Faculty of Medicine
**University of Dhaka**

# Effectiveness of Shacklock's Neural Mobilization for Acute & Sub-Acute Lumbar Disc Prolapsed: A Randomized Controlled Trial

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Master of Science in Physiotherapy
DU Exam Roll: 703
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**Bangladesh Health Professions Institute (BHPI)**
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We the undersigned certify that we have carefully read and recommended to the Faculty of Medicine, University of Dhaka, for acceptance of this thesis entitled, **"Effectiveness of Shacklock's Neural Mobilization for Acute & Sub-Acute Lumbar Disc Prolapsed: A Randomized Controlled Trial".** Submitted by Zahid Bin Sultan Nahid, for the partial fulfillment of the requirements for the degree of Master of Science in Physiotherapy.

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# Declaration Form

This work has not previously been accepted in substance for any degree and is not concurrently submitted in candidature for any degree. This dissertation is being submitted in partial fulfillment of the requirements for the degree of M. Sc. in Physiotherapy. This dissertation is the result of my own independent work/investigation, except where otherwise stated. Other sources are acknowledged by giving explicit references. A Bibliography is appended.

I confirm that if anything identified in my work that I have done plagiarism or any form of cheating that will directly awarded me fail and I am subject to disciplinary actions of authority.

I confirm that the electronic copy is identical to the bound copy of the Thesis. In case of dissemination the finding of this project for future publication, research supervisor will highly concern and it will be duly acknowledged as undergraduate thesis.

Signature and Date:

Name: Zahid Bin Sultan Nahid

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# List of Abbreviations or Symbols

| | |
|---|---|
| **ADL** | Activity of Daily Living |
| **BHPI** | Bangladesh Health Professions Institute. |
| **BMI** | Body Mass Index |
| **BMRC** | Bangladesh Medical Research Association |
| **CRP** | Centre for the Rehabilitation of the Paralysed |
| **DM** | Diabetes Mellitus |
| **DPQ** | Dallas Pain Questionnaire |
| **HTN** | Hypertension |
| **IBR** | Institutional Review Board |
| **LBP** | Low Back Pain |
| **MRI** | Magnetic Resonance Imaging |
| **NIOSH** | National Institute of Occupational Safety and Health |
| **ODI** | Oswestry disability index |
| **PLID** | Prolapsed Lumber Intervertebral Disc |
| **PT** | Physiotherapy |
| **RCT** | Randomized Control Trial |
| **SD** | Standard Deviation |
| **SNM** | Shacklock's Neural Mobilisation |
| **SPSS** | Statistical Package for the Social Sciences |
| **TB** | Tuberculosis |
| **UPT** | Usual Physiotherapy |
| **USA** | United States of America |
| **VAS** | Visual Analogue Scale |
| **WHO** | World Health Organization |

# ABSTRACT

***Background:*** Lumbar disc prolapsed is a common cause of low back pain and radicular leg pain and neural mobilization is a newly developed approach that mobilize the nerves and reduce the symptoms of patients with LBP. ***Purpose:*** To find out the effectiveness of Shacklock's neural mobilization for acute and sub-acute lumbar disc prolapsed. ***Methodology:*** A double blinded randomized control trial were conducted, whereas 43 participants selected randomly by hospital based randomization among the patients who were attending Centre for the rehabilitation of the paralysed (CRP), Savar and Mirpur in a specific period of time. Then computer generated random number allocated 21 participants assign to experimental group and 22 participants to control group. Experimental group received Shacklock's neural mobilization along with usual physiotherapy intervention, however control group received only usual physiotherapy intervention. Data was collected by using structured questionnaire related to LBP and disability. Socio-demographic data were collected by a semi-structured questionnaire. Data was analyzed by using SPSS software version 24.0 which focused through column, pie chart, line diagram and paired t-test and also unrelated t-test, chi-square test and Mann-Whitney-U test. ***Results:*** A significant improvement of pain in different position and disability were demonstrated in within group analysis by paired t-test whereas, no significant improvement found in between group analysis by independent sample t test. ***Conclusion:*** It is concluded that neural mobilization is not effective for acute and sub-acute lumbar disc prolapsed.



**Key words:** *PLID, Neural Mobilization, Usual Physiotherapy.*

# CHAPTER-I INTRODUCTION

## 1.1 Background of the study:

Lumbar disc prolapsed is a common cause of Low Back Pain (LBP) and radicupathy (Yang et al., 2015). Whereas, about 50-80% of world's population has LBP at some period in their life (Van-Tulder et al., 2002). The prevalence of lumbar disc prolapse is 1-3 % that is considered as the most common reason for functional disability worldwide (Rubin, 2007). The treatment cost of Low back pain due to disc prolapsed are increasing in USA and the global prevalence of low back pain continues to increase day by day and obesity, smoking, lack of exercise, older age, lifestyle factors and psychological disorders are considered as risk factors for low back pain (Manchikanti et al., 2014). LBP is considered as a significant public health issue that affects people's well-being, daily activities and contribute substantially to the global burden of disease (Dagenais et al., 2008). It is identified by Cassidy et al. (2005) that the annual incidence of low back pain is reported as low as 4% and as high as 93% whereas, approximately 85% participants with LBP developed recurrent herniation at the same level because of axial loading during movements (Lurie et al., 2014).

It is critical to define lumbar disc herniation because the terms disc herniation, disc protrusion, and disc bulge are used interchangeably in many literature and according to American Society of Neuroradiology, the pathologies of lumber disc herniation are not the same (Fardon et al., 2014) and it depends on some primary and secondary factors. Research carried out by Cummins et al. (2006) identified that the average age of patients with a herniated disc was 41 years, and the males (57%) are more affected than females (43%). Weiler et al. (2011) evaluated that elevated body mass index (BMI) is a risk factor for lumbar disc herniation, because high BMI increased axial load on lumbar spine. A recent meta-analysis by Shiri et al. (2014), found that overweight patients who has Body Mass Index (BMI): 25–30 and obese patients (BMI > 30) had a statistically significant increase risk of developing lumbar disc problem than patients with a BMI (<25). Furthermore, study conducted by Meredith et al., (2010) found that overweight patient has high risk of developing recurrent disc herniation after micro discectomy, whereas, obese patients were 12 times more likely to develop herniation, and 30 times more likely to undergo a recurrent surgery than non-obese patients. Study carried out by Wu et al. (2020) revealed that the

age-related prevalence of LBP was 8.20% in 1990 whereas, decreased slightly to 7.50% in 2017. Years Lived with Disability (YLDs) were 42.5 million in 1990 that was increased by 52.7% to 64.9 million in 2017 globally.

Prevalence of LBP vary from country to country. It is reported by the National Health Survey of USA that higher prevalence of lower spinal pain found among the male workers & another study on LBP in Japan showed that desk worker who worked at home has greater chance of Low back pain than the office desk worker (Minoura, Ishimaru, Kokaze, & Tabuchi, 2021). Some basic factors like age, gender and some lifestyle factors such as smoking, alcohol consumption, some personal factor like, previous injury, psychosocial factors, socioeconomic conditions, poor muscle condition are responsible for developing disc herniation (Kanyenyeri et al., 2017). Overweight or obese person are more prone to develop LBP, moreover, prolonged sitting, poor fitness level, and abnormal posture at work were selected as causative factors for LBP (Workneh and Mekonen, 2021). Overweight or obese person faced difficulties in sitting, standing and walking due alteration of body biomechanics. They need more time to recover from an injury because of larger amount of fat and weight that increase pressure on disc and other structures (Ghaffari et al., 2006). A study (Charoenchai et al., 2006) examined the relationship between low back pain & different postures like bending, twisting & slouch postures. He found some potential risk factors for LBP such as, flexion or lateral bending of the spine & bending or rotation of the spine, and duration of daily working. Studies by Henschke et al. (2008), have shown that about 40% of people with Acute Low Back Pain (ALBP) recover within six weeks, on the other hand 48% carry LBP symptoms and disability after three months, whereas 30% people do not recover within 12 months. It is found that, about half of the population with acute LBP further develop chronic LBP. So, it is said that early appropriate care may reduce the chance of developing chronic LBP.

