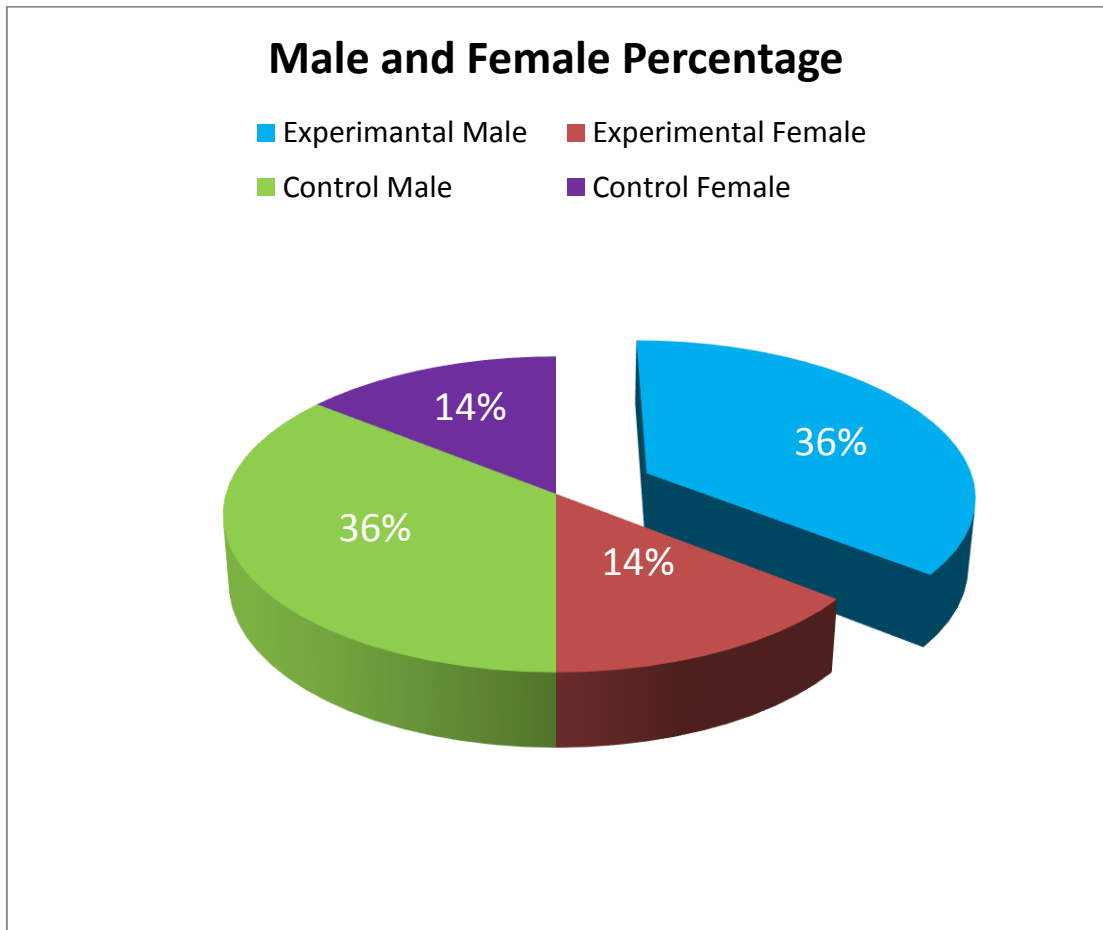
14 Patients with Low back pain were included as sample of the study, among them 71% (n=10) were Male and 29% (n=4) were Female.



**Figure – 4: Gender Distribution**

### Male and Female Percentage between groups

Among them, In Experimental Group 36% (n=5) were Male and 14% (n=2) were Female and in Control Group 36% (n=5) were Male and 14% (n=2) were Female



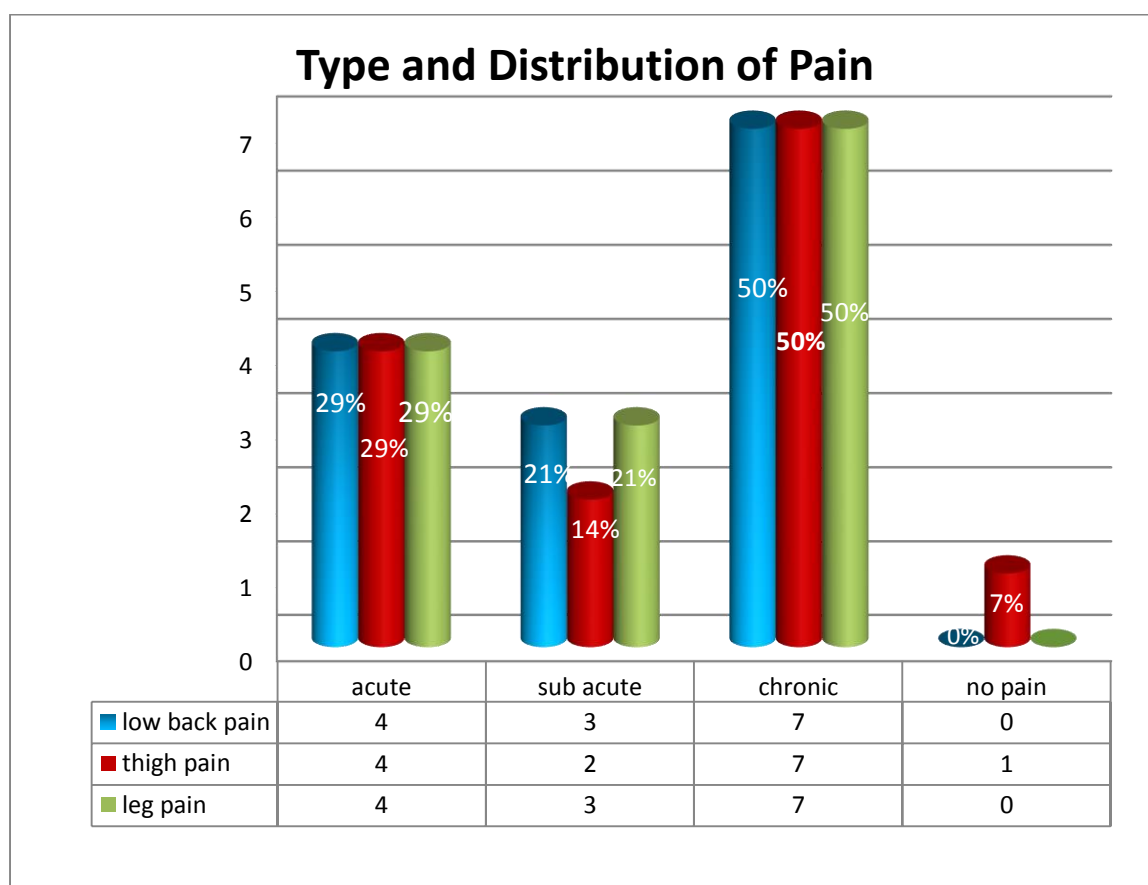
**Figure – 5: Male and Female Percentage between groups**

## Types and Distribution of pain

All the 14 patients of this study were suffering from low back pain and 50% (n=7) were of chronic low back pain, 29% (n=4) were of acute low back pain and 21% (n=3) were of sub-acute low back pain.

Among them 13 patients had radiating pain up to thigh and 50% (n=7) of them had chronic thigh pain, 29% (n=4) had acute thigh pain, 14% (n=2) had sub-acute thigh pain and 7% (n=1) had no thigh pain.

Among them 9 patients had radiating pain up to leg and 50% (n=7) of them had chronic leg pain, 21% (n=3) had sub-acute leg pain, 29% (n=4) had acute leg pain and 0% (n=0) had no leg pain.



**Figure- 6: Type and Distribution of Pain**

### Weakness in lower limb

The pie chart shows that among the participants it was found that less than half of them 29% (n=4) are getting less strength in lower limb. Among them 71% (n=4) are not getting less strength in lower limb.

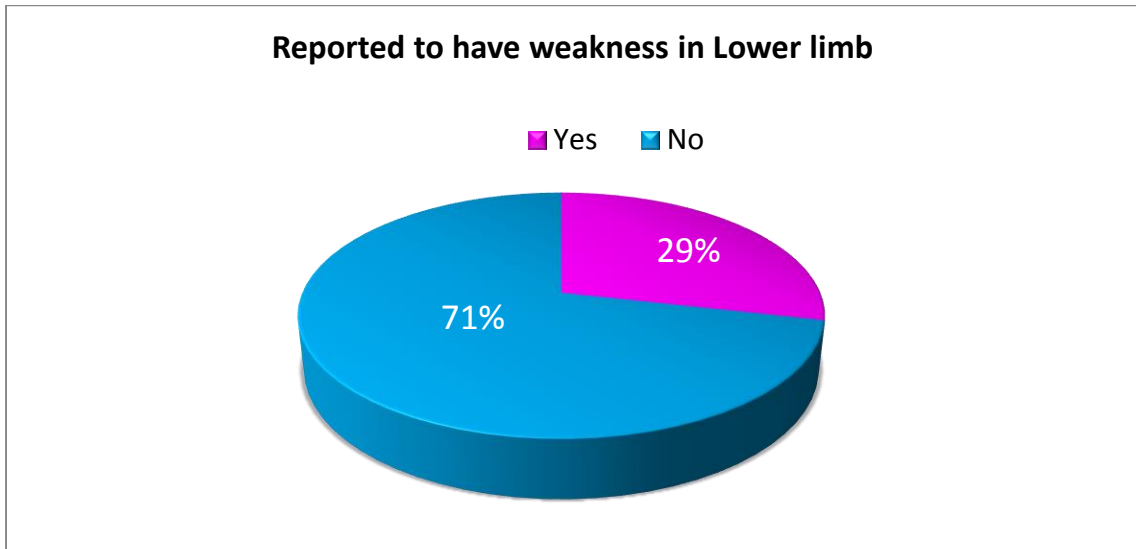


Figure-7: Weakness in lower limb

### Paresthesia and Numbness in Lower limb

The pie chart shows that among the participants it was found that 64% (n=9) has no Paresthesia and 36% (n=5) has suffering with Paresthesia or numbness.

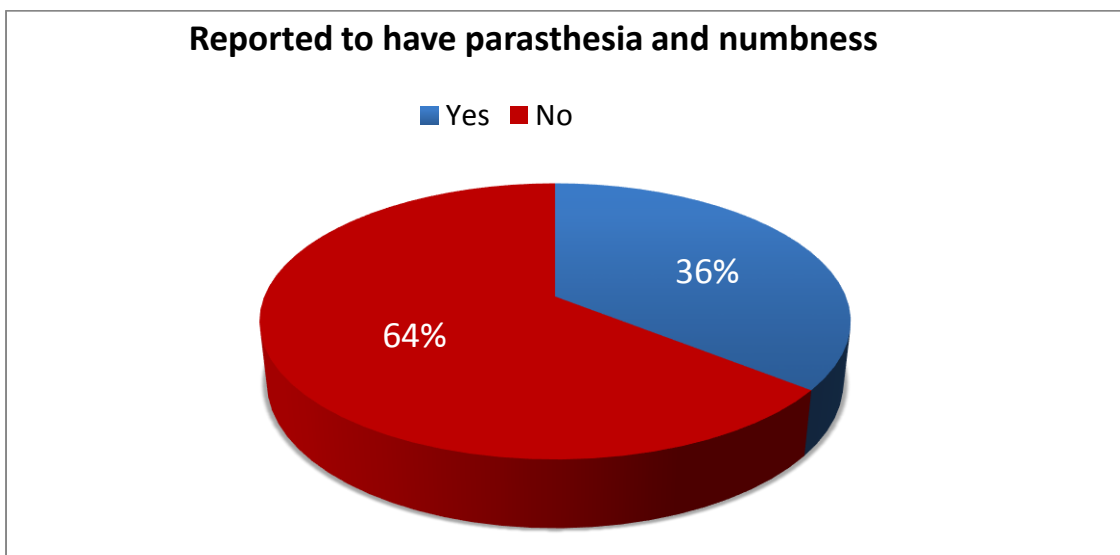


Figure - 8: Paresthesia and Numbness in lower limb

## Causes of Low Back Pain

According to the patients opinion most of the patients 43% (n=6) suffering from low back pain due to bad posture, 29% (n=4) due to lifting heavy weight, 14% (n=2) due to trauma or injury to lower back and 14% (n=2) due to unknown cause were suffering from low back pain

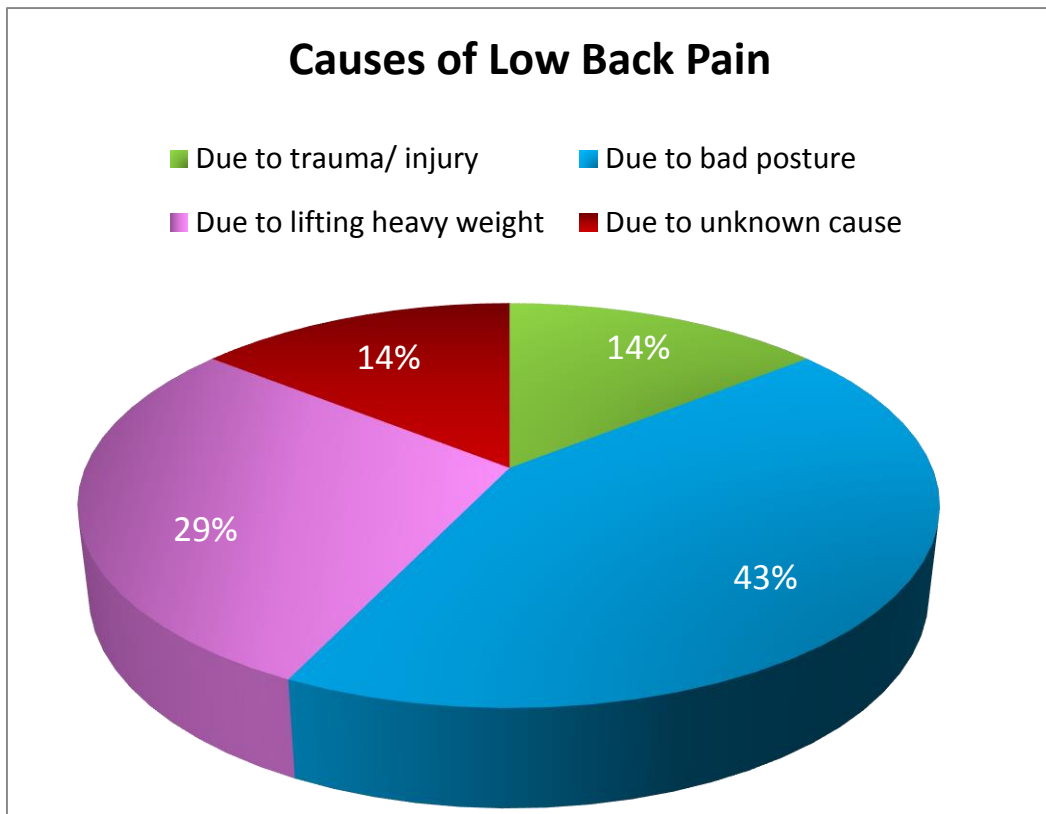


Figure- 9: Causes of low back pain

### Frequency of taking treatment previously

All the patient 100% (n=14) took Medication (pain killer) for low back pain. Among them 50% (n=7) used Lumber corset, 43% (n=6) took Rest, 14% (n=2) took Physiotherapy and 7% (n=1) took Injection therapy for their Low Back Pain previously. None of them had any operation or other treatment.