Neural mobilization is an effective intervention previously proven by many researcher for managing low back pain or disc prolapsed (Basson et al., 2017). It helps to mobilise the nerves that was compressed by disc or other structures, helps to increase neuronal blood flow thus improve physiology of the nerves as well. It facilitates to remove the scar or adherent nerve root and reduce the neuronal symptoms.

## 1.2 Rationale

Low Back Pain (LBP) due to prolapsed disc is one of the leading cause of disability worldwide which has a significant effect on daily life. Greater attention is urgently needed to mitigate the impact on health and social life. Various conservative and non-conservative treatments are used to treat patients with LBP, whereas physiotherapy intervention has a significant role to reduce pain and disability of patients with LBP. There are many different approaches of treatments are available for the management of patients with LBP, however neural mobilization is a newly developed treatment approach. This study explore the efficacy of neural mobilization in acute stage because there is limited evidence in acute stage. Though, many researches were conducted on efficacy of neural mobilization on patients with LBP, but the exact dose of treatment like intensity, duration, repetition are not fully developed. This study helps to identify the effect of neural mobilization on LBP that reduce the time and cost of treatment as well as improve the evidence based clinical practice. It also helps the professionals to be more accurate regarding the dose like intensity, repetition and duration of treatment. This study will enlarge clinical knowledge regarding the management of patients with LBP and also helps to conduct future research in this area. The design of this study will discover the most effective physiotherapy intervention to alleviate early symptoms of the condition and develop an evidence based treatment strategy for the professional.

### 1.3 Research Hypothesis:

#### 1.3.1 Null Hypothesis ($H_0$):

Shacklock's neural mobilization is no more effective for acute and sub-acute lumbar disc prolapsed.

Ho: μ1-μ2 = 0 or μ1=μ2, where the experimental group and control group initial and final mean difference is same.

#### 1.3.2 Alternative Hypothesis (Ha):

Shacklock's neural mobilization is effective for acute and sub-acute lumbar disc prolapsed.

Ha**:** μ1-μ2 ≠ 0 or μ1 ≠ μ2, where the experimental group and control group initial and final mean difference is not same.

Where,

*H*0 = the null hypothesis,

Ha = the alternative hypothesis,

$\mu$1 = the mean of population 1, and

$\mu$2 = the mean of population 2

## 1.4 Objectives of this study:

### 1.4.1 General objective:

To identify the effectiveness of Shacklock's Neural Mobilization for acute and sub-acute lumbar disc prolapsed.

### 1.4.2 Specific objectives:

i. To explore the sociodemographic variables of the participants.
ii. To find out the association of sociodemographic variables with pain and disability.
iii. To investigate the effectiveness of Shacklock's neural mobilization on pain intensity.
iv. To measure the effectiveness of Shacklock's neural mobilization on disability status.

### 1.5 Operational definition:

**Shacklock's Neural Mobilization**

Specialized manual technique developed by Michael Shacklock that remove nerve entrapment and mobilize the nerves**.**

**Usual Physiotherapy Intervention**

Physiotherapy interventions are the widely accepted interventions for managing disc prolpase which is practiced by physiotherapy professionals of CRP.

**Lumbar Disc Prolased**

Injury to the cushioning and connective tissue between lumbar vertebrae, due to excessive strain or trauma to the spine results in lower back pain with radiculopathy, diagnosed by Magnetic Resonance Imaging (MRI), or other physical tests.

**Acute Lumbar Disc Herniation**

Low back pain symptoms lasting less than four weeks due to disc prolapse is considered acute lumber disc prolapsed.

**Sub-acute Lumber Disc Herniation:**

Low back pain symptoms lasting between four to twelve weeks due to disc prolapse is considered sub-acute lumber disc prolapsed.

**Lumbar Reduced Closing Dysfunction:**

Low back pain and /or radiculopathy towards the leg in which symptoms increase in closing movements like lumbar extension and/or, ipsilateral side bending, and symptoms reduce by opening movements of the lumbar spine like flexion and/or contralateral side bending.

# CHAPTER-II LITERATURE REVIEW

One of the most common cause of disability is Lower back pain (LBP) wherein, 80 percent of world population have the symptoms at once of their lifetime. Lumbar disc prolapse and degenerative disc disease are the most common cause of low back pain in which approximately 90 percent prolapse occur at L4-L5 or L5-S1 level (Amin, Andrade, & Neuman, 2017). Fjeld et al. (2017), found the significant association between age group 40 to 59 years and about 5 -20 per 1000 persons are suffering from prolapsed disc annually. However, male are more affected then female as the ratio is 2:1. In developed and developing countries like Bangladesh low back pain is a significant health issue, whereas, it is one of the common musculoskeletal problem. Study carried out by Akrouf et al. (2010) identified in his study that, the most common affected body parts were the neck and lower back whereas, upper back and shoulder are less common. It is a major-medical condition that causes disability and expenditure of healthcare (Singh & Gebrekidan, 2019). According to Jordon, Konstantinou, & O'Dowd (2011), disc prolapse prevalence is 1 to 3 percent. Symptoms of disc prolapse is low back pain or, radicular leg pain wherein, pain on the lower back is called LBP, while this pain radiate to lower leg is called low back pain with radiculopathy. Study carried out by Modic et al. (2005) revealed that, the prevalence of prolapsed disc among the patients with LBP was 57% and among the patients with leg pain or, radiculopathy, the prevalence were 65%. LBP leads to loss of job, functional dependency, limitations of daily activity, and significant participation restrictions (Workneh & Mekonen, 2021). Wu et al. (2020) explored that Southern Latin American (13.47%) are more affected by low back pain than the Asia Pacific (13.16%), On the other hand, Central Latin America (5.62%) and, East Asian (3.92%), are less affected by low back pain.

It is estimated that about 80% of the people has low back pain at any time in their life, and the common incidents of low back in between ages of 25 and 50 years (Singh & Gebrekidan, 2019). Disc prolapsed most commonly occur in the age of 30 to 50 years because there were no association of disc prolapsed with other age group. About 95 percent people have disc prolapse occur at the level of L4-L5 or L5-S1 between the age of 25 to 55 years (Jordan, Konstantinou & O'Dowd, 2009).

Prevalence and incidence of prolapsed disc can vary from country to country. The National Health Survey reported a higher prevalence of disc prolapsed in male workers in USA & a study on LBP in Japan showed that the male workers are more affected than female workers (Carey et al., 1995). Smoking, sports activities such as weight lifting, hammer throw, motor vehicle driving, and repeated lifting are significant risk factor for disc herniation (Jordon, Konstantinou, & O'Dowd, 2011). Some factors are responsible for developing disc prolapsed such as some basic factors such as, age, gender, lifestyle factors like smoking, previous injury and some personal factors like psychology, nutrition or muscle flexibility and strength (Kanyenyeri et al., 2017). Another study explored that overweight, long time sitting job, poor posture are associated with disc prolapse (Workneh and Mekonen, 2021). Obese persons face difficulties in daily activities like sitting, standing, walking because of alteration of biomechanics. Overweight exerts more pressure on disc and surrounding structures causing disc herniation (Ghaffari et al., 2006). A study conducted by Charoenchai et al., (2006) examined the relationship different postures and low back pain and found significant relationship with low back pain. He also found, duration of desk job, flexion or side bending, and twisting of the spine are the potential risk factor for low back pain.

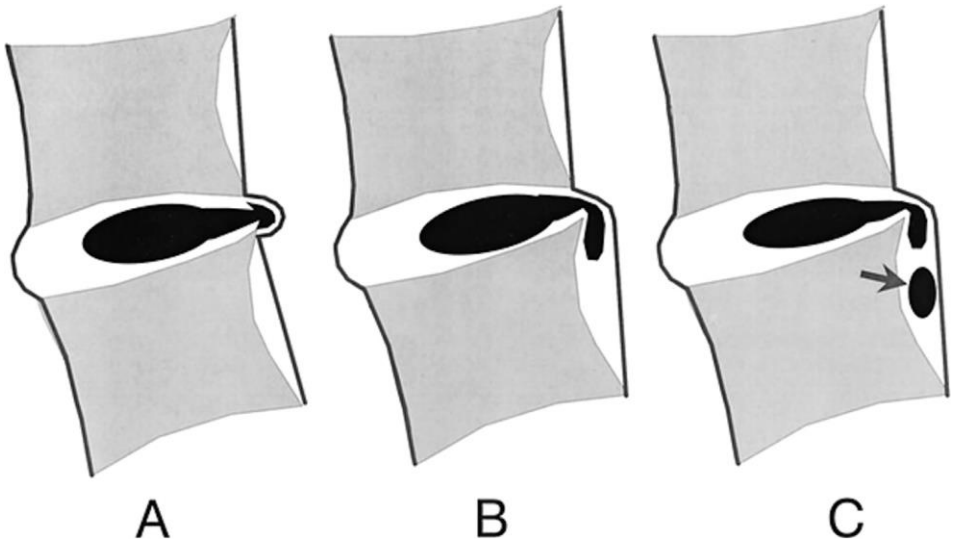
According to Ortiz-Hernandez et al., (2003), desk workers are more susceptible to develop low back pain due to long time working hour, and slouch sitting posture. Desk worker are also develop musculoskeletal disorders like neck, shoulder, hand because of poor posture and repeated work. Poor sitting posture exerts force unevenly through the spine and change in center of gravity causing joint pain (Chang et al., 2007). On the other hand, lack of physical activity or, the sedentary lifestyle reduce muscular power and strength, and also reduce the ability of the vertebral disc to maintain its normal water concentration. It is concluded that, lack of physical activity or long time inactivity can increase the risk of developing disc herniation or, low back pain that further becomes stiff, and weak (Workneh & Mekonen, 2021).

Working environment and postures are often play an important role for developing spinal pain or disc herniation. Simultaneously and, repeatedly bending, and twisting activity for a long period time causes low back pain or, disc prolapse

(Kanyenyeri et al., 2017). The nature of desk work, and the office environment are related to increased risks of low back pain. The pattern of work and adjustable table and, chair are important as well where, there is no proper ergonomic furniture's available for the office workers like Bankers. The consequences of low back pain is not good because it causes to take leave from the job, reduce the productivity and also has negative economic impact. Low back leads to some kind of disability that has negative impact on economical, societal, and public health sector (Workneh & Mekonen, 2021).

LBP is classified into three types according to duration of symptoms acute, sub-acute and chronic LBP. LBP that continues for less than six weeks is called acute LBP. LBP that occurs between the time period of six weeks and three months is called sub-acute LBP and the back pain that goes on for more than three months is known as chronic LBP (Tauqeer et al., 2018). LBP is also classified according to etiology such as Mechanical or nonspecific LBP has no serious underline pathology or nerve root compression. Secondary low back pain is associated with underline pathology like cancer, osteomyelitis, and epidural abscess or, tuberculosis. About 5 to 20 cases per 1000 adults affected by herniated disc annually and it is most common in people in their third to the fifth decade of life whereas, male-female ratio is 2:1 (Fjeld et al., 2019). Mechanical low back pain is classified by McKenzie and May (2003) as in the three relatively simple categories postural, dysfunctional syndrome, and derangement wherein, postural syndrome refers to the pain that occurs due to prolong stress, when a person sit or stand in a faulty posture for a long time. Dysfunctional pain refers to any contracture or adhesions formed after trauma or derangement or due to poor postural habit (Werneke et al., 2010). Moreover, the derangement syndrome caused by any mechanical dysfunction such as anatomical disruption, displacement within the intervertebral disc (McKenzie and May, 2003).

There are three basic types of disc herniation that are responsible for LBP, such as protrusion, extrusion, and sequestration (see figure-1).




(Schroeder, Guyre and Vaccaro, 2016)

**Figure-1:** Representing protrusion (A), extrusion (B), and sequestration (C).

There is lack of evidence regarding the absolute indication for operative or, conservative method but, most of the cases patient get well with conservative treatment like medication and physiotherapy interventions. The principle of conservative treatment of disc prolapse are to relieve pain, restore normal function and prevent recurrence (Kreiner, 2014). Ergonomic education is one of the well documented LBP interventions. Maintain correct posture while sitting, standing posture is very important to prevent and also reduce the LBP. Learn and maintain how to lift object safely to protect the back (Bohr, 2000). Research conducted Chou et al, (2007) found that conservative method and self-care is the best way of treating during acute disc prolapse such as cold compression, continue activity within pain limit, limitation of aggravating factors, slow doses of strengthening exercises. Progressive strengthening exercises help increase tone, strength and power. Lumbar stabilization exercises such as strength and endurance training provide energy to perform daily living activities. Core muscle and pelvic floor stabilization exercises helps to reduce the symptoms of disc prolapse. Research shows that early ergonomic intervention or, postural education helps to reduce symptoms, improve function and prevent reoccurrence (Martimo et al., 2010).

Fenety and Walkar, (2002) developed a guideline regarding stretching exercises for low back pain. Stretch the lower back and leg muscles slowly and hold try to avoid jerky movements. Slow, gentle, comfortable stretch and hold for 20-30 seconds. Repeat each stretching exercise 5-10 times and maintain slow, deep, and rhythmic breath during stretching.

The content related to ideal work posture and workstation forms the core of ergonomics education programs for office computer workers. Mani, Provident, Eckel (2016) explained that the ideal work posture is the one where the back is straight or slightly reclined (95 to110 degree), the shoulders are abducted less than 20 degree, the elbows are flexed at 90 to 100 degree and the forearm is pronated with the wrist, hand, forearm in a straight line with the work item. Wrist extension or deviation of more than 15 degree must be avoided. For lower extremities, the legs need to be perpendicular to the floor, the thighs should be parallel to the floor, and the hip joint should be slightly higher than the knee joint. The feet should rest flat on the floor or a footrest. According to the United States Occupational Safety and Health Administration (OSHA), an ideal workstation has an adjustable work surface, a keyboard tray, a keyboard and input device (mouse) at the same level and frequently used items placed within easy reach. The US Occupational Safety and Health Administration recommends a chair with adequate lumbar support, sufficient depth and width to accommodate the user, a seat front with a waterfall edge, and adequate thigh and knee clearance. In an ideal workstation, the top edge of the monitor lies at eye level3 or slightly below and is placed at a distance from the user so that the user does not have to bend or extend the neck/head to see and read the monitor (approximately at an arm's length from the user). The monitors are placed perpendicular to the window to minimize glare. An ideal workstation also provides adequate space under the work surface so that the user can get close to the work surface and can cross his/her legs without bumping. It is recommended to leave the area under the desk free of storage. The US Occupational Safety and Health Administration recommends that all workstation accessories and components be well maintained and serviced.

Maintain correct posture while sitting, standing posture is very important to prevent and also reduce the LBP. Learn and maintain how to lift object safely to protect the back. Maintain a healthy weight to avoid excess strain on the lower

back. Eat a nutritious diet getting plenty of calcium, phosphorus, vitamin D to prevent osteoporosis, which can lead to compression fracture and LBP. Regular exercise to stay healthy and painfree. Exercise program that include aerobic conditioning and strengthening exercises can help reduce the recurrence of LBP. The principle of treatment of LBP are to relieve pain in acute case, restore normal movement in chronic cases and recurrence is to be prevented (Ebnezar, 2003).