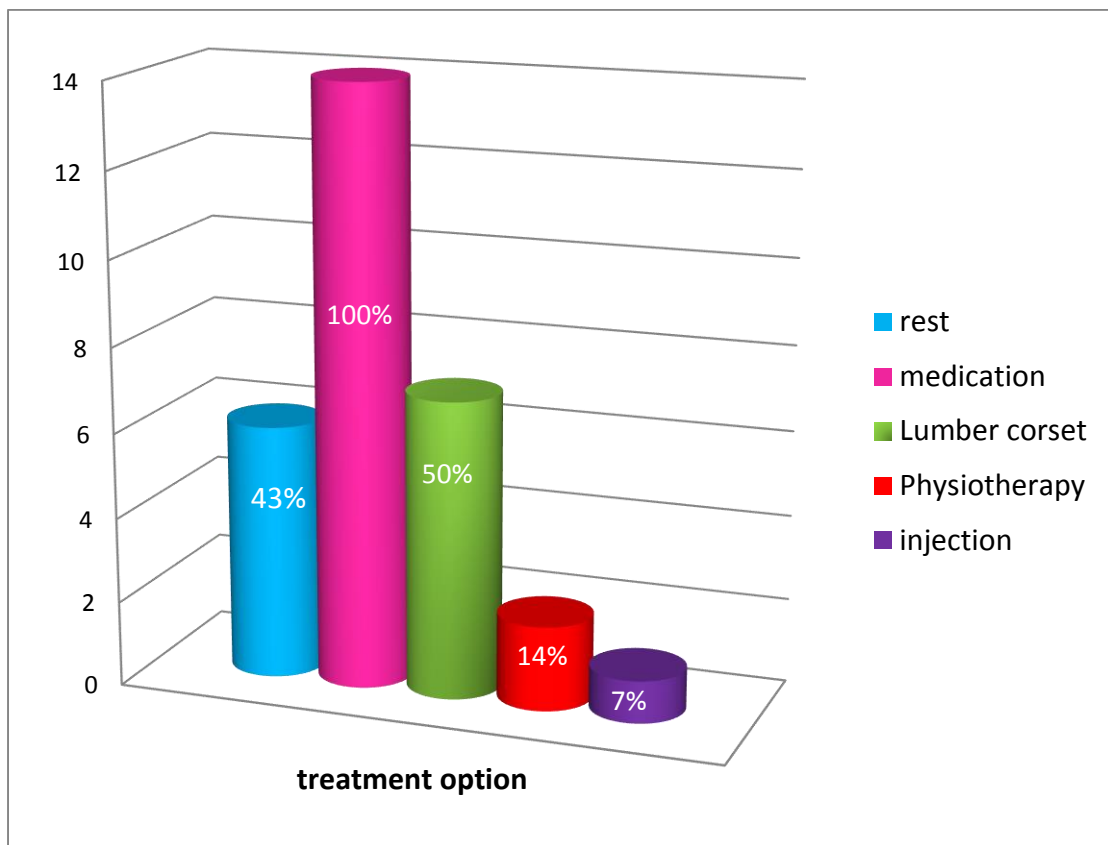
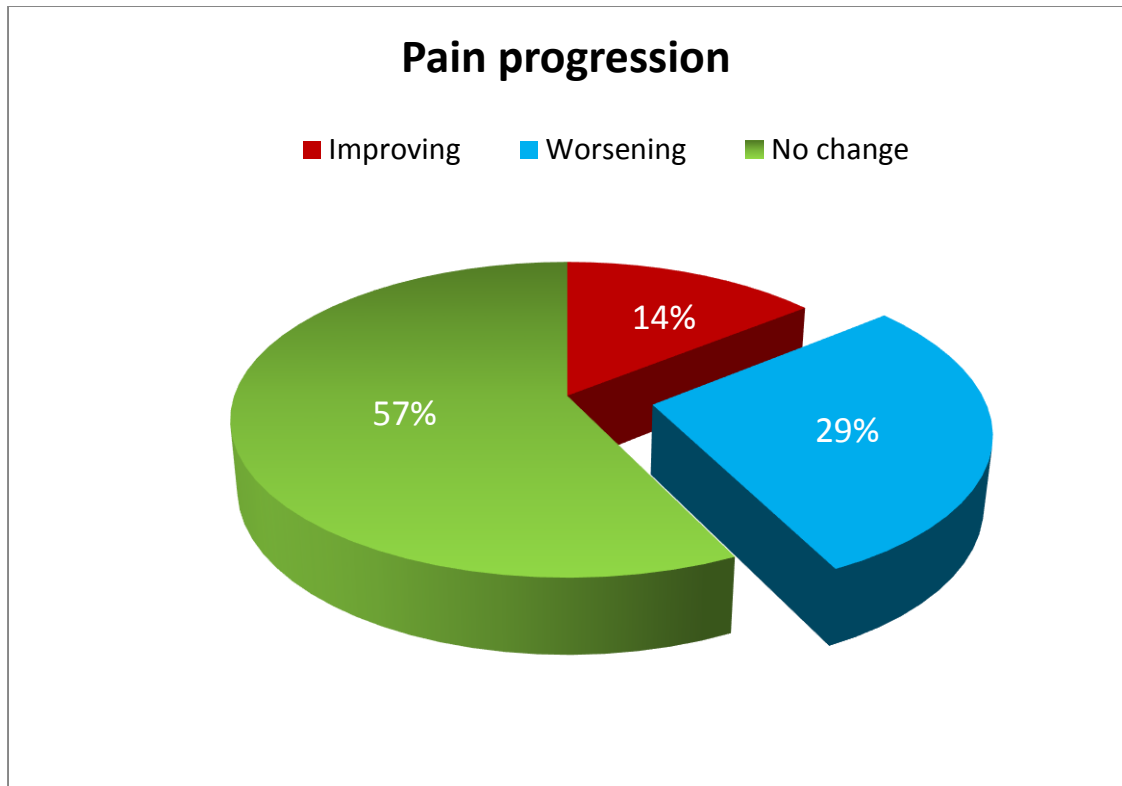


Figure- 10: Frequency of taking treatment previously

## Pain progression

After taking previous treatment 57% (n=8) patients complained that their pain was not changing and 29% (n=4) patients complained that their pain was worsening. Only 14% (n=2) patients told that their pain was improving.



**Figure -11: Pain Progression**

## Reduction of Back Pain in Control Group

Reduction of pain is shown in the chart.

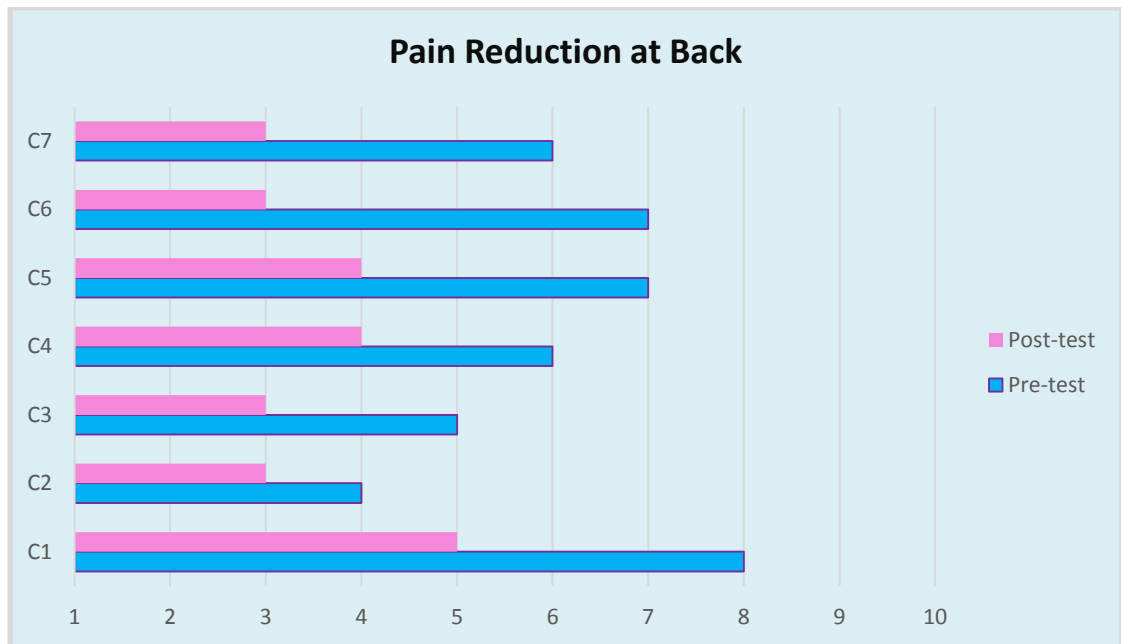


Figure – 12: Reduction of Low Back Pain on NPRS in Control Group

## Mean Reduction of Back Pain in Control Group

The mean of pain reduction in back between pre-test and post-test of control group are 6.14 and 3.57.

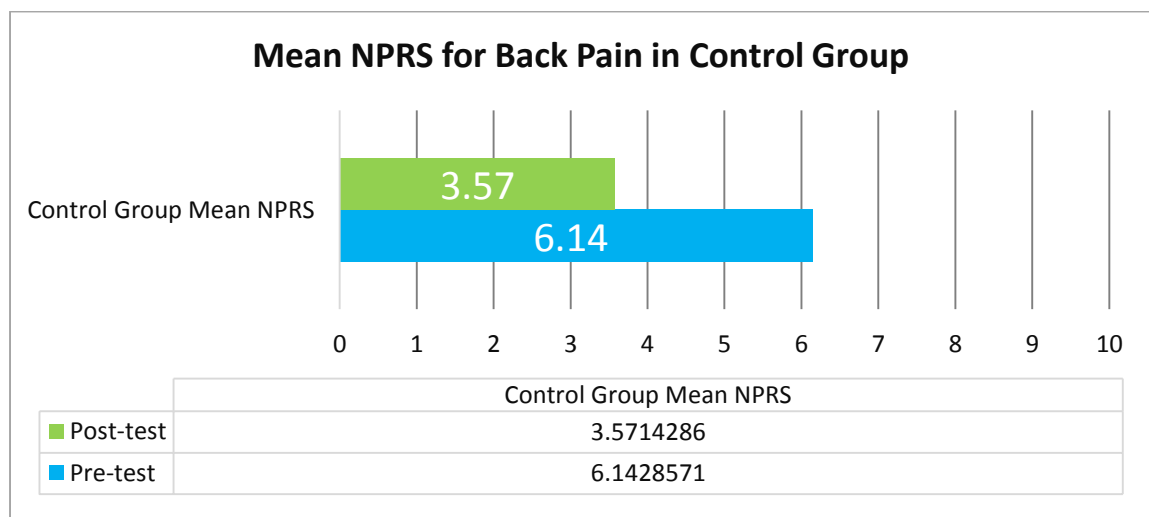
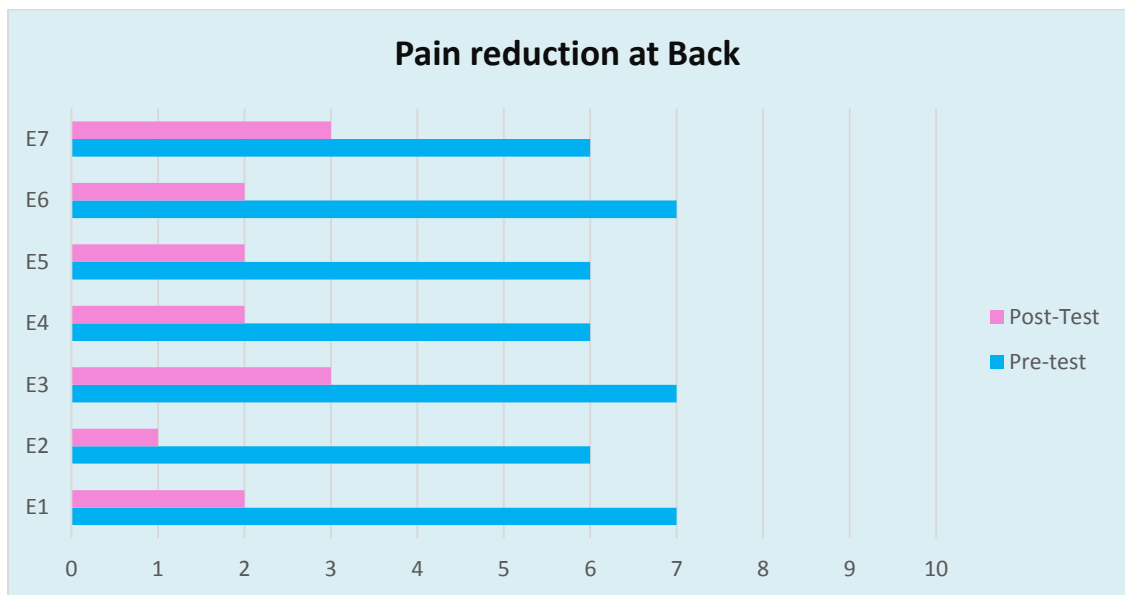


Figure – 13: Mean Reduction of Back Pain on NPRS



## Reduction of Back Pain in Experimental Group

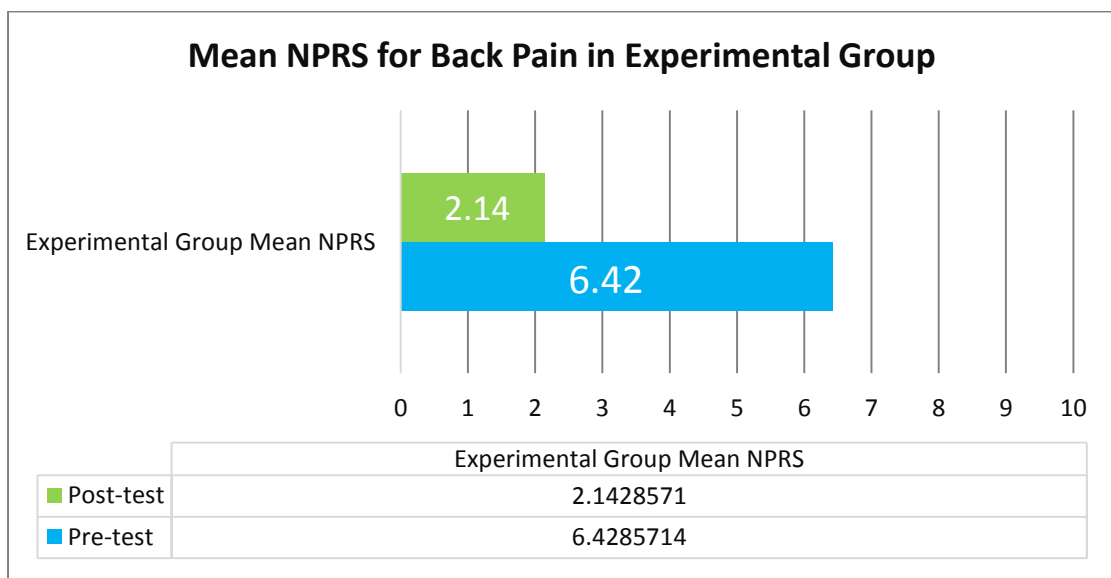
Reduction of pain is shown in the chart.



**Figure – 14: Reduction of Pain at Lower Back in Experimental Group**

## Mean Reduction of Back Pain in Experimental Group

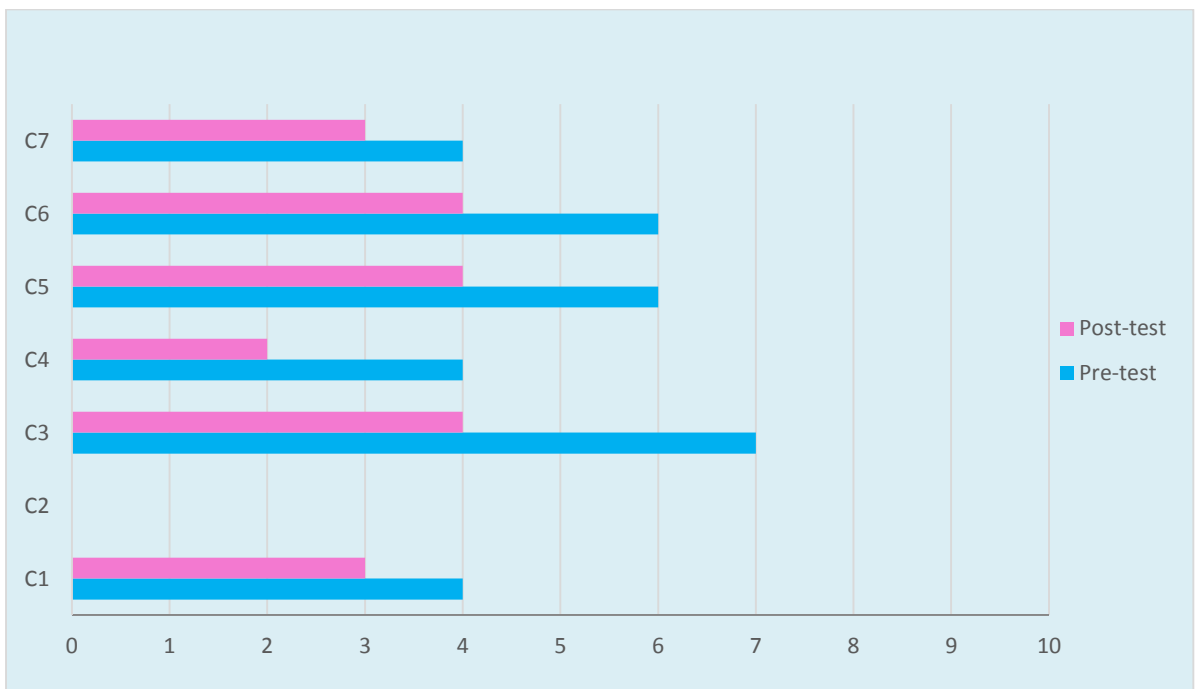
Mean reduction of back pain between pretest and post-test of experimental group are 6.42 and 2.14



**Figure -15: Mean NPRS for Back Pain in experimental Group**

## Reduction of Radiating Thigh Pain in Control Group

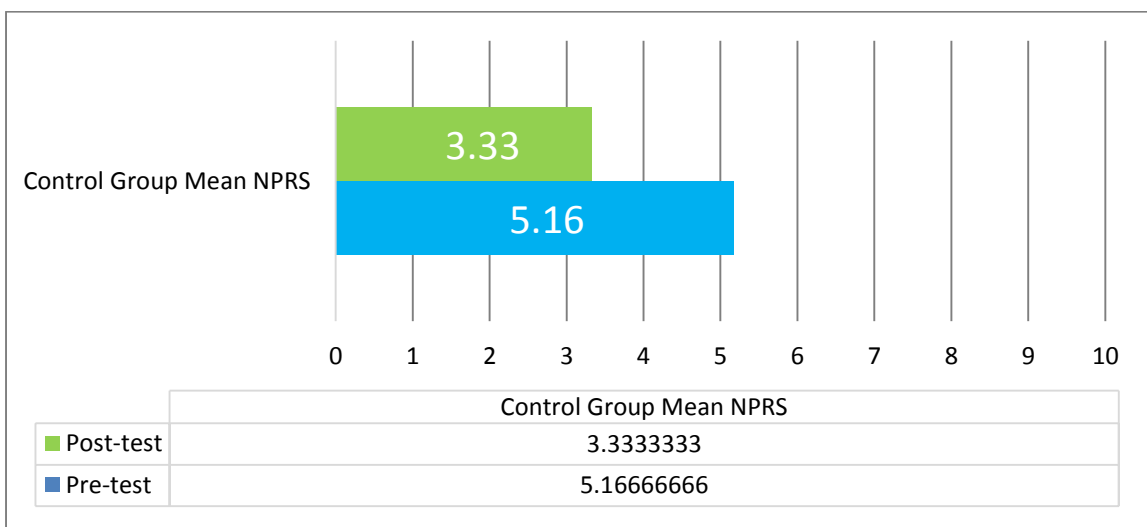
Reduction of pain is shown in the chart.



**Figure – 16: Reduction of Thigh Pain on NPRS in Control Group**

## Mean Reduction of Radiating Thigh Pain in Control Group

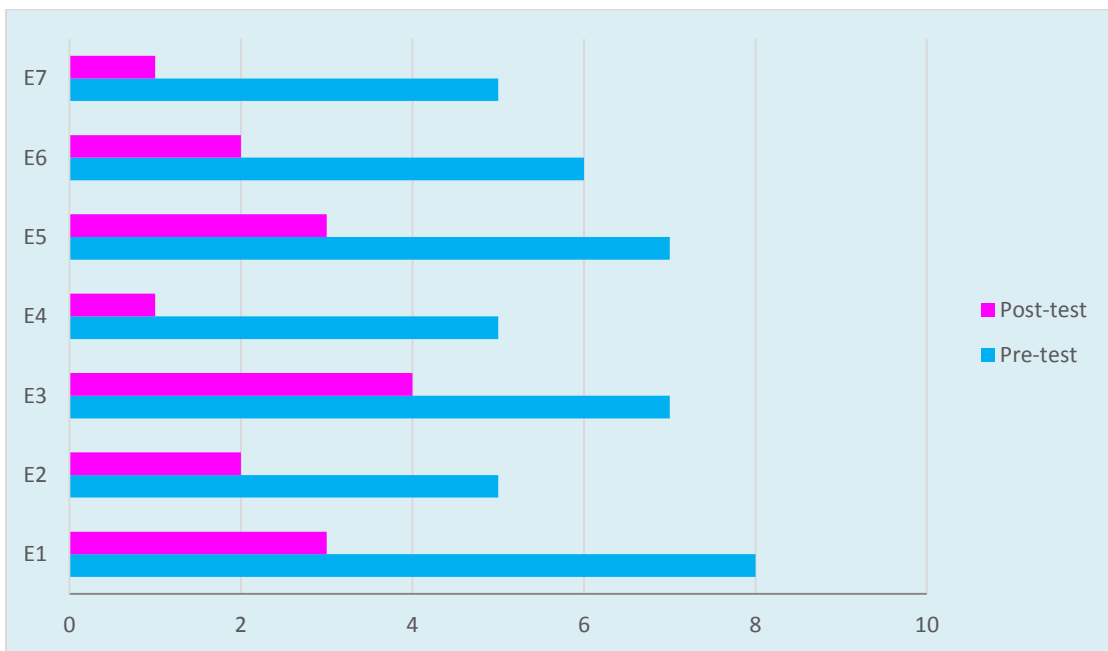
Mean reduction of radiating thigh pain between pre-test and post-test of control group are 5.16 and 3.33



**Figure – 17: Mean Reduction of Thigh Pain on NPRS in Control Group**

## Reduction of Radiating Thigh Pain in Experimental Group:

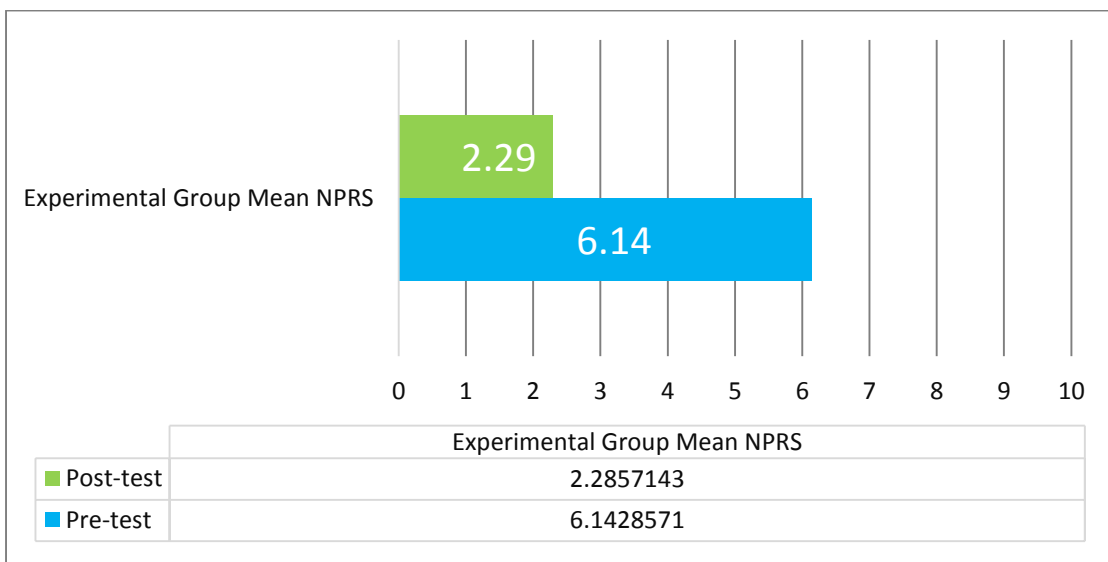
Reduction of pain is shown in the chart.



**Figure – 18: Reduction of Thigh Pain in Experimental Group on NPRS**

## Mean Reduction of Thigh Pain in Experimental Group

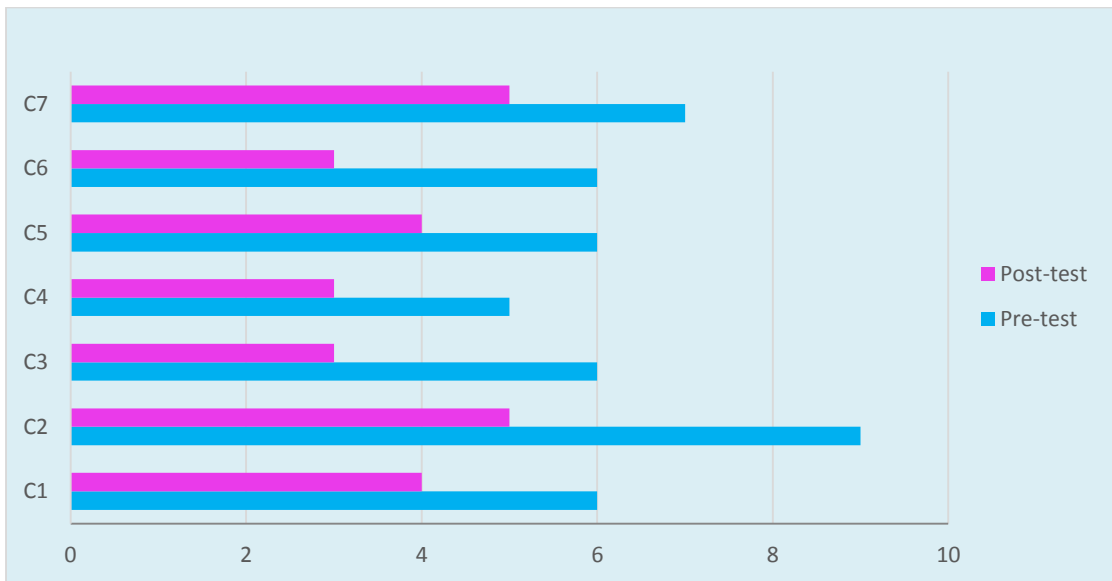
Mean difference of radiating thigh pain between pre-test and post-test of experimental group 6.14 and 2.28



**Figure -19: Mean Reduction of Thigh Pain on NPRS in Experimental Group**

## Reduction of Radiating Leg Pain in Control Group

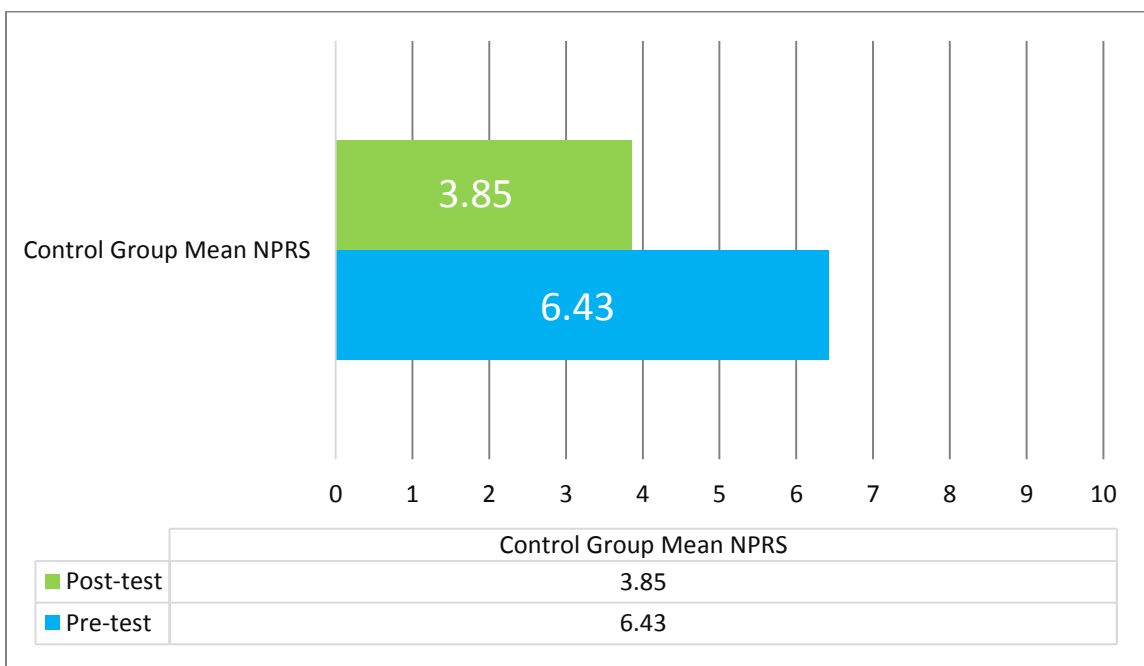
Reduction of pain is shown in the chart.



**Figure – 20: Reduction of Leg Pain on NPRS in Control Group**

## Mean Reduction of Radiating Leg Pain in Control Group

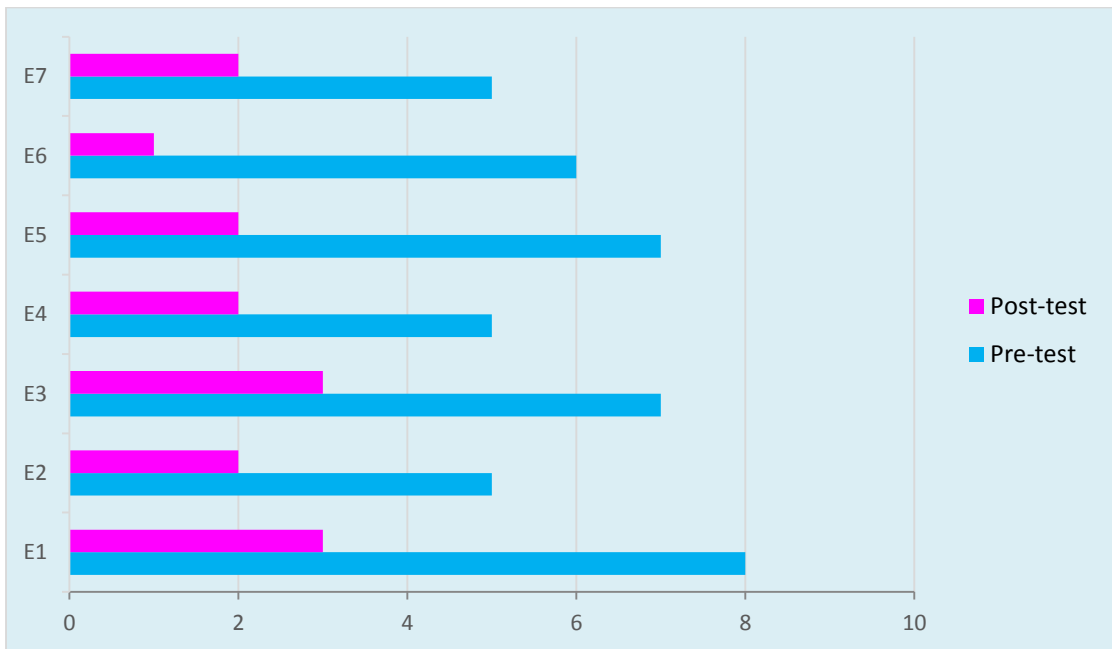
Mean reduction of radiating leg pain between pre-test and post-test of control group are 6.43 and 3.85



**Figure -21: Mean Reduction of Leg Pain in Control Group**

## Reduction of Radiating Leg Pain in Experimental Group

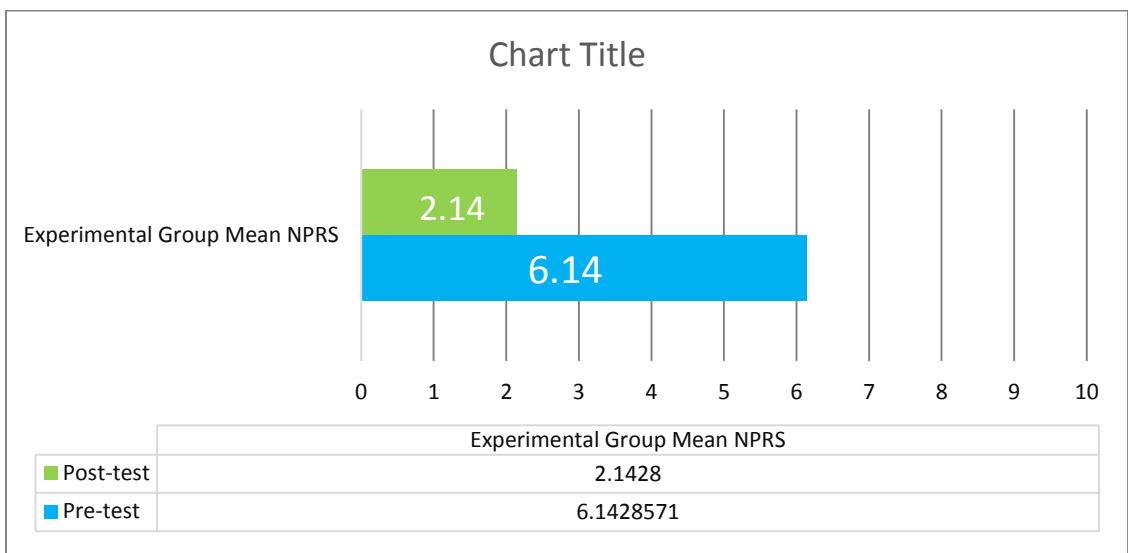
Reduction of pain is shown in the chart.