For acute cases that are not debilitating, low back pain may be best treated with conservative self-care (Chou et al, 2007) including: application of heat or cold and continued activity within the bounds of the pain, Firm mattresses have demonstrated less effectiveness than medium-firm mattresses (Atlas, 2010). Strengthening exercises help increase muscular tonus and improve the standard of muscles. Muscle strength and endurance provide energy and a sense of wellness to assist you perform daily routine activities. Adequate core strength that comes from abdominal and back muscles helps stabilize the spine, allows proper spinal movement, and makes it easier to take care of correct posture.

Ergonomic intervention use for minimizing the risks of back injuries focus on improving working posture and equipment design. Ergonomic interventions include postural change and use of back support. Alternate between sitting and standing to reduce postural fatigue and maximize postural variety, which helps to reduce static muscle fatigue & LBP. Use Support when sitting or standing, don’t lean forwards or stoop in an unsupported posture for prolonged periods. If you're sitting, stay up straight or recline slightly during a chair with good back support, and use an honest footrest if necessary. If you're standing for prolonged periods attempt to find something to assist you lean on. Research shows that early ergonomic intervention, in addition to adequate medical care, is effective in preventing and restoring self-reported productivity (Martimo et al., 2010).

According to Driessen et al., (2010), Ergonomic interventions are used to prevent or reduce low back pain (LBP) and neck pain among workers. Most ergonomic intervention programs modify the loads, the design of objects handled, lifting techniques, workplace layout and task design (Halpern, 1992). A systematic review of randomized controlled trials (RCTs) on the effectiveness of ergonomic

interventions shows that there was low to moderate quality evidence that physical and organizational ergonomic interventions were not simpler than no ergonomic intervention on short and future LBP and neck pain incidence/prevalence, and short and future LBP intensity. There was inferiority evidence that a physical ergonomic intervention was significantly simpler for reducing neck pain intensity within the short term (ie, curved or flat seat pan chair) and the long term (arm board) than no ergonomic intervention (Driessen et al., 2010).

Many studies shows that ergonomic interventions are frequently implemented at the workplace to reduce biomechanical and psychosocial load In order to prevent occupational LBP. The findings of a recent systematic review by Sowah (2018), showed that the implementation of physical and organizational ergonomic interventions alone weren't effective to stop. LBP could also be lack of effects might be thanks to the inadequate implementation of ergonomic measures (i.e., compliance, satisfaction and experience), therefore National Institute of Occupational Safety and Health (NIOSH) and the European Agency for Safety and Health at Work (EASHW) recommended, participatory ergonomics (PE), as a strategy to implement ergonomic measures for controlling WMSD and initiating an ergonomic program. PE, an increasingly utilized method of improving ergonomic aspects of labor and workplaces, consists within the workers' active involvement within the process to spot risk factors within the workplace, and to pick the foremost appropriate solutions for these risks, supported by their supervisors and managers, so as to enhance their working conditions. PE has been claimed to feature some advantages to the normal ergonomic intervention, including enhanced intervention efficacy, added problem solving capability (essential for effective assessment of the multifactorial risks associated with WMSD), as well as better communication among workplace parties and better acceptance of change by the workforce (as a result of their increased ownership of workplace changes). The participatory approach has already been wont to reduce physical work demands and to stop WMSD in several studies, presenting promising results (Bernardes et al., 2012).

Postural education is one of the well documented ergonomic interventions. Ergonomics education is a strategy in which an ergonomic expert educates the

participant or workers regarding ergonomic principles and other necessary ergonomic information either on-site or virtually. The aim is to enhance participant's knowledge on work related musculoskeletal disorder's risk factors, work related musculoskeletal disorder's prevention strategies, and effective working pattern or behavior. Ergonomics education program has two primary objectives. One is to help participants become aware of the risk factors and the other is to influence participants to modify their working pattern (Bohr, 2000). Ergonomics education increase the knowledge about the risk factors related with work related musculoskeletal disorders. One study conducted in a small nonprofit organization, found that 89% of the participants were able to identify more risk factors and answer more questions correctly in a pre-post knowledge test after on work ergonomics education intervention (Mani, Provident, & Eckel, 2016).

Another large scale experimental research study revealed that participants who received education and ergonomics training including self-evaluation of work places, and rearrange workstation showed a significant increase knowledge regarding posture and risk factors of work related musculoskeletal disorders (Robertson et. el., 2009). Ergonomics education intervention was reported to be an effective intervention in reducing musculoskeletal pain and discomfort. Studied carried out by Bohr (2000), stated that people who received ergonomic education intervention complained less pain or discomfort. Another randomized controlled trial by Ketola et al. (2002), identified that computer workers who underwent intensive ergonomics modification and ergonomics education interventions revealed less musculoskeletal symptoms during post-intervention follow up assessment.

**Principles of Desk Ergonomics (Rizzo et al., 1997):**

1. Adequate clearance: Computer workers must have adequate thigh/knee clearance under their desk.
2. Adjustability: Computer workers must ensure that their workstation components, including the office chair, are adjustable.
3. Keep things within reach: Computer workers must keep frequently used items within forearm's distance and occasionally used items within arm's distance.
4. Minimize direct pressure: Computer workers must avoid resting their forearms/hands/thighs against sharp edges and hard surfaces.

5. Minimize fatigue: Computer workers must avoid prolonged work and sustained posture.
6. Work in good posture: Computer workers must be mindful of their posture and assume the ideal work posture at work.
7. Work at proper heights: Computer workers must adjust the workstation and chair as necessary to work at proper heights.

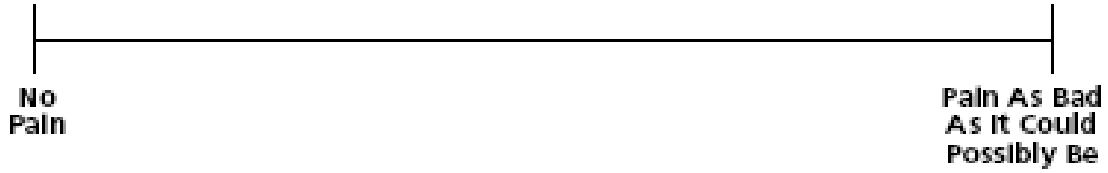
Fenety and Walkar, (2002) given a guideline regarding stretching exercises of a desk worker. Stretch the muscles slowly and avoid jerky movements. Gentle stretch only to the point of comfortable stretch. Try to feel the stretch and hold the stretch for 20-30 seconds. Repeat each stretching exercise 5-10 times or at least 3-4 times during each episode of exercise. Breathe slow, deep, and rhythmic while stretching.

Neural mobilization techniques are a special form of manual therapy, which promote sliding movement between nerves and their surrounding structures through different positioning and movement of joints (Shacklock, 2005). One systemic review by Basson et al. (2017) revealed that Neural Mobilization is an effective intervention to reduce pain and disability of patients with LBP and Neck pain. Neural mobilization helps to restoring the homeostasis in and around the nervous system, by mobilization of the nervous system itself or the structures that surround the nervous system (Coppieters & Butler, 2008). Study carried out by Anzures-Cabrera & Higgins (2010), neural mobilization initiates sliding movement between neural structures and their surroundings (interface) through special manual techniques or exercise.

**Visual Analogue Scale (VAS) for Pain:**

In this study investigator used visual analogue scale for measuring the pain intensity. The VAS is a simple and accurate way that subjectively assessing pain along a continuous visual spectrum. VAS consists of a straight line on which the participants being assessed marks the level of pain. The ends of the straight line are the extreme limits of pain with 0 representing no pain and 10 representing the worst pain ever experienced.