**Figure -22: Reduction of Leg Pain in Experimental Group**

## Mean Reduction of Radiating Leg Pain in Experimental Group

Mean reduction of radiating leg pain between pre-test and post-test in experimental group are 6.14 and 2.14



**Figure -23: Mean Reduction of Leg Pain in Experimental Group**

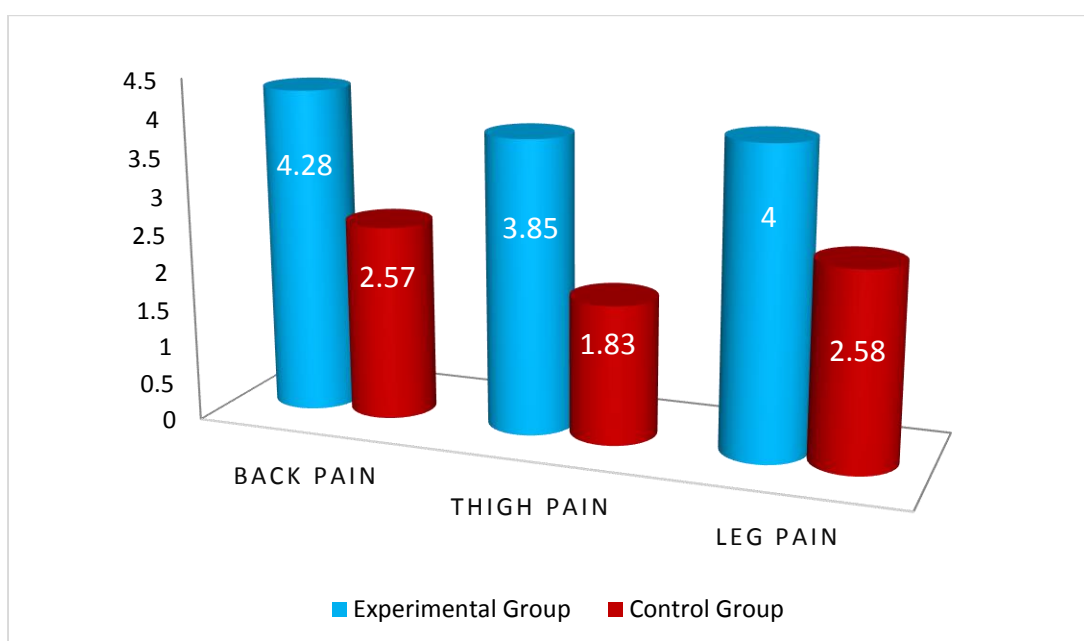
**Table – 5: Mean Difference of Pain Reduction in Both Groups**

Control Group	Back Pain		Thigh Pain		Leg Pain	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Mean	6.14	3.57	5.16	3.33	6.43	3.85
Mean Difference	2.57		1.83		2.58	

Experimental Group	Back Pain		Thigh Pain		Leg Pain	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Mean	6.42	2.14	6.14	2.29	6.14	2.14
Mean Difference	4.28		3.85		4	

**Mean Difference of Pain Reduction in Both Groups**

Mean reduction of pain in back, thigh and leg in both control group and experimental group are shown by bar chart below.



**Figure – 24: Mean Difference of Pain Reduction in Both Groups**

**Table – 6: Level of significance**

Variables in the study statistically significance at the following level of significance:

<b>No.</b>	<b>Variables</b>	<b>Observed ‘u’ value</b>	<b>Observed P value</b>	<b>Level of significance</b>
1	Low back pain	4	<.05	Statistically significant
2	Radiating pain up to thigh	23.5		Statistically not significant
3	Radiating pain up to leg	3	<.05	Statistically significant

## Control Group ODI Score

ODI score of control group is shown in the chart.

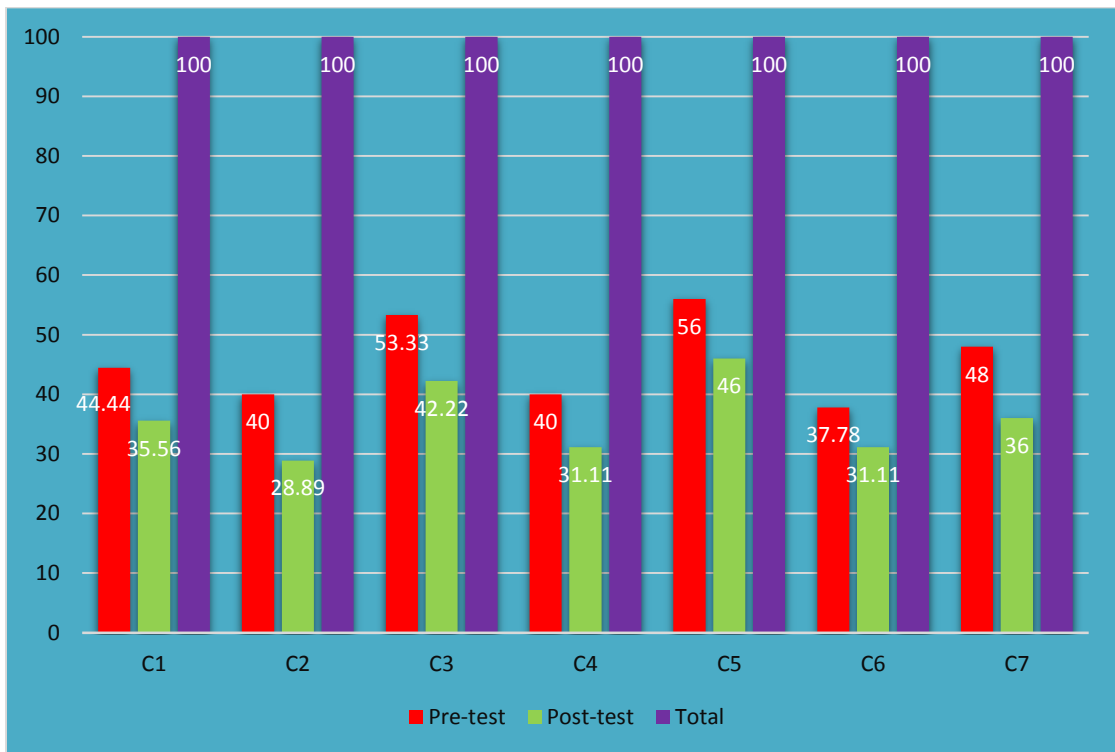


Figure – 25: ODI Score in Control Group

## Mean ODI in Control Group

Mean ODI in control group between pre-test and post-test are 45.65 and 35.85

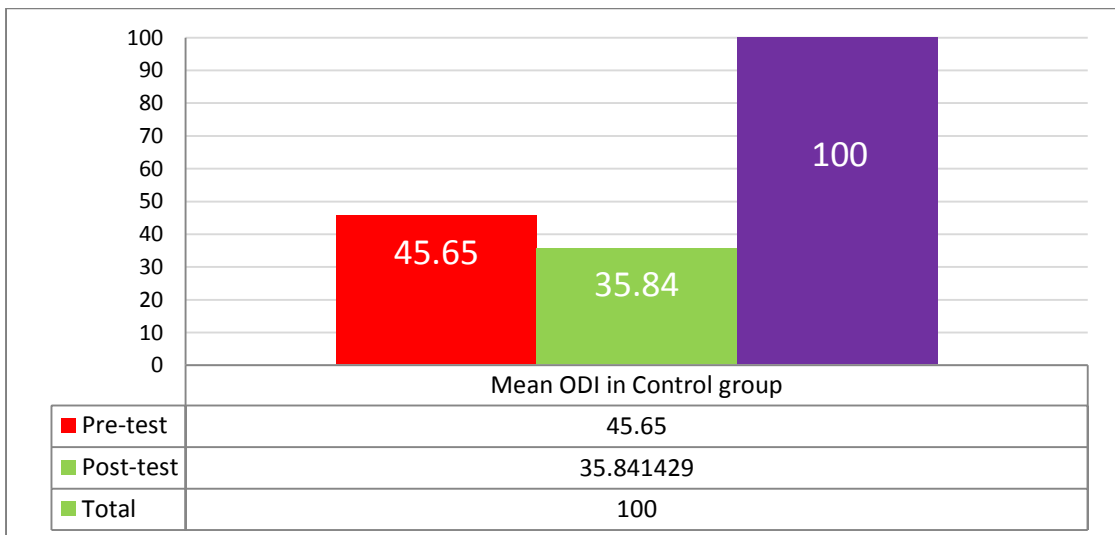


Figure- 26: Mean ODI Score of Control Group



## Experimental Group ODI Score

ODI scores of experimental group are shown below in the chart.

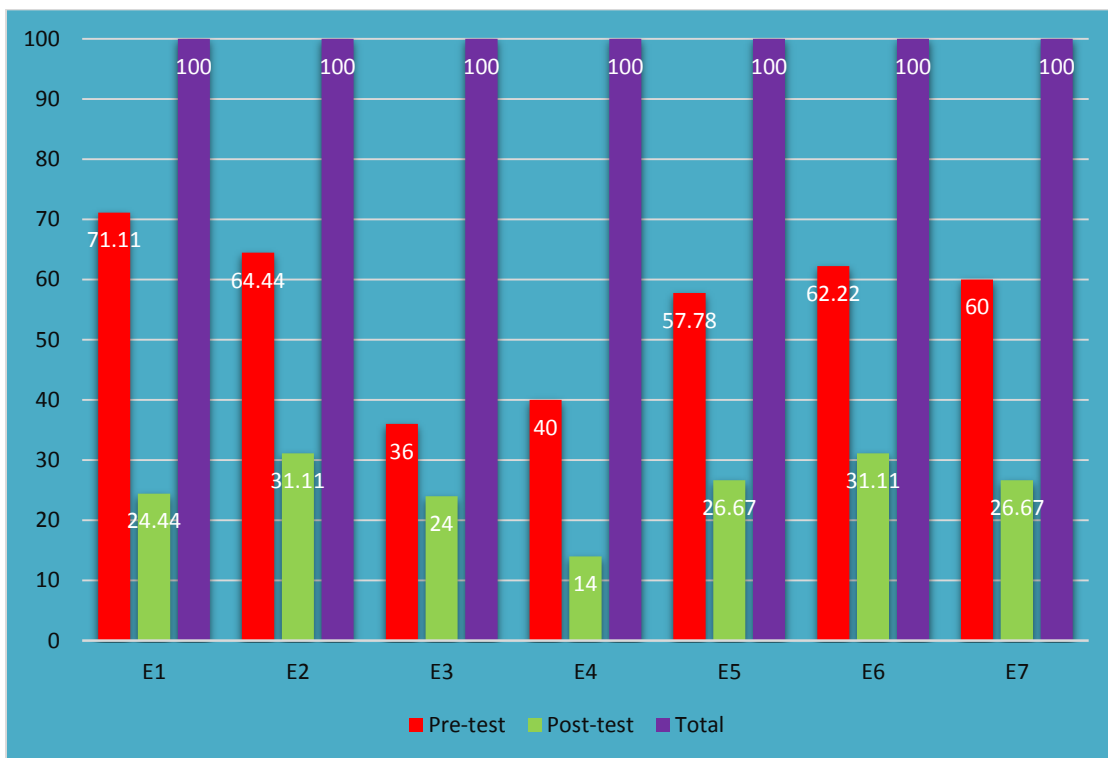


Figure – 27: ODI Score in Experimental Group

## Mean ODI in Control Group

Mean ODI between pre-test and post-test in control group are 55.94 and 25.43

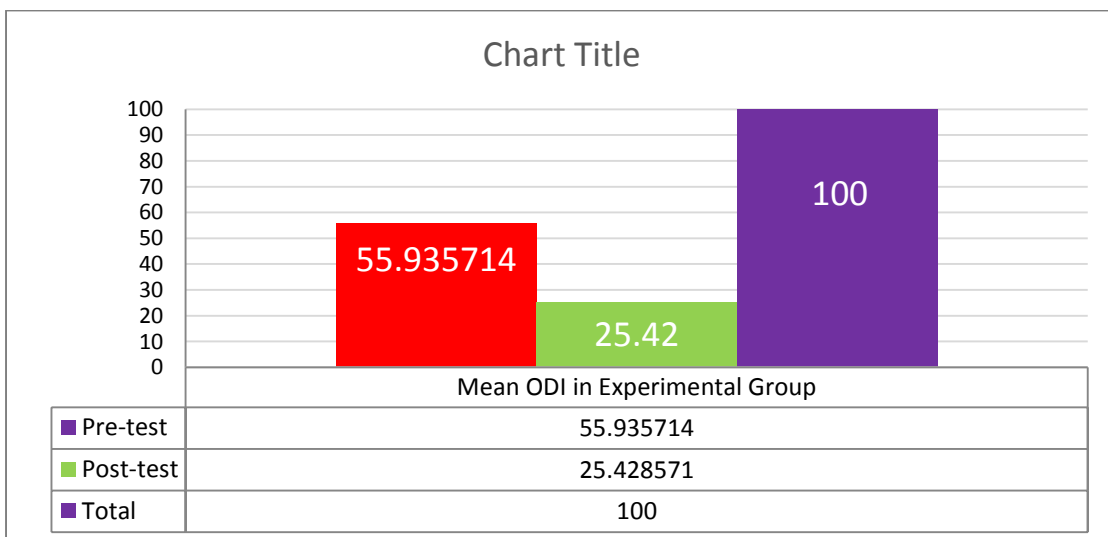
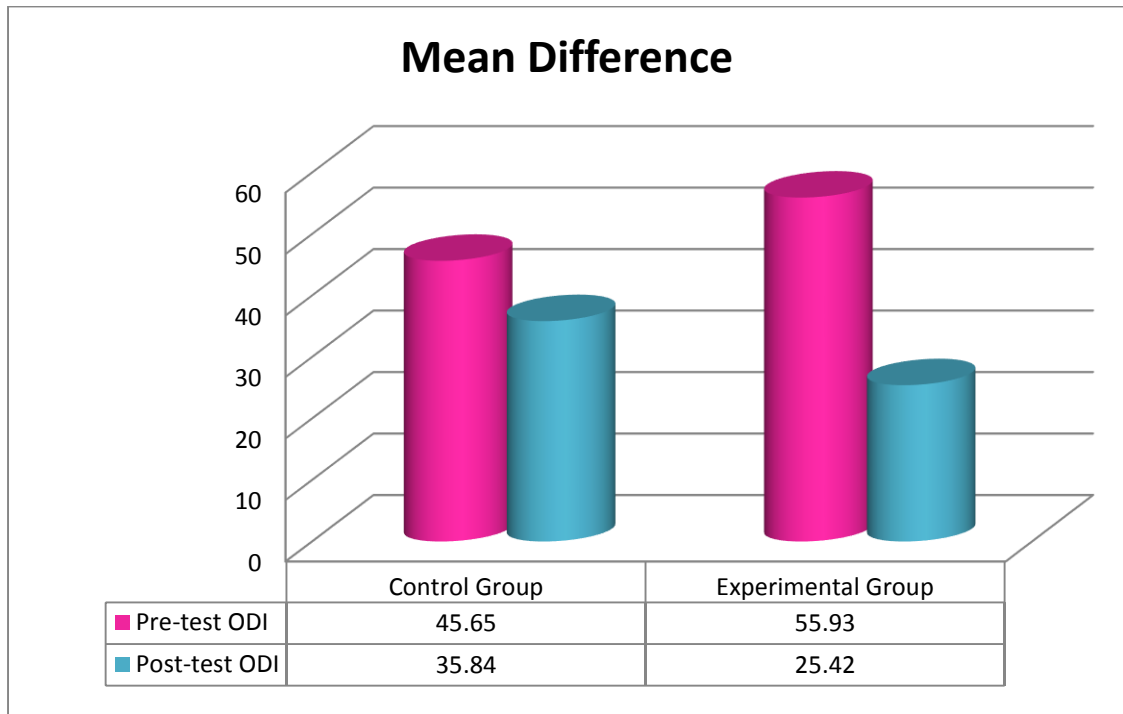


Figure- 28: Mean ODI Score of Experimental Group

## Mean Difference in ODI Score in Both Groups

Mean difference in ODI between both groups in pre-test and post-test has been shown below in the bar chart.