*Visual Analog Scale (VAS)†*




Joos et. al., (1991)

Visual simple scales (VAS) are psychometric measurement tool that intended to record the pain related manifestation and extend of pain in individual participants and utilize this to accomplish a quick, factually quantifiable and reproducible characterization (Klimek,et al., 2017). Vishwanathan and Braithwaite (2019) recommended VAS to use in Low Back Pain patients with radicular pain in lower limb and expressed to be the most responsive in evaluating pain outcome. Ankarali, Ataoglu, Ankarali and Guclu (2018) reported the VAS is a material of choice to measure pain intensity in Bangladeshi respondents.

**Validity:**

In the absence of a gold standard for pain, criterion validity cannot be evaluated. For construct validity, in patients with a variety of rheumatic diseases, the pain VAS has been shown to be highly correlated with a 5-point verbal descriptive scale (“nil,” “mild,” “moderate,” “severe,” and “very severe”) and a numeric pain rating scale (with response options from “no pain” to “unbearable pain”), with correlations ranging from 0.71–0.78 and 0.62–0.91, respectively, (Downie 1978) The correlation between vertical and horizontal orientations of the VAS is 0.99 (Scott 1979).

**Reliability**

Test–retest reliability has been shown to be good, but higher among literate (r= 0.94, P= 0.001) than illiterate patients (r = 0.71,P= 0.001) before and after attending a rheumatology outpatient clinic (Ferraz 1990).

**Oswestry Low Back Disability Index (ODI):**

This is more suitable for Acute or chronic low back pain patients. Most effective for persistent severe disability while the Roland-Morris is better for mild

to moderate disability (Davies and Claire 2009). Niskanen (2002) stated the oswestry low back pain disability questionnaire is a gold standard questionnaire for determining disability in lumbar disc herniation and associated post-surgical patients. Fairbank and Pynsent (2000) reviewed the tool as valid, vigorous and worthwhile outcome measurement tool. 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 (Fairbank, & Pynsent, 2000).

**Interpretation:**

ODI contains 10 different sections of questions, each of which has 6 grades of defined statements. 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 the section score = 5. ODI consist of following: pain intensity, personal care, lifting, walking, sitting, standing, sleeping, sex life, social life and travelling. The total score is obtained by summing up the score of all sections giving a maximum of 50 points.

**Reliability**

The ODI addresses a broader concept of disability than that directly related to pain intensity (Gronblad M, Hupli M et al.1989).

**Validity**

Matthew Yates (2017) said that the ODI represents an easily reproducible, reliable, objective score of disability in LBP that aids in the long-term management of this potentially complex patient group. The simplicity of the ODI makes it particularly suited for occupational health practitioners, who may be dealing with large volume of musculoskeletal cases. The content and construct validity of the ODI were considered moderate to high for measuring low-back pain and lower-extremity disability in the adult population. In construct validation process, the strongest correlation was found between the Short Form Health survey questionnaire (SF-36) pain sub-score and the ODI ($r = -0.75$). Similarly, the Short Form McGill Pain Questionnaire (SF-MPQ) and Brief Pain Inventory (BPI) scores correlated with the ODI score produced *r*-values of 0.52 and 0.66, respectively.

# Chapter-III Methodology

## 3.1 Study design

Randomized Controlled Trail (RCT) design was selected to conduct the study. According to DePoy & Gitlin (2013) the design could be shown by:

| | | | | |
|---|---|---|---|---|
| Experimental Group: | r | O1 | X | O2 |
| Control Group: | r | O1 | | O2 |

The researcher has conducted the study with experimental group and control group with an aim to compare in between experimental group and control group. It was a double blinded study where the assessor and participants were blinded.

### 3.2 CONSORT FLOW chart:

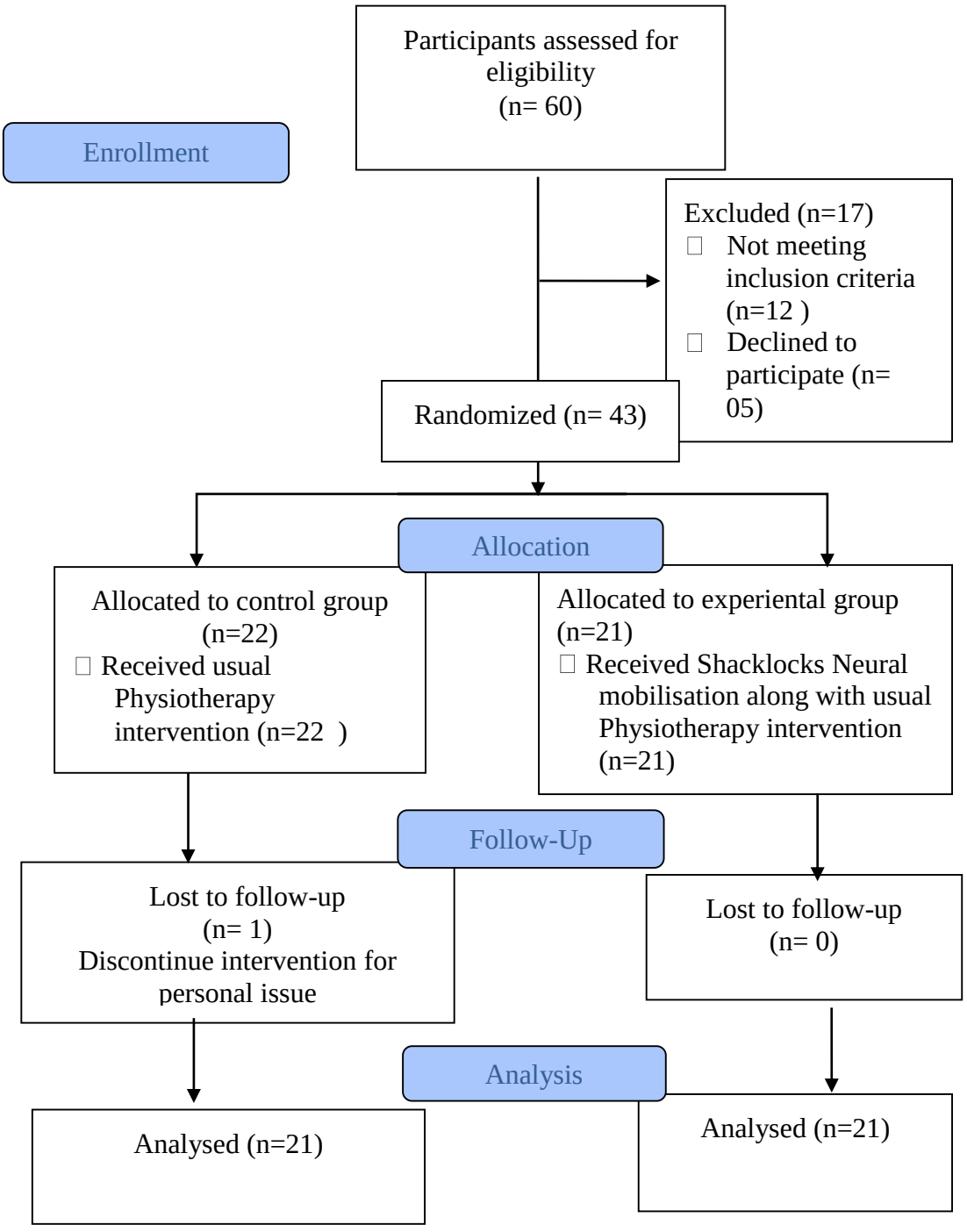



**Figure 3.1: CONSORT Flow Diagram**

### 3.3 Study site

The study conducted at Musculo-skeletal Unit of Physiotherapy Department in CRP (Centre for the Rehabilitation of the Paralyzed), Savar and Mirpur. Because these patients came at CRP from all over the Bangladesh from all economic groups for comprehensive rehabilitation, so it reflects the entire population.

### 3.4 Data collection period

The duration was six months from 1st November 2022 to 30th April 2023.

### 3.5 Study Population

The study population was the patients with LBP and radiculopathy diagnosed as herniated disc by MRI attended in the Musculo-skeletal Unit of Physiotherapy Department at CRP. Savar, Dhaka.

### 3.6 Sample Size

Researcher taken 43 participants as sample. Then randomly allocated 22 to the experimental, and 21 to the control group. Obviously this is a small sample but still we believe they will provide a representative picture of the study. Due to time limitation the researcher has to choose small sample size to conduct this study; within the short time it could not be possible to conduct the study with a large number subjects.

### 3.7 Sampling Technique

Hospital randomization technique was used for selecting sample from population. The study group subjects were studied in such a way that those patients coming to CRP-Savar and CRP-Mirpur within a particular time period. As these patients attained in these CRP randomly without the choice of CRP authority or the researcher's choice, so they may be considered as a random sample. Among 43 participants randomly assigned 21 into experimental and 22 into control group by computer generated random number.

### 3.8 Selection Criteria

#### 3.8.1 Inclusion criteria:

- Patients with acute and sub-acute single or multiple level of lumbar disc prolapse evident in MRI (Pfirrmann, Metzdorf, Zanetti, Hodler & Boos, 2001 & Rahman, et al., 2017). Yu et al., (2012) explored that, diagnostic accuracy of MRI was 97%.
- Both gender with age between 25 to 55 years. About 95 percent lumbar herniation occur in this age group (Jordon, Konstantinou, & O'Dowd, 2011). Fjeld et al. (2017), found no significant association in the age of less than 40 and over 59 years. The common incidents of low back in between ages of 25 and 50 years (Singh & Gebrekidan, 2019).
- Patients with prolapsed disc with symptoms of reduced closing dysfunction (Shacklock, 2005).

#### 3.8.2 Exclusion criteria:

- Any history of surgery for lumbar disc prolapse.
- Patients who wre suffering from serious pathological disease eg; Tuberculosis, tumour or, infection.
- History of fracture to the spine, pregnancy, or medically unstable patient, or any condition where physiotherapy is contraindicated.

### 3.9 Data Processing

#### 3.9.1 Data Collection Tools

- Data collection form.
- Consent Form.
- Structured questionnaire: Dallas Pain Questionnaire and Oswestry Disability Index (ODI)
- Pen, paper, measurement tape, and weight machine.

#### 3.9.2 Measurement

To conduct this study, the researcher collected data through using different types of data collection tools. The researcher has used Dallas pain questionnaire by using Visual Analogue Scale (VAS) for pain measurement in different working position and also activities, Oswestry Low Back Pain Disability Questionnaire were used for disability measurement and structural questionnaire was used for socio-demographic indicators.

#### 3.9.2a Dallas pain questionnaire (DPQ)

The DPQ was a 15-item instrument to assess pain and intensity, personal care, lifting, standing, sitting, walking and sleeping; work and leisure activities and each item was scored with a 10 cm Visual Analog Scale (VAS). This questionnaire slightly modified for the requirement of this study. Scale extremities are labeled with specific words (e.g. ‘no pain in left/all the time severe pain in right). For every specific question, the patient marks the point on the scale which represents his/her condition.

#### 3.9.2b Oswestry disability index (ODI)

The Oswestry disability index (ODI) was included 10 sections of questions. The sections had selected from experimental questionnaires that aimed to assess several aspects of daily living. The ODI domains were the following: pain intensity, personal care, lifting, walking, sitting, standing, sleeping, sex life and social life. Each section contained six statements that were scored from 0 (minimum degree of difficulty in that activity) to 5 (maximum degree of difficulty). If more than one statement was marked

in each section, the highest score should be taken. The total score is obtained by summing up the scores of all sections, giving a maximum of 50 points.

### 3.10 Data collection procedure

The researcher collected data through structured questionnaires, face to face interviews with closed ended question. A structured closed ended questionnaire was developed for socio-demographic indicators by the researcher himself to find out the actual information from every aspect of the participant. Others questionnaire was followed by individuals' questionnaire items and slightly changed for correlation with research topics. The interview contacted face to face interviews before and after eight sessions of treatment. Dallas Pain Questionnaire and Oswestry Disability Index questionnaire were measured initial day and after eight session treatment. Data was collected in initial day as initial assessment and final assessment was taken after 8 session of treatment. The researcher was to determine 43 participants understanding of the questions by observed their facial expressions. Questionnaires used both English and Bengal for easy understanding of the participants.

### 3.11 Intervention

The experimental group participants were received neural mobilization along with usual physiotherapy treatment. The usual physiotherapy treatments include McKenzie concept directional treatment procedures according to patients condition and basic physiotherapy treatment like pelvic floor, back muscles strengthening and leg muscle strengthening, postural advice and also given the home advice. In control group participants were given only usual physiotherapy treatment. They both group received treatment weekly four days in two weeks. Treatment has given by four qualified physiotherapists and among them two were trained in neural mobilization. The researchers arranged special training on neural mobilization and usual care. Postural advice/education was given in sitting and standing in both group participant.

### 3.12 Treatment Protocol

Shacklock's neural mobilization along with other intervention will be given by trained qualified physiotherapist in the experimental group. Neural mobilization treatment protocol developed by Michael Shacklock and usual physiotherapy intervention by CRP. The following treatment will be given:

**Table-1: Treatment Protocol**

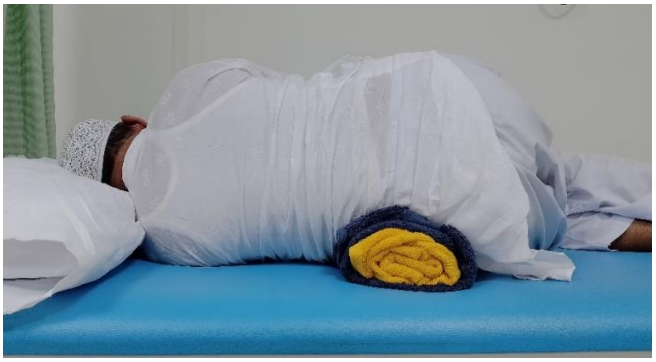
| Experimental Group (SNM along with UPT) | Control Group (UPT Intervention) |
|---|---|
| • Usual Physiotherapy Intervention and<br>• Shacklock's neural mobilization (Figure 2.1):<br>Progression (P)-1: Static Opener<br>P-2: Dynamic Opener<br>P-3: Closing Mobilisation<br>P-4: Sliding<br>P-5: Tensioner<br>P-6: Closing with tensioner | • Education about posture and home exercises.<br>• McKenzie Approach (Directional Preference) - 1 set of 10 repetition performed in every 2 hours.<br>• Lumbar spinal mobilisation: 30-60 oscillation per minute in every segments performed in each session.<br>• Soft tissue technique-performed 10 minutes in each session.<br>• Lower back, pelvic floor and core muscles stabilization exercises: 8-12 repetition of 1 set with 10 seconds hold twice daily. |

**Figure 2.1: Progression for Shacklock's neural mobilization**

**Progression-1: Static Opener**

Opening position of lumbar spine while the painful part (right side) remain up.