**Figure – 29: Mean Difference of ODI Score in Both Groups**

### **Interpretation of results (NPRS score)**

The researcher interprets the results by using the values of pain intensity on NPRS that come from this study.

### **Pain at Lower Back**

14 patients were enrolled and 7 patients were assigned to control group who receive only conventional physiotherapy. The rest of 7 patients were assigned to experimental group who received Neural Mobilization along with conventional physiotherapy.

Mean difference of pain between pre-test and post-test of experimental group and control group were 4.28 and 2.27. Following application of treatment the study found that the experimental group showed a significant improvement ( $p < .05$ ) in case of low back pain.

### **Radiating Pain up to Thigh**

14 patients were enrolled and 7 patients were assigned to control group who receive only conventional physiotherapy. The rest of 7 patients were assigned to experimental group who received Neural Mobilization along with conventional physiotherapy. From them 7 patients have radiating pain up to thigh in experimental group and 6 patients had radiating pain up to thigh in control group.

Mean difference between pre-test and post-test of experimental group and control group were 3.83 and 1.83. Following application of treatment the study found that the experimental group showed a significant improvement therapeutically but also showed not significant result statistically in case of radiating thigh pain.

### **Radiating Pain up to Leg**

14 patients were enrolled and 7 patients were assigned to control group who receive only conventional physiotherapy. The rest of 7 patients were assigned to experimental group who received Neural Mobilization along with conventional physiotherapy. From them 7 patients have radiating pain up to Leg in experimental group and 3 patients had radiating pain up to leg in control group.

Mean difference between pre-test and post-test of experimental group and control group were 4 and 2.58. Following application of treatment the study found that the experimental group showed a significant improvement therapeutically and showed significant result statistically ( $p < .05$ ) in case of radiating leg pain.

### **ODI Score for Disability**

The researcher interprets the results by using the values of disability on ODI that come from this study.

14 patients were enrolled and 7 patients were assigned to control group who receive only conventional physiotherapy. The rest of 7 patients were assigned to experimental group who received Neural Mobilization along with conventional physiotherapy.

Mean difference between pre-test and post-test of experimental group and control group were 30.51 and 9.81. Following application of treatment the study found that the experimental group showed a significant improvement in case of Disability.

The study was indicated a process that could be continuing to establish the result. Here the aim of this study could be achieved if the researcher could show effective support. The purpose of this study was to evaluate the effectiveness of the Neural Mobilization with conventional physiotherapy compare to only conventional physiotherapy for radiating low back pain.

In this experimental study 14 patients were enrolled and 7 patients were assigned to control group who receive only conventional physiotherapy. The rest of 7 patients were assigned to experimental group who received Neural Mobilization along with conventional physiotherapy. Each group attended for 5 sessions of treatment within two weeks in the Physiotherapy outpatient Unit of CRP, Savar in order to demonstrate the improvement. The outcome was measured by using Numeric Pain Measurement Scale (NPMS) for pain intensity and Oswestry Disability Index (ODI) for measuring disability.

In this study there were total 14 participants. The mean age of experimental group was 42 years and the mean age of control group is 45 years.

Colakovic & Avdic in 2013 had a study on effects on neural mobilization on pain, straight leg raise and disability in patients with radicular low back pain. In their study there was 60 patients. The result of their study about age told that the mean age of experimental group was 42 years and the mean age of control group is 43 years.

The researcher found the male female ratio between 14 the patients, and 71% (n=10) were Male and 29% (n=4) were Female. Among them, In Experimental Group 36% (n=5) were Male and 14% (n=2) were Female and in Control Group 36% (n=5) were Male and 14% (n=2) were Female.

Colakovic & Avdic in 2013 in their study found 45% (n=27) Male and 55% (n=33) male. Among them, In Experimental Group 18.33% (n=11) were Male and 31.66% (n=19) were Female, and in Control Group 26.66% (n=16) were Male and 23.33% (n=14) were Female.

The researcher found significant improvement ( $p < .05$ ) of back pain in experimental group on NPRS. In Experimental group, the post-test Mean on NPRS was 2.27. Also there was significant improvement of pain in leg ( $p < .05$ ), as the post-test mean were consecutively 1.83 and 3 times more in experimental group than control group.

In 2011 Sahar had a study with 60 patients on Effectiveness of Neural Mobilization in treatment of Low Back Dysfunction. In his study he found significant improvement ( $p=0.06$ ) of pain in experimental group on NPRS. In Experimental group, the post-test Mean on NPRS was 1.83.

In this study the researcher found a significant improvement in case of Disability on ODI. Mean difference reducing disability between pre-test and post-test of experimental group and control group were 30.51 and 9.81.

Kumar (2013) had a study on effectiveness of Neural Mobilization for the treatment of Low Back Pain with 30 patients. . In his study he found significant improvement in case of Disability on ODI. Mean difference reducing disability between pre-test and post-test of experimental group and control group were 25.74 and 8.27.

## **Limitations of the Study**

The study was conducted with 14 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.

There was given neural mobilization of sciatic nerve with branch of tibial and peroneal nerve. The researcher did not diagnose specific nerve root involvement and did not mobilize specific nerve root.

It is limited by the fact daily activities of the subject were not monitored which could have influenced. Researcher only explored the effect of Neural Mobilization after 5 sessions of treatments, so the long term effect of Neural Mobilization was not explored in this study.

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 with specific intervention for Bangladesh was very limited in this study.

**6.1 Conclusion**

The result of the study have identified that the effectiveness of conventional physiotherapy with Neural Mobilization was better than the conventional physiotherapy alone for radiating Low Back Pain patients which was a Quantitative experimental study. The result of the current study indicates that the conventional physiotherapy with Neural Mobilization can be an effective therapeutic approach for patient with radiating low back pain. Participants in the conventional physiotherapy with Neural Mobilization group showed a greater benefit than those in the only conventional physiotherapy group. The result indicate that the significant changes in both groups are due to the selection of a well- defined population of radiating low back pain patients using specific inclusion and exclusion criteria. It may be helpful for patient with radiating low back pain to increase return to normal daily activities, work and to measure longer term effects for determining cost effectiveness of Neural Mobilization in conjunction with conventional physiotherapy as an intervention for radiating low back pain.



## **6.2 Recommendation**

In this study, the researcher provided 5 session of treatment to both groups and measure pain intensity and disability in different functional positions.

As a consequence of the research it is recommended that with further well-controlled double blinding study include comparison of the conventional physiotherapy with Neural Mobilization group with the conventional physiotherapy alone and assessing effects and efficacy of these treatments. In particular, since the back is sensitive area this is a frequent cause of functional disability and pain. This study directed towards an assessment of the specific management in treating back of specific back problem in an outpatient, if pursued further could prove extremely fruitful. Furthermore, chronic associated with many cases of back pain, and the extensive pathology that exists in the surrounding structure that was joints, tissues and bone, may suggest a further study of a longer duration as this may give even better results.

The researcher did not diagnose specific nerve root involvement and did not mobilize specific nerve root. It is recommended to do further study with diagnosis of specific nerve root involvement and mobilization of specific nerve.

These samples were selected between the age group of 18-60 years, but the researcher could not find out which age group was more effective. If the most effective age group were found then the study will be more effective.

The researcher did random assigned in both group rather than random selection. That's why researcher recommended to do further study with enough time and by maintaining random selection to make the study more valid.

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## ANNEXURE

1. Consent Form (Bengali Version)
2. Questionnaire (Bengali Version)
3. Consent Form (English Version)
4. Questionnaire (English Version)
5. Anatomy of Lumbar Spine
6. Statistical Analysis
7. Statistical Probability Table
8. Permission Letter

## সম্মতিপত্র

আসসালামু আলাইকুম/নমস্কার, আমি সানজিদা ইসলাম লামিয়া, ৪র্থ বর্ষ ঢাকা বিশ্ববিদ্যালয়ের চিকিৎসা অনুষদের অধীনে বাংলাদেশ হেলথ প্রফেশন ইনস্টিটিউট (বিএইচপিআই) এর বি.এস.সি. ইন ফিজিওথেরাপি বিভাগ এর একজন শিক্ষার্থী। অধ্যয়নের অংশ হিসেবে আমাকে একটি গবেষণা সম্পাদন করতে হবে এবং এটা আমার প্রাতিষ্ঠানিক কাজের একটা অংশ। নিম্নোক্ত তথ্যাদি পাঠ করার পর অংশগ্রহণকারীদের অধ্যয়নে অংশগ্রহণের জন্য অনুরোধ করা হলো।

আমার গবেষণা শিরোনাম "কোমর ব্যথার রোগীদের ক্ষেত্রে নিউরাল মোবিলাইজেশন এর কার্যকারিতা"। এই গবেষণায় মাধ্যমে আমি কোমর ব্যথার চিকিৎসার জন্য অন্যান্য ফিজিওথেরাপি সঙ্গে নিউরাল মোবিলাইজেশন এর কার্যকারিতা খুঁজে বের করার চেষ্টা করবো। আমার গবেষণার উদ্দেশ্য হলো থেরাপী দেবার পূর্বে ও পরে রোগীদের ব্যথা, নড়াচড়া ও প্রতিবন্ধকতা পরিমাপ করা। আমি যদি আমার গবেষণাটি সার্থকভাবে সম্পূর্ণ করতে পারি তবে যেসব রোগীরা কোমর ব্যথায় ভুগছেন তারা উপকৃত হবেন এবং এটি হবে একটি পরীক্ষামূলক প্রমাণ।

আমার গবেষণা প্রকল্প বাস্তবায়ন করার জন্য, আমি রোগীদের কাছ থেকে কিছু তথ্য সংগ্রহ করব। এজন্য আমি আপনার সাথে বেশ কয়েকবার দেখা করব। আমার গবেষণায় অংশগ্রহণে আপনার কোন ক্ষতি বা বিপদ হবে না। আপনি যে কোনো সময় নিজেকে এ গবেষণা থেকে প্রত্যাহার করতে পারেন। এই গবেষণার প্রাপ্ত তথ্য সম্পূর্ণভাবে গোপনীয় থাকবে এবং অংশগ্রহণকারীর ব্যক্তিগত তথ্য আপনার অনুমতি ব্যতিরেকে অন্য কোথাও প্রকাশ করা হবে না।

আপনার গবেষণা সম্পর্কে যদি কোনো জিজ্ঞাসা থাকে তবে আপনি অনুগ্রহপূর্বক যোগাযোগ করতে পারেন গবেষক সানজিদা ইসলাম লামিয়া অথবা নাসিরুল ইসলাম, সহযোগী অধ্যাপক, ফিজিওথেরাপি বিভাগ বিএইচপিআই, সিআরপি, সাভার, ঢাকা-১৩৪৩ এ যোগাযোগ করতে পারেন।

শুরু করার আগে আপনার কি কোন প্রশ্ন আছে ?

আমি কি শুরু করতে পারি ?

হ্যাঁ

না

অংশগ্রহণকারীর স্বাক্ষর ও তারিখ .....

গবেষকের স্বাক্ষর ও তারিখ .....

সাক্ষীর স্বাক্ষর ও তারিখ .....



## প্রশ্নাবলী (বাংলা)

### পর্ব-ক: ব্যক্তিগত তথ্যাবলী

এই প্রশ্নপত্রটি তৈরি করা হয়েছে কোমর ব্যথার রোগীদের ব্যথা পরিমাপ করার জন্য। ব্যক্তিগত তথ্যাবলী অংশটি ফিজিওথেরাপিস্ট/গবেষক কালো/নীল কলমের দ্বারা পূরণ করবেন।

কোড নং:

তারিখ:

রোগীর নাম:

লিঙ্গ:

বয়স:

পেশা:

ঠিকানা:

ফোন নম্বর:

১. আপনি কতদিন যাবত কোমর ব্যথায় ভুগছেন?

বছর ..... মাস ..... সপ্তাহ .....

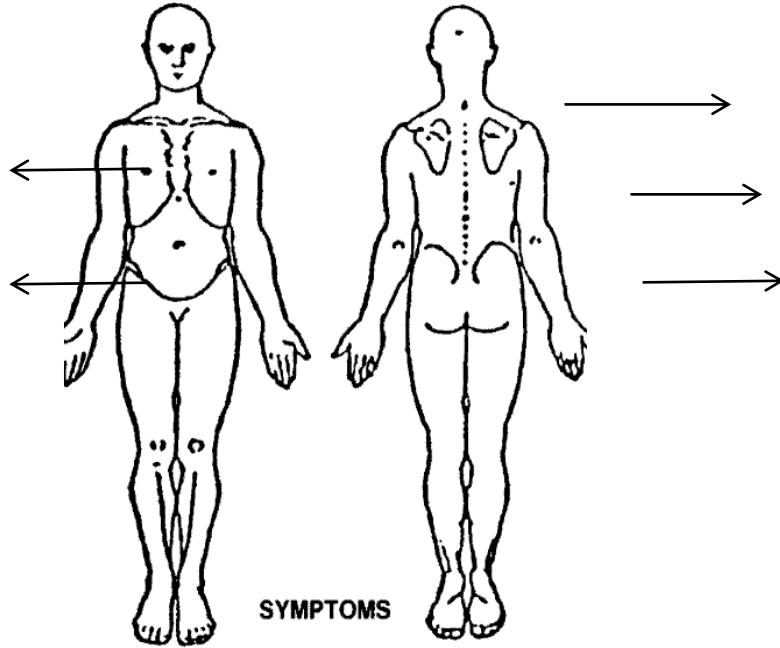
আপনার কোমর ব্যথা কোন পাশে বেশি?

১ ডান পাশে

২ বাম পাশে

৩ মাঝখানে

৪ উভয় পাশে সমান



২। আপনার কী উরুতে কোন ব্যাথা আছে?  ১ হ্যাঁ  ২ না

যদি থাকে, তবে আপনি কতদিন ধরে উরুর ব্যথায় ভুগছেন?

বছর ..... মাস ..... সপ্তাহ .....

আপনার উরুর ব্যাথা কোন পাশে বেশি? ( সঠিক উত্তর এর পাশে টিক চিহ্ন দিন)

১ ডান  ২ বাম  ৩ উভয়

৩। আপনার কী পায়ে কোন ব্যাথা আছে?  ১ হ্যাঁ  ২ না

যদি থাকে, তবে আপনি কতদিন ধরে পায়ের ব্যথায় ভুগছেন?

বছর ..... মাস ..... সপ্তাহ .....

আপনার পায়ের ব্যাথা কোন পাশে বেশি? ( সঠিক উত্তর এর পাশে টিক চিহ্ন দিন)

১ ডান পাশে  ২ বাম পাশে  ৩ উভয় পাশে সমান

৪। আপনার ব্যাথা কোথায় বেশি?

১ কোমরের ব্যাথা পায়ের ব্যথার চেয়ে বেশি

২ পা-এর ব্যাথা কোমরের এর ব্যথার চেয়ে বেশি

৩ কোমর ও পায়ের ব্যাথা সমান।

৫। আপনার পায়ে কি দুর্বলতা অনুভব করেন?  ১ হ্যাঁ  ২ না

আপনার পায়ের দুর্বলতা কোন পাশে বেশি? ( সঠিক উত্তর এর পাশে টিক চিহ্ন দিন)

১ ডান পাশে  ২ বাম পাশে  ৩ উভয় পাশে সমান

৬। আপনার পায়ে কি অসাড়তা অনুভব করেন?  হ্যাঁ  না

আপনার পায়ের অসাড়তা কোন পাশে বেশি? ( সঠিক উত্তর এর পাশে টিক চিহ্ন দিন)

ডান পাশে  বাম পাশে  উভয় পাশে সমান

৭। আপনার কি মূত্রাশয় নিয়ন্ত্রণে সমস্যা হয়?  হ্যাঁ  না

৮। আপনার কি অন্ত্র নিয়ন্ত্রণে সমস্যা হয়?  হ্যাঁ  না

৯। আপনার ভারসাম্যে কোন সমস্যা আছে?  হ্যাঁ  না

১০। নিম্নোক্ত চেক করুন-

- কোমর ব্যথার কারণে জর আসে
- কোমর ব্যথার কারণে ঘুমের সমস্যা হয়
- ওজন কমছে
- ওজন বাড়ছে

১১। আপনার ব্যাথা করে নিম্নলিখিত

	থারাপ	ভাল	অপরিবর্তিত
ক) চিত হয়ে শুলে	<input type="checkbox"/> ১	<input type="checkbox"/> ২	<input type="checkbox"/> ৩
খ) ডান কাত হয়ে শুলে	<input type="checkbox"/> ১	<input type="checkbox"/> ২	<input type="checkbox"/> ৩
গ) বাম কাত হয়ে শুলে	<input type="checkbox"/> ১	<input type="checkbox"/> ২	<input type="checkbox"/> ৩
ঘ) সামনের দিকে বুকলে	<input type="checkbox"/> ১	<input type="checkbox"/> ২	<input type="checkbox"/> ৩
ঙ) বসে থাকলে	<input type="checkbox"/> ১	<input type="checkbox"/> ২	<input type="checkbox"/> ৩

চ) দাঁড়িয়ে থাকলে

১

২

৩

ছ) হাঁটলে

১

২

৩

জ) কাশি / হাঁচি দিলে

১

২

৩

ঝ) কোন কিছু উঠাতে গেলে

১

২

৩

ঞ) ভ্রমন/ ড্রাইভিং

১

২

৩

১২। আপনার ব্যাথা কি কারনে সৃষ্টি হয়েছে বলে আপনি মনে করেন? ( সঠিক উত্তর এর পাশে টিক চিহ্ন দিন)

১ কোন আঘাতের ফলে

২ ত্রুটিপূর্ণ দেহভঙ্গি

৩ কোন ভারি বস্তু তুলতে গিয়ে

৪ অন্যান্য

১৩। আপনার ব্যাথা কখন তীব্র হয়? ( সঠিক উত্তর এর পাশে টিক চিহ্ন দিন)

১ সকালে

২ সন্ধ্যায়

৩ দিন বাড়ার সাথে সাথে

৪ সারাদিন

১৪। এখানে আসার আগে পর্যন্ত আপনি কী কী ধরনের চিকিৎসা নিয়েছেন?

ক) বিশ্রাম	<input type="checkbox"/> ১	হ্যাঁ	<input type="checkbox"/> ২	না
খ) ঔষধ	<input type="checkbox"/> ১	হ্যাঁ	<input type="checkbox"/> ২	না
গ) কোমরের বেল্ট	<input type="checkbox"/> ১	হ্যাঁ	<input type="checkbox"/> ২	না
ঘ) ফিজিওথেরাপি	<input type="checkbox"/> ১	হ্যাঁ	<input type="checkbox"/> ২	না
ঙ) ম্যাসেজ	<input type="checkbox"/> ১	হ্যাঁ	<input type="checkbox"/> ২	না
চ) ইনজেকশন	<input type="checkbox"/> ১	হ্যাঁ	<input type="checkbox"/> ২	না
ছ) অস্ত্রোপচার	<input type="checkbox"/> ১	হ্যাঁ	<input type="checkbox"/> ২	না
জ) অন্যান্য	<input type="checkbox"/> ১	হ্যাঁ	<input type="checkbox"/> ২	না

১৫। আপনার সমস্যাটির অগ্রগতি কেমন? ( সঠিক উত্তর এর পাশে টিক চিহ্ন দিন)

- ১ উন্নতির দিকে  
 ২ অপরিবর্তিত  
 ৩ অবনতির দিকে

## চিকিৎসার পূর্বে ব্যথার পরিমাণ

### পর্ব-খ: ব্যথার পরিমাণ।

এই প্রশ্নাবলী কোমর ব্যথার রোগীদের জন্য পরিকল্পনা করা হয়েছে। McCaffery & Beebe, (১৯৯৩) রোগীদের ব্যথার অভিজ্ঞতা ব্যখ্যা করার জন্য নিওমারিক পেইন রেটিং স্কেল ব্যবহার করেন। এটা সংখ্যাসূচক ব্যথা নির্ধারক স্কেল হিসাবে পরিচিত। এখানে স্কেলে শূন্য (০) মানে কোন ব্যথা নেই (১-৩) মানে হালকা ব্যথা (৪-৬) মানে সহনীয় ব্যথা এবং (৭-১০) মানে তীব্র ব্যথা।

প্রশ্নাবলীর এই অংশে একটি কালো বা নীল রঙীন বল কলম ব্যবহার করে রোগীর দ্বারা পূরণ করা হবে। রোগী কোন প্রশ্ন মানে বুঝতে না পারলে, ফিজিওথেরাপিস্টকে নির্দিষ্ট অংশের অর্থ পরিষ্কার করতে অনুরোধ করা হল।

এখানে কিছু প্রশ্ন আছে এবং প্রতিটি প্রশ্নের সঙ্গে একটি দীর্ঘ লাইন আছে। লাইনটি ব্যথার পরিস্থিতি উপস্থাপন করে, বাম হাতের দিকে শূন্য (০) কোন ব্যথা নেই এবং ডান হাতের দিকে দশ (১০) তীব্র ব্যথা মানে প্রতিনিধিত্ব করে। নিম্নলিখিত প্রশ্নে আপনার ব্যথার পরিমাণ লাইন চিহ্নিত করুন।

উদাহরণ সরূপ-

যদি কারো কোমর ব্যথার পরিমাণ হয় ৭ থেকে ৯ এর মধ্যে তাহলে তিনি পূরণ করবেন-

০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০

এখানে শূন্য (০) মানে কোন ব্যথা নেই (১-৩) মানে হালকা ব্যথা (৪-৬) মানে সহনীয় ব্যথা এবং (৭-১০) মানে তীব্র ব্যথা।

১। আজকে আপনার কোমড় ব্যথার তীব্রতা কতোটুকু?

০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০

এখানে শূন্য (০) মানে কোন ব্যথা নেই (১-৩) মানে হালকা ব্যথা (৪-৬) মানে সহনীয় ব্যথা এবং (৭-১০) মানে তীব্র ব্যথা।

২। আজকে আপনার উরুর ব্যথার তীব্রতা কতোটুকু?

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০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০

এখানে শূন্য (০) মানে কোন ব্যথা নেই (১-৩) মানে হালকা ব্যথা (৪-৬) মানে সহনীয় ব্যথা এবং (৭-১০) মানে তীব্র ব্যথা।

৩। আজকে আপনার পা-এর ব্যথার তীব্রতা কতোটুকু?

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০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০

এখানে শূন্য (০) মানে কোন ব্যথা নেই (১-৩) মানে হালকা ব্যথা (৪-৬) মানে সহনীয় ব্যথা এবং (৭-১০) মানে তীব্র ব্যথা।

## অসওয়েসট্রি অক্ষমতা সূচক প্রশ্নাবলী

এই প্রশ্নপত্রটি আপনার কোমড় ব্যথা এবং পায়ের ব্যথা আপনার দৈনন্দিন জীবনকে কতখানি প্রভাবিত করে তার সম্বন্ধে আমাদের ধারণা দিবে। আপনি দয়া করে নীচের প্রতিটি বিভাগ হতে যেকোন একটি উক্তি গোল দাগ দিয়ে চিহ্নিত করুন যেটি আপনার বর্তমান অবস্থাকে সবচেয়ে ভালভাবে ব্যখ্যা করে।

### বিভাগঃ-১ ব্যথার তীব্রতা

- ০ আমার এই মুহূর্তে কোন ব্যথা নেই
- ১ এই মুহূর্তে ব্যথা খুবই হালকা
- ২ এই মুহূর্তে ব্যথা সহনীয় আছে
- ৩ এই মুহূর্তে ব্যথা মাঝামাঝি
- ৪ এই মুহূর্তে ব্যথা খুব তীব্র
- ৫ এই মুহূর্তে ব্যথা সবচেয়ে খারাপ

### বিভাগঃ-২ ব্যক্তিগত যত্ন (কাপড় পরা ও ধোয়া ইত্যাদি)

- ০ আমি সাধারণত অতিরিক্ত ব্যথা ছাড়া নিজের দেখাশোনা করতে পারি
- ১ আমি সাধারণত নিজের দেখাশোনা করতে পারি, কিন্তু ব্যথা হয়
- ২ ব্যথার কারণে নিজের দেখাশোনা করার জন্য আমি সতর্কতা অবলম্বন করছি
- ৩ আমি নিজের যত্ন নিতে পারি কিন্তু আমার কিছুটা সাহায্যের প্রয়োজন হয়,
- ৪ আমার নিজের যত্নের প্রায় সব ক্ষেত্রে প্রতিদিন সাহায্যের প্রয়োজন হয়.
- ৫ আমার পোশাক পরিধানে ও ধোয়ার কাজে অসুবিধা হয় এবং আমি বিছানায় পড়ে থাকি.



### বিভাগঃ-৩ উত্তোলন (গৃহপালিত প্রাণি, মুদি, বই, সরঞ্জাম ইত্যাদি)

- ০ আমি অতিরিক্ত ব্যথা ছাড়া ভারী ওজন উত্তোলন করতে পারি
- ১ আমি ভারী ওজন উত্তোলন করতে পারি, কিন্তু এটা আমাকে অতিরিক্ত ব্যথা দেয়.
- ২ ব্যথার কারণে আমি মেঝে থেকে ভারি ওজন উত্তোলন করতে পারি না, কিন্তু সুবিধামত (যেমন একটি টেবিলের উপর থেকে) স্থান হলে, আমি উত্তোলন করতে পারি.
- ৩ ব্যথা ভারী ওজন উত্তোলন থেকে আমাকে বাধা দেয়, কিন্তু আমি হালকা থেকে মাঝারি ওজন তারা সুবিধামত স্থানে উত্তোলন করতে পারি।
- ৪ আমি শুধুমাত্র খুব হালকা ওজন উত্তোলন করতে পারি।
- ৫ আমি কিছু বহন বা উত্তোলন করতে পারি না।

### বিভাগঃ-৪ ঘুমানো

- ০ ব্যথার কারণে আমার ঘুমের কোন সমস্যা হয় না।
- ১ ব্যথার কারণে মাঝে মাঝে আমার ঘুমের সমস্যা হয়
- ২ ব্যথার কারণে আমার ছয় ঘন্টার কম ঘুম হয়।
- ৩ ব্যথার কারণে আমার চার ঘন্টার কম ঘুম হয়।
- ৪ ব্যথার কারণে আমার দুই ঘন্টার কম ঘুম হয়।
- ৫ ব্যথার কারণে আমি ঘুমাতে পারি না।

### বিভাগঃ-৫ বসা

- ০ আমি পছন্দ মত যে কোন চেয়ারে যতক্ষণ খুশি বসে থাকতে পারি.
- ১ আমি যতক্ষণ চাই আমার প্রিয় চেয়ারে বসে থাকতে পারি.
- ২ ব্যথার কারণে আমি এক ঘন্টার বেশি বসে থাকতে পারি না

- ৩ ব্যথার কারণে আমি আধ ঘন্টার বেশি বসে থাকতে পারি না
- ৪ ব্যথার কারণে আমি ১০ মিনিটের বেশি বসে থাকতে পারি না
- ৫ ব্যথার কারণে আমি একেবারেই বসে থাকতে পারি না

#### বিভাগঃ-৬ দাঁড়ানো

- ০ আমি অতিরিক্ত ব্যথা ছাড়া যতক্ষন খুশি দাঁড়িয়ে থাকতে পারি।
- ১ আমি যতক্ষন খুশি দাঁড়িয়ে থাকতে পারি, কিন্তু এটা আমাকে অতিরিক্ত ব্যথা দেয়।
- ২ ব্যথার কারণে এক ঘন্টা অধিক সময় দাঁড়িয়ে থাকা যায় না।
- ৩ ব্যথার কারণে আধ ঘন্টা অধিক সময় দাঁড়িয়ে থাকা যায় না।
- ৪ ব্যথার কারণে ১০ মিনিটের অধিক সময় দাঁড়িয়ে থাকা যায় না।
- ৫ ব্যথার কারণে আমি একেবারেই দাঁড়িয়ে থাকতে পারিনা।

#### বিভাগঃ-৭ হাঁটা

- ০ হাঁটার সময় আমার কোন বাধা হয় না।
- ১ ব্যথা এক মাইল এর বেশী হাঁটার ক্ষেত্রে আমাকে বাধা দেয়.
- ২ ব্যথা আধ মাইল এর বেশি হাঁটার ক্ষেত্রে আমাকে বাধা দেয়.
- ৩ ব্যথা ১০০ গজ এর বেশি হাঁটার ক্ষেত্রে আমাকে বাধা দেয়.
- ৪ আমি শুধুমাত্র একটি লাঠি বা ক্রাচ ব্যবহার করে হাঁটতে পারি
- ৫ আমি অধিকাংশ সময় বিছানায় থাকি

### বিভাগঃ-৮ যৌন জীবন (প্রযোজ্য হলে)

- ০ আমার যৌন জীবন স্বাভাবিক এবং কোন অতিরিক্ত ব্যথা হয়না
- ১ আমার যৌন জীবন স্বাভাবিক কিন্তু কিছুটা ব্যথা হয়
- ২ আমার যৌন জীবন প্রায় স্বাভাবিক কিন্তু অনেক ব্যথা হয়
- ৩ আমার যৌন জীবন ব্যথা দ্বারা গুরুতরভাবে বাধাগ্রস্ত
- ৪ আমার যৌন জীবন ব্যথার কারণে প্রায় অনুপস্থিত
- ৫ ব্যথার কারণে আমার যৌন জীবন পুরোপুরিভাবে বাধাগ্রস্ত

### বিভাগঃ-৯ সামাজিক জীবন

- ০ আমার সামাজিক জীবন স্বাভাবিক এবং এতে কোন অতিরিক্ত ব্যথা হয় না।
- ১ আমার সামাজিক জীবন স্বাভাবিক, কিন্তু ব্যথা বৃদ্ধি পায়।
- ২ ব্যথা আমার সামাজিক জীবনের উপর উল্লেখযোগ্য প্রভাব ফেলতে পাড়েনি (যেমন ক্রীড়া, ইত্যাদি).
- ৩ ব্যথা কারণে আমার সামাজিক জীবন সীমাবদ্ধ হয়েছে এবং আমি প্রায়ই বাইরে যেতে পারি না।
- ৪ ব্যথা আমার বাড়িতে আমার সামাজিক জীবন সীমিত করেছে।
- ৫ ব্যথার কারণে আমার কোন সামাজিক জীবন নেই।

### বিভাগঃ-১০ ভ্রমণ

- ০ আমি ব্যথা ছাড়া যে কোন জায়গায় ভ্রমণ করতে পারি।
- ১ আমি কোথাও ভ্রমণ করতে পারি, কিন্তু এটা অতিরিক্ত ব্যথা দেয়.
- ২ আমি দুই ঘন্টার উপর যাতায়াতের পরিচালনা করতে পারি, কিন্তু এটা ব্যথাকে খারাপ করে
- ৩ ব্যথা কারণে আমার যাতায়াত সীমিত এবং তা এক ঘন্টার কম।

৪ ব্যথা কারণে আমার যাতায়াত সীমিত এবং তা ৩০ মিনিটের কম।

৫ ব্যথা আমার চিকিৎসা গ্রহণ ছাড়া অন্য সকল ভ্রমণে আমাকে বাধা দেয়।

**Score:**            /50    **Transform to percentage score x 100 =    % points**

**Scoring:**

For each section the total possible score is 5: if the first statement is marked the section score = 0, if the last statement is marked it = 5.