Dose: (5 – 15 minutes) x three times a day



**Progression-2: Dynamic Opener**

This is the opening mobilization of lumbar spine where, the painful side remain up, therapist place one hand between the iliac crest and greater trochanter and other hand on the trunk. Direction of force should be caudally downwards. Dose: (15-20 oscillations per minute, 2-5 sets per session)

**Progression-3: Dynamic Closer**

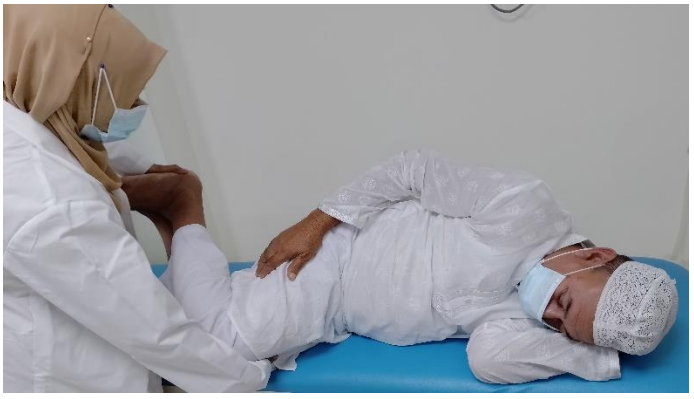
Ipsilateral side flexion. This is the closing position for lumbar spine while the patient's painful side remain up. Dose: (15-20 oscillations per minute, 2-5 sets per session)

**Progression-4: Dynamic closing with distal sliding**

Ipsilateral lumbar side flexion with knee extension while the painful side is remain up. Dose: (15-20 oscillations per minute, 2-5 sets per session).

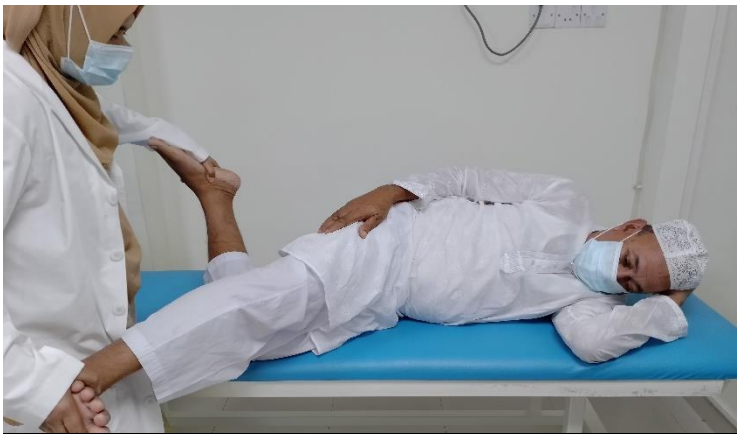
**Progression-5: Dynamic closing with distal sliding**

Ipsilateral lumbar side flexion with neck flexion while the painful side is remain up. Dose: (15-20 oscillations per minute, 2-5 sets per session).



**Progression-6: Dynamic Closing with Tension**

Ipsilateral lumbar side flexion with knee extension and neck flexion. Dose: (15-20 oscillations per minute, 2-5 sets per session)



### 3. 13 Data analysis

- Data was analysed by using SPSS version 24 to compute the descriptive statistics.
- Mann-whitney-U test was used to compare the baseline variability among the categorical data.
- Used paired t-test to measure within group mean difference and unpaired t-test to calculate between groups mean differences.
- Chi-square test was used to show the association among different variables.

### 3.14 Level of Significant

The researcher has used 5% level of significant to test the hypothesis. Calculated t value and compared with standard t value in with appropriate degrees of freedom; the null hypothesis will be rejected when observed t-value is large than the standard t-value and alternative hypothesis is accepted. On the other hand, reversed decision has taken when the calculated value of t is smaller than the standard t-value. All these decisions are taken with a prefixed level of significance (for this case this is 5%).

### 3.15 Ethical consideration

- The investigator followed the World Health Organization (WHO) & Bangladesh Medical Research Council (BMRC) guidelines.
- The researcher took the WHO clinical trial registration.
- Approval received from the IRB of BHPI.
- Data collection permission was taken from the Head of the Physiotherapy Department of CRP.
- Confidentiality maintained strictly.
- Informed consent was taken from every participants.

### 3.15 Informed Consent

Before conducting research with the respondents, it is necessary to gain consent from the subjects (Mandal, Acharya, & Parija, 2011). For this study researcher was given consent form to every participants and the purpose of the research and consent forms was explained to the subject verbally. Researcher mentioned those participants were fully voluntary and they had the right to withdraw at any time. Researcher insured them confidentiality would be maintained. Information might be published in the way of presentation or writing format but they did not be identified. The study results may not have any direct effects on them but the members of Physiotherapy population may be benefited from the study in future. They will not be embarrassed by the study. At any time the researcher would be available to answer any additional questions in regard to the study.

# CHAPTER-IV RESULTS

## 4.1 Baseline Characteristics:

Table-4.1: Baseline characteristics of the participants

| Variable | Experimental group (n=21) | Control group (n=22) | P |
|---|---|---|---|
| **Mean Age (years) ± SD** | 41.48 ± 8.86 | 39.41 ± 10.31 | 0.33 |
| **Gender, n (%)** | | | |
| Male | 13 (61.9%) | 14 (63.6%) | 0.91 |
| Female | 08 (38.1%) | 08 (36.4%) | |
| **Mean Height (m) ± SD** | 1.64 ± 0.06 | 1.63 ± 0.06 | 0.79 |
| **Mean Weight(kg) ± SD** | 65.90 ± 10.35 | 67.36 ± 11.72 | 0.94 |
| **Mean BMI (kg/m2) ± SD** | 25.03 ± 2.91 | 25.19 ± 4.15 | 0.42 |
| **Marital status, n (%)** | | | |
| Married | 20 (95.20%) | 18 (81.8%) | |
| Unmarried | 01 (4.80%) | 04 (18.2%) | 0.18 |
| **Living Area, n (%)** | | | |
| Urban | 17 (81%) | 15 (68.2%) | 0.34 |
| Rural | 04 (19%) | 07 (31.8%) | |
| **Duration of suffering, n (%)** | | | |
| Acute (>4 weeks) | 03 (14.3%) | 06 (27.3%) | 0.31 |
| Sub-acute (4-12 weeks) | 18 (85.7%) | 16 (72.7%) | |
| **Pain Intensity** | | | |
| (Mean VAS in 10 cm) | 6.58 ± 1.56 | 6.67 ± 1.38 | 0.35 |
| **Disability Status** | | | |
| (Mean ODI % ± SD) | 56.38 ± 14.80 | 52.64 ± 13.75 | 0.58 |

The above mentioned table- 4.1 shows the base line characteristics of experimental, and control group which revealed their frequency, mean value with standard deviations and significance levels. In addition, two groups did not show significant differences at baseline characteristics, because significant p vale is <0.05.

### 4.2 Socio-Demographical variables

#### 4.2.1 Age of the Participants

Among all the participants, mean age was 40.42 years with standard deviation (SD) ± 9.57, minimum age was 19 years and maximum was 55 years. The mean age of participants were 41.48 ± 8.86 (SD) years in experimental group and 39.41 ± 10.31 (SD) years in control group. Age ranges were grouped into four categories as in experimental group, between 19-34 years age group were, n = 04 (19%), 35-40 years were, n = 05 (23.8%), 41-47 years were, n = 08 (38.1%), 48- 55 years were, n = 04 (19%) and in control group, age group between 19-34 years were, n = 06 (27.3%), 35-40 years were, n = 06 (27.3%), 41-47 years were, n = 4 (18.2%), 48- 55 years were, n = 06 (27.3%).