If all ten sections are completed the score is calculated as follows:

Example:

16 (total scored)

50 (total possible score) x 100 = 32%

If one section is missed or not applicable the score is calculated: 16 (total scored)

45 (total possible score) x 100 = 35.5%

Minimum Detectable Change (90% confidence): 5 points or 10 %points

## চিকিৎসা পরবর্তী প্রশ্নাবলী (বাংলা)

### পর্ব-ক: ব্যক্তিগত তথ্যাবলী

এই প্রশ্নপত্রটি তৈরি করা হয়েছে কোমর ব্যথার রোগীদের ব্যাথা পরিমাপ করার জন্য। ব্যক্তিগত তথ্যাবলী অংশটি ফিজিওথেরাপিস্ট/গবেষক কালো/নীল কলমের দ্বারা পূরণ করবেন।

কোড নংঃ

তারিখঃ

রোগীর নামঃ

লিঙ্গঃ

বয়সঃ

পেশাঃ

ঠিকানাঃ

ফোন নম্বরঃ

### পর্ব-খ: ব্যাথার অবস্থা পরিমাপ

এই প্রশ্নাবলী কোমর ব্যথার রোগীদের জন্য পরিকল্পনা করা হয়েছে। McCaffery & Beebe, (১৯৯৩) রোগীদের ব্যথার অভিজ্ঞতা ব্যাখ্যা করার জন্য নিওমারিক পেইন রেটিং স্কেল ব্যবহার করেন। এটা সংখ্যাসূচক ব্যাথা নির্ধারক স্কেল হিসাবে পরিচিত। এখানে স্কেলে শূন্য (০) মানে কোন ব্যাথা নেই (১-৩) মানে হালকা ব্যাথা (৪-৬) মানে সহনীয় ব্যাথা এবং (৭-১০) মানে তীব্র ব্যাথা।

প্রশ্নাবলীর এই অংশে একটি কালো বা নীল রঙীন বল কলম ব্যবহার করে রোগীর দ্বারা পূরণ করা হবে। এখানে কিছু প্রশ্ন আছে এবং প্রতিটি প্রশ্নের সঙ্গে একটি দীর্ঘ লাইন আছে। লাইনটি ব্যাথার পরিস্থিতি উপস্থাপন করে, বাম হাতের দিকে শূন্য (০) কোন ব্যাথা নেই এবং ডান হাতের দিকে দশ (১০) তীব্র ব্যাথা মানে প্রতিনিধিত্ব করে। নিম্নলিখিত প্রশ্নে আপনার ব্যাথার পরিমাণ লাইন চিহ্নিত করুন।

উদাহরণ সরূপ-

যদি কারো কোমর ব্যাথার পরিমাণ হয় ৭ থেকে ৯ এর মধ্যে তাহলে তিনি পূরণ করবেন-

০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০

এখানে শূন্য (০) মানে কোন ব্যাথা নেই (১-৩) মানে হালকা ব্যাথা (৪-৬) মানে সহনীয় ব্যাথা এবং (৭-১০) মানে তীব্র ব্যাথা।

১। আজকে আপনার কোমড় ব্যথার তীব্রতা কতোটুকু?

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০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০

এখানে শূন্য (০) মানে কোন ব্যথা নেই (১-৩) মানে হালকা ব্যথা (৪-৬) মানে সহনীয় ব্যথা এবং (৭-১০) মানে তীব্র ব্যথা।

২। আজকে আপনার উরুর ব্যথার তীব্রতা কতোটুকু?

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০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০

এখানে শূন্য (০) মানে কোন ব্যথা নেই (১-৩) মানে হালকা ব্যথা (৪-৬) মানে সহনীয় ব্যথা এবং (৭-১০) মানে তীব্র ব্যথা।

৩। আজকে আপনার পা-এর ব্যথার তীব্রতা কতোটুকু?

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০ ১ ২ ৩ ৪ ৫ ৬ ৭ ৮ ৯ ১০

এখানে শূন্য (০) মানে কোন ব্যথা নেই (১-৩) মানে হালকা ব্যথা (৪-৬) মানে সহনীয় ব্যথা এবং (৭-১০) মানে তীব্র ব্যথা।

## অসুস্থতায় অক্ষমতা সূচক প্রশ্নাবলী

এই প্রশ্নপত্রটি আপনার কোমড় ব্যথা এবং পায়ের ব্যথা আপনার দৈনন্দিন জীবনকে কতখানি প্রভাবিত করে তার সম্বন্ধে আমাদের ধারণা দিবে। আপনি দয়া করে নীচের প্রতিটি বিভাগ হতে যেকোন একটি উক্তি গোল দাগ দিয়ে চিহ্নিত করুন যেটি আপনার বর্তমান অবস্থাকে সবচেয়ে ভালভাবে ব্যাখ্যা করে।

### বিভাগঃ-১ ব্যথার তীব্রতা

- ০ আমার এই মুহূর্তে কোন ব্যথা নেই
- ১ এই মুহূর্তে ব্যথা খুবই হালকা
- ২ এই মুহূর্তে ব্যথা সহনীয় আছে
- ৩ এই মুহূর্তে ব্যথা মাঝামাঝি
- ৪ এই মুহূর্তে ব্যথা খুব তীব্র
- ৫ এই মুহূর্তে ব্যথা সবচেয়ে খারাপ

### বিভাগঃ-২ ব্যক্তিগত যত্ন (কাপড় পরা ও ধোয়া ইত্যাদি)

- ০ আমি সাধারণত অতিরিক্ত ব্যথা ছাড়া নিজের দেখাশোনা করতে পারি
- ১ আমি সাধারণত নিজের দেখাশোনা করতে পারি, কিন্তু ব্যথা হয়
- ২ ব্যথার কারণে নিজের দেখাশোনা করার জন্য আমি সতর্কতা অবলম্বন করছি
- ৩ আমি নিজের যত্ন নিতে পারি কিন্তু আমার কিছুটা সাহায্যের প্রয়োজন হয়,
- ৪ আমার নিজের যত্নের প্রায় সব ক্ষেত্রে প্রতিদিন সাহায্যের প্রয়োজন হয়.
- ৫ আমার পোশাক পরিধানে ও ধোয়ার কাজে অসুবিধা হয় এবং আমি বিছানায় পড়ে থাকি.

### বিভাগঃ-৩ উত্তোলন (গৃহপালিত প্রাণি, মুদি, বই, সরঞ্জাম ইত্যাদি)

- ০ আমি অতিরিক্ত ব্যথা ছাড়া ভারী ওজন উত্তোলন করতে পারি
- ১ আমি ভারী ওজন উত্তোলন করতে পারি, কিন্তু এটা আমাকে অতিরিক্ত ব্যথা দেয়.
- ২ ব্যথার কারণে আমি মেঝে থেকে ভারি ওজন উত্তোলন করতে পারি না, কিন্তু সুবিধামত (যেমন একটি টেবিলের উপর থেকে) স্থান হলে, আমি উত্তোলন করতে পারি.
- ৩ ব্যথা ভারী ওজন উত্তোলন থেকে আমাকে বাধা দেয়, কিন্তু আমি হালকা থেকে মাঝারি ওজন তারা সুবিধামত স্থানে উত্তোলন করতে পারি।
- ৪ আমি শুধুমাত্র খুব হালকা ওজন উত্তোলন করতে পারি।
- ৫ আমি কিছু বহন বা উত্তোলন করতে পারি না।

### বিভাগঃ-৪ ঘুমানো

- ০ ব্যথার কারণে আমার ঘুমের কোন সমস্যা হয় না।
- ১ ব্যথার কারণে মাঝে মাঝে আমার ঘুমের সমস্যা হয়
- ২ ব্যথার কারণে আমার ছয় ঘন্টার কম ঘুম হয়।
- ৩ ব্যথার কারণে আমার চার ঘন্টার কম ঘুম হয়।
- ৪ ব্যথার কারণে আমার দুই ঘন্টার কম ঘুম হয়।
- ৫ ব্যথার কারণে আমি ঘুমাতে পারি না।

### বিভাগঃ-৫ বসা

- ০ আমি পছন্দ মত যে কোন চেয়ারে যতক্ষণ খুশি বসে থাকতে পারি.
- ১ আমি যতক্ষণ চাই আমার প্রিয় চেয়ারে বসে থাকতে পারি.
- ২ ব্যথার কারণে আমি এক ঘন্টার বেশি বসে থাকতে পারি না



- ৩ ব্যথার কারণে আমি আধ ঘন্টার বেশি বসে থাকতে পারি না
- ৪ ব্যথার কারণে আমি ১০ মিনিটের বেশি বসে থাকতে পারি না
- ৫ ব্যথার কারণে আমি একেবারেই বসে থাকতে পারি না

#### বিভাগঃ-৬ দাঁড়ানো

- ০ আমি অতিরিক্ত ব্যথা ছাড়া যতক্ষন খুশি দাঁড়িয়ে থাকতে পারি।
- ১ আমি যতক্ষন খুশি দাঁড়িয়ে থাকতে পারি, কিন্তু এটা আমাকে অতিরিক্ত ব্যথা দেয়।
- ২ ব্যথার কারণে এক ঘন্টা অধিক সময় দাঁড়িয়ে থাকা যায় না।
- ৩ ব্যথার কারণে আধ ঘন্টা অধিক সময় দাঁড়িয়ে থাকা যায় না।
- ৪ ব্যথার কারণে ১০ মিনিটের অধিক সময় দাঁড়িয়ে থাকা যায় না।
- ৫ ব্যথার কারণে আমি একেবারেই দাঁড়িয়ে থাকতে পারিনা।

#### বিভাগঃ-৭ হাঁটা

- ০ হাঁটার সময় আমার কোন বাধা হয় না।
- ১ ব্যথা এক মাইল এর বেশী হাঁটার ক্ষেত্রে আমাকে বাধা দেয়.
- ২ ব্যথা আধ মাইল এর বেশি হাঁটার ক্ষেত্রে আমাকে বাধা দেয়.
- ৩ ব্যথা ১০০ গজ এর বেশি হাঁটার ক্ষেত্রে আমাকে বাধা দেয়.
- ৪ আমি শুধুমাত্র একটি লাঠি বা ক্রাচ ব্যবহার করে হাঁটতে পারি
- ৫ আমি অধিকাংশ সময় বিছানায় থাকি

### বিভাগঃ-৮ যৌন জীবন (প্রযোজ্য হলে)

- ০ আমার যৌন জীবন স্বাভাবিক এবং কোন অতিরিক্ত ব্যথা হয়না
- ১ আমার যৌন জীবন স্বাভাবিক কিন্তু কিছুটা ব্যথা হয়
- ২ আমার যৌন জীবন প্রায় স্বাভাবিক কিন্তু অনেক ব্যথা হয়
- ৩ আমার যৌন জীবন ব্যথা দ্বারা গুরুতরভাবে বাধাগ্রস্ত
- ৪ আমার যৌন জীবন ব্যথার কারণে প্রায় অনুপস্থিত
- ৫ ব্যথার কারণে আমার যৌন জীবন পুরোপুরিভাবে বাধাগ্রস্ত

### বিভাগঃ-৯ সামাজিক জীবন

- ০ আমার সামাজিক জীবন স্বাভাবিক এবং এতে কোন অতিরিক্ত ব্যথা হয় না।
- ১ আমার সামাজিক জীবন স্বাভাবিক, কিন্তু ব্যথা বৃদ্ধি পায়।
- ২ ব্যথা আমার সামাজিক জীবনের উপর উল্লেখযোগ্য প্রভাব ফেলতে পাড়েনি (যেমন ক্রীড়া, ইত্যাদি).
- ৩ ব্যথা কারণে আমার সামাজিক জীবন সীমাবদ্ধ হয়েছে এবং আমি প্রায়ই বাইরে যেতে পারি না।
- ৪ ব্যথা আমার বাড়িতে আমার সামাজিক জীবন সীমিত করেছে।
- ৫ ব্যথার কারণে আমার কোন সামাজিক জীবন নেই।

### বিভাগঃ-১০ ভ্রমণ

- ০ আমি ব্যথা ছাড়া যে কোন জায়গায় ভ্রমণ করতে পারি।
- ১ আমি কোথাও ভ্রমণ করতে পারি, কিন্তু এটা অতিরিক্ত ব্যথা দেয়.
- ২ আমি দুই ঘন্টার উপর যাতায়াতের পরিচালনা করতে পারি, কিন্তু এটা ব্যথাকে খারাপ করে
- ৩ ব্যথা কারণে আমার যাতায়াত সীমিত এবং তা এক ঘন্টার কম।

৪ ব্যথা কারণে আমার যাতায়াত সীমিত এবং তা ৩০ মিনিটের কম।

৫ ব্যথা আমার চিকিৎসা গ্রহণ ছাড়া অন্য সকল ভ্রমণে আমাকে বাধা দেয়।

**Score:**            /50      **Transform to percentage score x 100 =**      **% points**

**Scoring:**

For each section the total possible score is 5: if the first statement is marked the section score = 0, if the last statement is marked it = 5.

If all ten sections are completed the score is calculated as follows:

Example:

16 (total scored)

45 (total possible score) x 100 = 32%

If one section is missed or not applicable the score is calculated: 16 (total scored)

45 (total possible score) x 100 = 35.5%

Minimum Detectable Change (90% confidence): 5 points or 10 %points

## Verbal Consent Form

Title: Effectiveness of neural mobilization along with other physiotherapy for the treatment of Low Back Pain.

Assalamualaikum\ Namashker,

I am Sanjida Islam Lamia, the 4th year B.Sc. (Hon's) in Physiotherapy student of Bangladesh Health Professions Institute (BHPI) under Medicine faculty of University of Dhaka. To obtain my Bachelor degree, I shall have to conduct a research and it is a part of my study. The participants are requested to participate in the study after reading the following.

My research title is “**EFFECTIVENESS OF NEURAL MOBILIZATION FOR THE TREATMENT OF RADIATING LOW BACK PAIN**”. Through this study I will find the effectiveness of Neural Mobilization Along With Other Physiotherapy for the Treatment of Low Back Pain. If I can complete the study successfully, the patients may get the benefits of improve musculoskeletal outdoor physiotherapy service. To implement my research project, I need to collect data from the musculoskeletal patients. Therefore, you could be one of my valuable subjects for my study.

I am committed that the study will not pose any harm or risk to you. You have the absolute right to withdraw or discontinue at any time without any hesitation or risk. I will keep all the information confidential which I obtained from you and personal identification of the participant would not be published anywhere.

If you have any query about the study, you may contact with the researcher Sanjida Islam Lamia.

Do you have any questions before I start?

So, may I have your consent to proceed with the interview?

Yes..... No.....

Signature of the participant & Date.....

Signature of the researcher & Date.....

Signature of the witness & Date.....

## Questionnaire (English Version)

### SECTION-A: Subjective Information

This questionnaire is developed to measure the pain of the patient with radiating Low Back Pain and this portion will be filled by physiotherapist/researcher using a pencil.

Code No:

Date:

Patient's name:

Sex: M / F

Age:

Occupation:

Address:

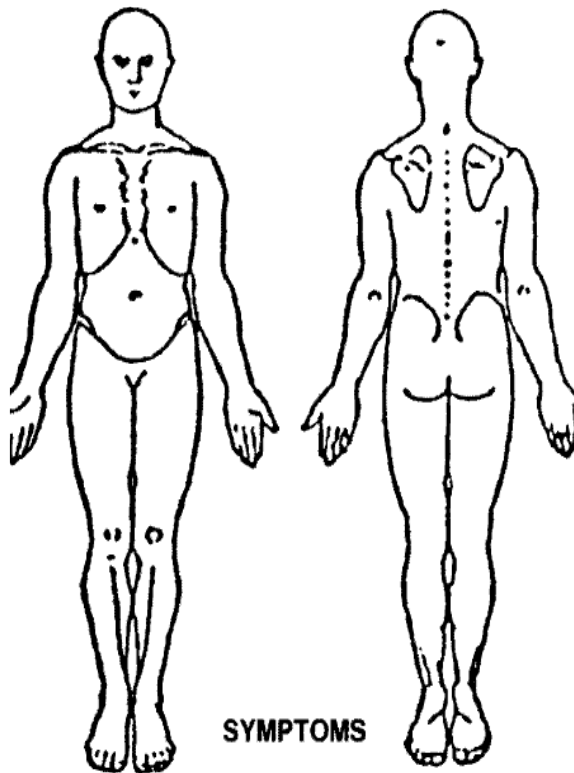
Contact No:

1. How long have you been suffering from low back pain?

Years..... Months..... Weeks.....

In which side of your back pain is more?

1. Right      2. Left      3. Middle      4. Both



2. Do you have any radiating pain on your thigh?

Yes ..... No.....

If yes, how long have you been suffering from radiating thigh pain?

Years..... Months..... Weeks.....

And which side is affected?

Right ..... Left ..... Both .....

3. Do you have any radiating pain on your leg?

Yes ..... No.....

If yes, how long have you been suffering from radiating leg pain?

Years..... Months..... Weeks.....

And which side is affected?

Right ..... Left ..... Both .....

4. Where you feel more pain relatively?

1. Back pain is more than thigh\leg pain
2. Thigh\leg pain is more than back pain
3. Back pain and thigh\leg pain are equal

5. Do you feel weakness in thigh\leg?

Yes ..... No.....

And which side is affected?

Right ..... Left ..... Both .....

6. Do you feel numbness in thigh\leg?

Yes ..... No.....

And which side is affected?

Right ..... Left ..... Both .....

7. Do you have any problem in bladder function?

Yes ..... No.....

8. Do you have any problem in bowel function?

Yes .....

No.....

9. Do you have any balance problem?

Yes .....

No.....

10. Check the following

- You have fever due to back pain
- You have sleep disturbance due to back pain
- You are losing weight
- You are gaining weight

11. How you feel pain in following activity?

	Worse	Better	Unchanged
1) Supine Lying	1	2	3
2) Right Side Lying	1	2	3
3) Left Side Lying	1	2	3
4) Lumber flexion	1	2	3
5) In sitting	1	2	3
6) In standing	1	2	3
7) In walking	1	2	3
8) Sneezing\Coughing	1	2	3
9) Lifting weight	1	2	3
10) Traveling/ driving	1	2	3

12. What do you think about the cause of your pain?

Due to injury

Due to lifting heavy weight

Due to bad posture

others

13. When you feel worse pain?

At morning

At evening

As the day progresses

All day

**14.** What treatment options you have tried before?

- Rest
- Pain Killer
- Lumber corset
- Physiotherapy
- Massage
- Injection
- Surgery
- Others

**15.** Is the problem

Improving..... Worsening..... Staying the same.....



## Pain Rating Scale

McCaffery & Beebe (1993) suggested Numeric Pain Rating Scale.

For example:

If your Back pain is between 7 and 9 then circle like below:

0    1    2    3    4    5    6    7    8    9    10

Here Zero (0) means No pain (1-3) means Mild Pain (4-6) means Moderate Pain and (7-10) means Severe Pain.

1. How severe is your Back Pain today?

0    1    2    3    4    5    6    7    8    9    10

Here Zero (0) means No pain (1-3) means Mild Pain (4-6) means Moderate Pain and (7-10) means Severe Pain.

2. How severe is your Thigh Pain today?

0    1    2    3    4    5    6    7    8    9    10

Here Zero (0) means No pain (1-3) means Mild Pain (4-6) means Moderate Pain and (7-10) means Severe Pain.

3. How severe is your Leg Pain today?

0    1    2    3    4    5    6    7    8    9    10

Here Zero (0) means No pain (1-3) means Mild Pain (4-6) means Moderate Pain and (7-10) means Severe Pain.

## Oswestry Low Back Disability Questionnaire

This questionnaire has been designed to give us information as to how your back pain has affected your ability to manage in everyday life.

Please answer every section and **mark in each section only the one box that applies to you.**

We realise you may consider that two or more statements in any one section relate to you, but please just mark the box that most closely describes your problem.

### Section 1 – Pain intensity

- 0 I have no pain at the moment
- 1 The pain is very mild at the moment
- 2 The pain is moderate at the moment
- 3 The pain is fairly severe at the moment
- 4 The pain is very severe at the moment
- 5 The pain is the worst imaginable at the moment

### Section 2 – Personal care (washing, dressing etc)

- 0 I can look after myself normally without causing extra pain
- 1 I can look after myself normally but it causes extra pain
- 2 It is painful to look after myself and I am slow and careful
- 3 I need some help but manage most of my personal care
- 4 I need help every day in most aspects of self-care
- 5 I do not get dressed, I wash with difficulty and stay in bed

### Section 3 – Lifting

- 0 I can lift heavy weights without extra pain
- 1 I can lift heavy weights but it gives extra pain

Pain prevents me from lifting heavy weights off the floor, but I can manage if they are conveniently placed e.g. on a table

Pain prevents me from lifting heavy weights, but I can manage light to medium weights if they are conveniently positioned

I can lift very light weights

I cannot lift or carry anything at all

#### **Section 4 – Walking\***

Pain does not prevent me walking any distance

Pain prevents me from walking more than 1 miles

Pain prevents me from walking more than half mile

Pain prevents me from walking more than 100 gauge

I can only walk using a stick or crutches

I am in bed most of the time

#### **Section 5 – Sitting**

I can sit in any chair as long as I like

I can only sit in my favourite chair as long as I like

Pain prevents me sitting more than one hour

Pain prevents me from sitting more than 30 minutes

Pain prevents me from sitting more than 10 minutes

Pain prevents me from sitting at all

#### **Section 6 – Standing**

I can stand as long as I want without extra pain

I can stand as long as I want but it gives me extra pain

Pain prevents me from standing for more than 1 hour

Pain prevents me from standing for more than 30 minutes

Pain prevents me from standing for more than 10 minutes

Pain prevents me from standing at all

### **Section 7 – Sleeping**

My sleep is never disturbed by pain

My sleep is occasionally disturbed by pain

Because of pain I have less than 6 hours sleep

Because of pain I have less than 4 hours sleep

Because of pain I have less than 2 hours sleep

Pain prevents me from sleeping at all

### **Section 8 – Sex life (if applicable)**

My sex life is normal and causes no extra pain

My sex life is normal but causes some extra pain

My sex life is nearly normal but is very painful

My sex life is severely restricted by pain

My sex life is nearly absent because of pain

Pain prevents any sex life at all

### **Section 9 – Social life**

My social life is normal and gives me no extra pain

My social life is normal but increases the degree of pain

Pain has no significant effect on my social life apart from limiting my more energetic interests e.g., sport

Pain has restricted my social life and I do not go out as often

4 Pain has restricted my social life to my home

5 I have no social life because of pain

### **Section 10 – Travelling**

0 I can travel anywhere without pain

1 I can travel anywhere but it gives me extra pain

2 Pain is bad but I manage journeys over two hours

3 Pain restricts me to journeys of less than one hour

4 Pain restricts me to short necessary journeys under 30 minutes

5 Pain prevents me from travelling except to receive treatment

**Score:**            / 50    **Transform to percentage score x 100 =**            **% points**

#### **Scoring:**

For each section the total possible score is 5: if the first statement is marked the section score = 0, if the last statement is marked it = 5.

If all ten sections are completed the score is calculated as follows:

Example:

16 (total scored)

50 (total possible score) x 100 = 32%

If one section is missed or not applicable the score is calculated: 16 (total scored)

45 (total possible score) x 100 = 35.5%

Minimum Detectable Change (90% confidence): 5 points or 10 %points.

## Anatomy of Lumbar Spine

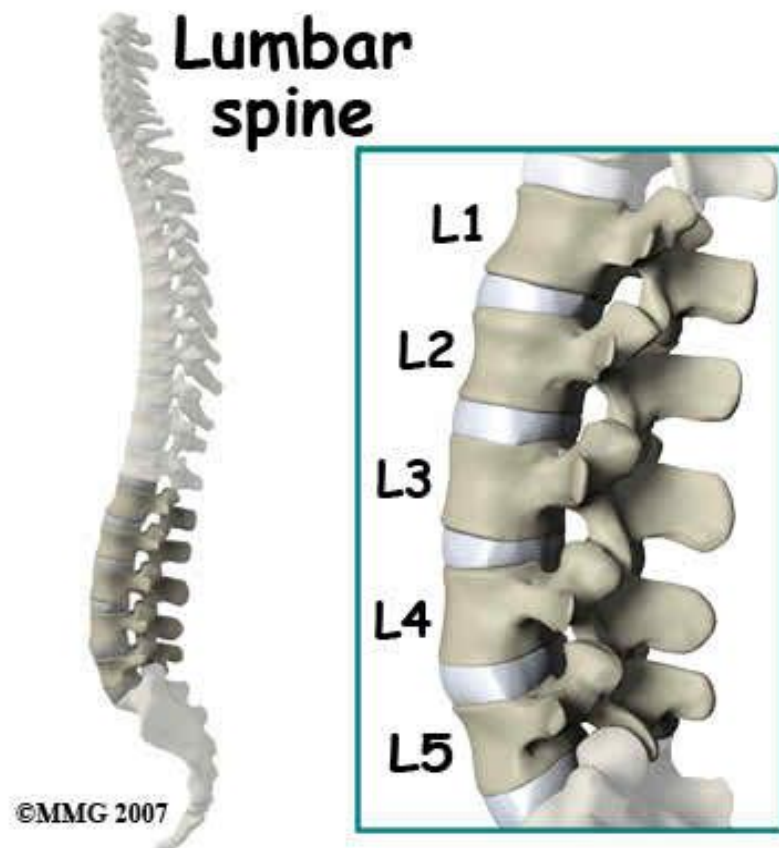


Figure No. – 30: Anatomy of Lumbar Spine

## Statistical Analysis

**Table – 7: Calculation of U - value for Low Back Pain**

Reduction of pain scores in experimental group and only control group in the lower back were differences between pre-test and post-test pain scores.

Subjects Of Experimental Group	Pain scores	Rank	Subjects Of Control Group	Pain scores	Rank
E1	2	3.5	C1	5	14
E2	1	1	C2	3	8.5
E3	3	8.5	C3	3	8.5
E4	2	3.5	C4	4	12.5
E5	2	3.5	C5	4	12.5
E6	2	3.5	C6	3	8.5
E7	3	8.5	C7	3	8.5
$n_1 = 7$		Total = 35	$n_2 = 7$		Total = 73

Here,

$$n_1 = 7$$

$$n_2 = 7$$

$$T_x = 73$$

Now 'U' formula

$$\begin{aligned}U &= n_1 \times n_2 + \frac{n_x(n_x+1)}{2} - T_x \\&= 7 \times 7 + \frac{7(7+1)}{2} - 73 \\&= 77 - 73 \\&= 4\end{aligned}$$

[Here,

$n_1$  = the number of the subjects in trail group

$n_2$  = the number of the subject in control group.

$n_x$  = the number of the subjects of the group with larger rank total.

$T_x$  = the larger rank total.]



**Table – 8: Calculation of U- value for radiating Thigh Pain**

Reduction of pain scores in experimental group and only control group in the lower back were differences between pre-test and post-test pain scores.

Subjects Of Experimental Group	Pain scores	Ranks	Subjects Of Control Group	Pain scores	Ranks
E1	3	7.5	C1	3	7.5
E2	2	4	C2	0	0
E3	4	11.5	C3	4	11.5
E4	1	1.5	C4	2	4
E5	3	7.5	C5	4	11.5
E6	2	4	C6	4	11.5
E7	1	1.5	C7	3	7.5
$n_1 = 7$		Total = 37.5	$n_2 = 7$		Total = 53.5

Here,

$$n_1 = 7$$

$$n_2 = 7$$

$$T_x = 53.5$$

Now 'U' formula

$$\begin{aligned}U &= n_1 \times n_2 + \frac{n_x(n_x+1)}{2} - T_x \\&= 7 \times 7 + \frac{7(7+1)}{2} - 53.5 \\&= 77 - 53.5 \\&= 23.5\end{aligned}$$

**Table – 9: Calculation of U- value for Radiating Leg Pain**

Reduction of pain scores in experimental group and only control group in the lower back were differences between pre-test and post-test pain scores.

Subjects Of Experimental Group	Pain scores	Ranks	Subjects Of Control Group	Pain scores	Ranks
E1	3	8	C1	4	11.5
E2	2	3.5	C2	5	13.5
E3	3	8	C3	3	8
E4	2	3.5	C4	3	8
E5	2	3.5	C5	4	11.5
E6	1	1	C6	3	8
E7	2	3.5	C7	5	13.5
$n_1 = 7$	$\Sigma X_1 = 17$	Total = 31	$n_2 = 4$	$\Sigma X_2 = 15$	Total = 74

Here,

$$n_1 = 7$$

$$n_2 = 7$$

$$T_x = 73$$

Now 'U' formula

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

$$= 7 \times 7 + \frac{7(7+1)}{2} - 74$$

$$= 77 - 74$$

$$= 3$$

## Statistical Probability Table

**Critical values of  $U$  for a one tailed test at 0.05**

		$n_1$																			
$n_2$	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0
2	—	—	—	—	0	0	0	1	1	1	1	2	2	2	3	3	3	4	4	4	4
3	—	—	0	0	1	2	2	3	3	4	5	5	6	7	7	8	9	9	10	11	11
4	—	—	0	1	2	3	4	5	6	7	8	9	10	11	12	14	15	16	17	18	18
5	—	0	1	2	4	5	6	8	9	11	12	13	15	16	18	19	20	22	23	25	25
6	—	0	2	3	5	7	8	10	12	14	16	17	19	21	23	25	26	28	30	32	32
7	—	0	2	4	6	8	11	13	15	17	19	21	24	26	28	30	33	35	37	39	39
8	—	1	3	5	8	10	13	15	18	20	23	26	28	31	33	36	39	41	44	47	47
9	—	1	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	54
10	—	1	4	7	11	14	17	20	24	27	31	34	37	41	44	48	51	55	58	62	62
11	—	1	5	8	12	16	19	23	27	31	34	38	42	46	50	54	57	61	65	69	69
12	—	2	5	9	13	17	21	26	30	34	38	42	47	51	55	60	64	68	72	77	77
13	—	2	6	10	15	19	24	28	33	37	42	47	51	56	61	65	70	75	80	84	84
14	—	2	7	11	16	21	26	31	36	41	46	51	56	61	66	71	77	82	87	92	92
15	—	3	7	12	18	23	28	33	39	44	50	55	61	66	72	77	83	88	94	100	100
16	—	3	8	14	19	25	30	36	42	48	54	60	65	71	77	83	89	95	101	107	107
17	—	3	9	15	20	26	33	39	45	51	57	64	70	77	83	89	96	102	109	115	115
18	—	4	9	16	22	28	35	41	48	55	61	68	75	82	88	95	102	109	116	123	123
19	0	4	10	17	23	30	37	44	51	58	65	72	80	87	94	101	109	116	123	130	130
20	0	4	11	18	25	32	39	47	54	62	69	77	84	92	100	107	115	123	130	138	138

\*Dashes in the table mean that no decision is possible for those  $n$  values at the given level of significance.

March 07, 2015

Head

Department of Physiotherapy

Centre for the Rehabilitation of the Paralysed.(CRP)

CRP-Chapain, Savar, Dhaka-1343

Through: Head, Department of Physiotherapy, BHPI

**Subject: Seeking permission to collect data to conduct my research project on "Effectiveness of neural mobilization for the treatment of low back pain".**

Dear Sir,

With due respect and humble submission to state that I am Sanjida Islam Lamia, a student of 4<sup>th</sup> Professional B.Sc. in Physiotherapy at Bangladesh Health Professions Institute (BHPI). As per approval of ethical review committee of BHPI, I have been conducting a research project on "Effectiveness of neural mobilization for the treatment of low back pain". Mr. Nasirul Islam, Associate Professor of BHPI has been supervising me in order to accomplish this study. However, conducting this research project is partial of the requirement for the degree of B.Sc. in Physiotherapy. I want to collect necessary data from the patients attending at musculoskeletal outpatient department of CRP Savar. Therefore I need to obtain your kind written permission to initiate data collection from the targeted patients. I would like to assure that ethical principles would be followed as per guidelines of my institution/department.

I therefore, pray and hope that you would be kind enough to grant my application and permit me to collect required data to accomplish my research objectives.

Yours faithfully,

Sanjida Islam Lamia  
.....  
Sanjida Islam Lamia  
4<sup>th</sup> Professional B.Sc. in Physiotherapy  
Session: 2009-2010  
Bangladesh Health Professions Institute (BHPI)  
(An academic institution of CRP)  
CRP-Chapain, Savar, Dhaka-1343.

Given permission for data collection  
at MS unit CRP-PT Dept. Please contact  
with Farhida Khan, @PT as a counter  
part of your data collection

Forwarded  
Nasir  
07/03/15

Mohammad Faruk Hossain  
Associate Professor  
Head of Physiotherapy Dept  
CRP-Chapain, Savar, Dhaka-1343  
Forwarded for Approval  
9/1/15  
15/03/15