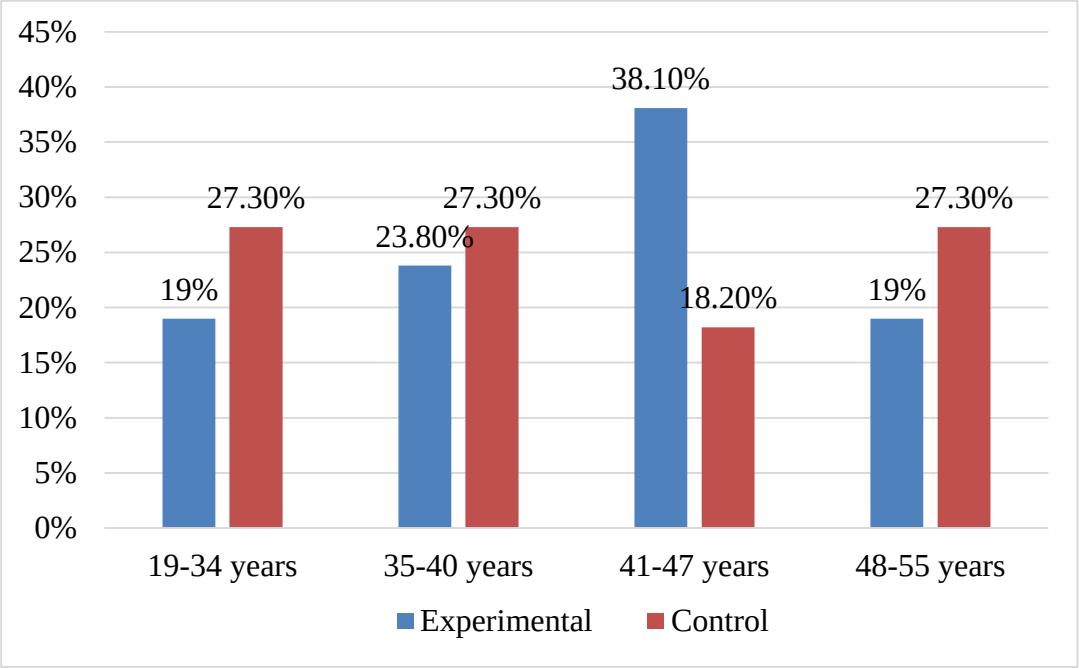



Figure-4.1: Age of the participants

### 4.2.2. Gender Distribution among participants

Among all the participants, n = 27 (62.8%) participants were male and n = 16 (37.2%) participants were female.

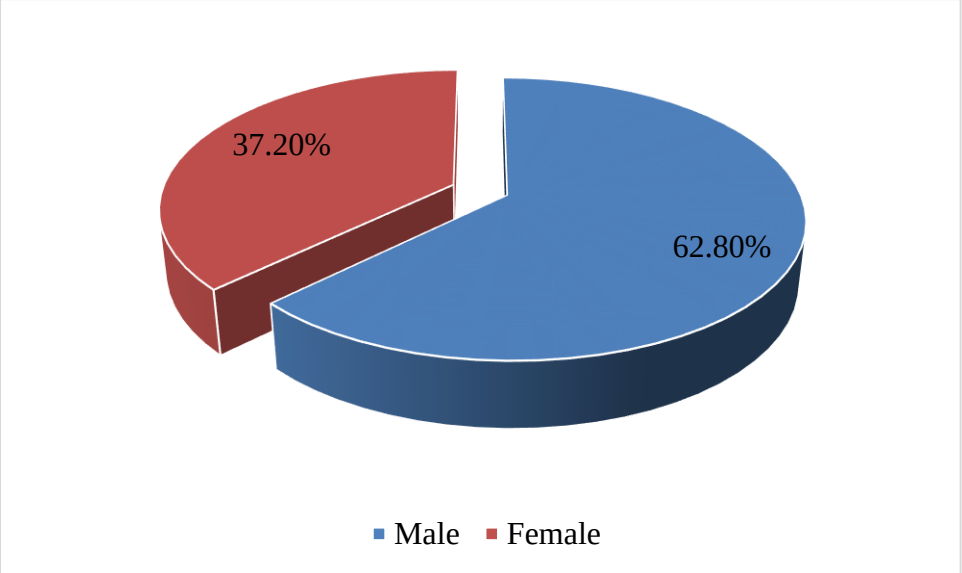



Figure 4.2: Gender of the participants

### 4.2.3 Occupation of the participants

Among the participants, 32.6% (n=14) were housewives (38.1% in experimental group and 27.3% in control group), 18.6% (n=8) were service holder (9.5% in experimental group and 27.3% in control group), 14% (n=6) were businessman (14.3% in experimental group and 13.6% in control group), 4.7% (n=2) were farmer ( 4.8% in experimental and 4.5% in control), 4.7% (n=2) were student ( no one in experimental group but 9.1 % in control, 4.7% (n=2) were driver ( 4.8% in experimental whereas, 4.5% in control group, 7% (n=3) were unemployment (9.5% in experimental and, 4.5% in control group and 14% (n=6) were the others (19% in experimental and 9.1 % in control).

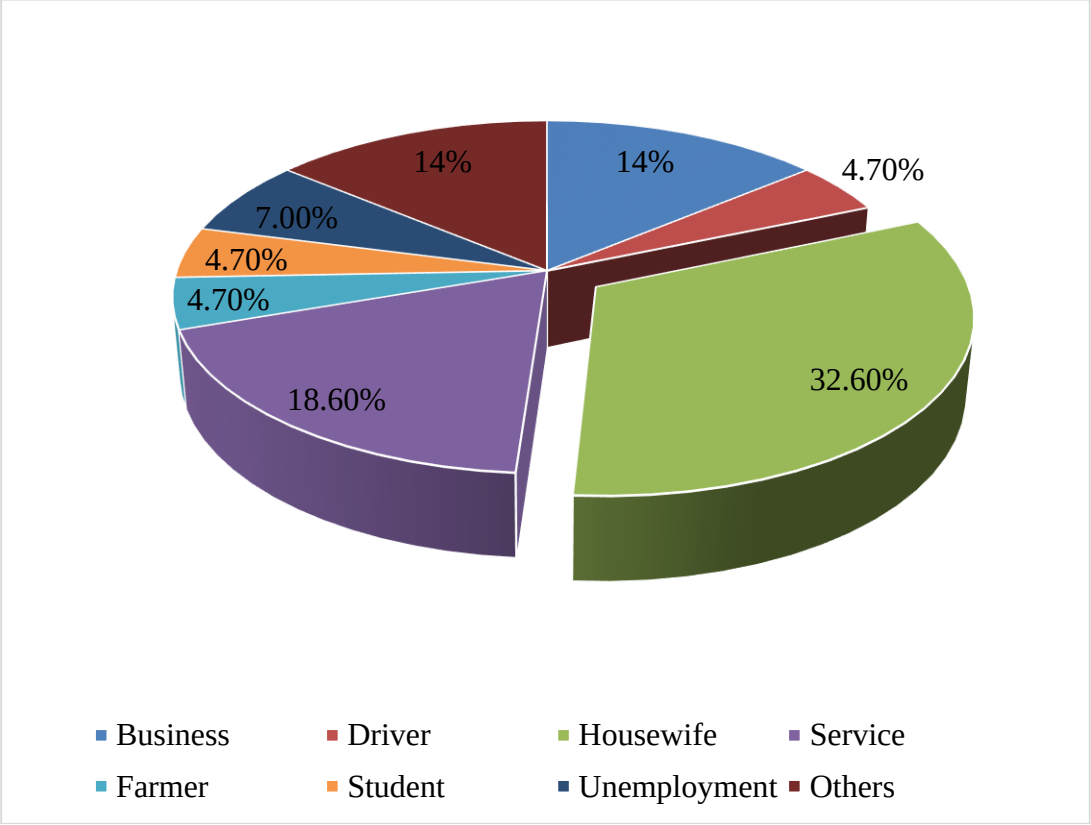



Figure 4.3: Occupation of the participants

### 4.2.4 Educational Status

In this study, among all the participants, 2.3% (n=1) were illiterate (0% in experimental group and 2.3% in control group), 07% (n=3) had completed primary level (9.5% in experimental group and 4.5% in control group), 18.6 % ( n=8) had completed secondary level (9.5% in experimental group and 27.3% in control group), 30.2% (n=13) has completed higher secondary (47.6% in experimental group and 13.6% in control group) and 41.9% (n=18) completed graduation and further studies (33.3% in experimental group and 50% in control group).

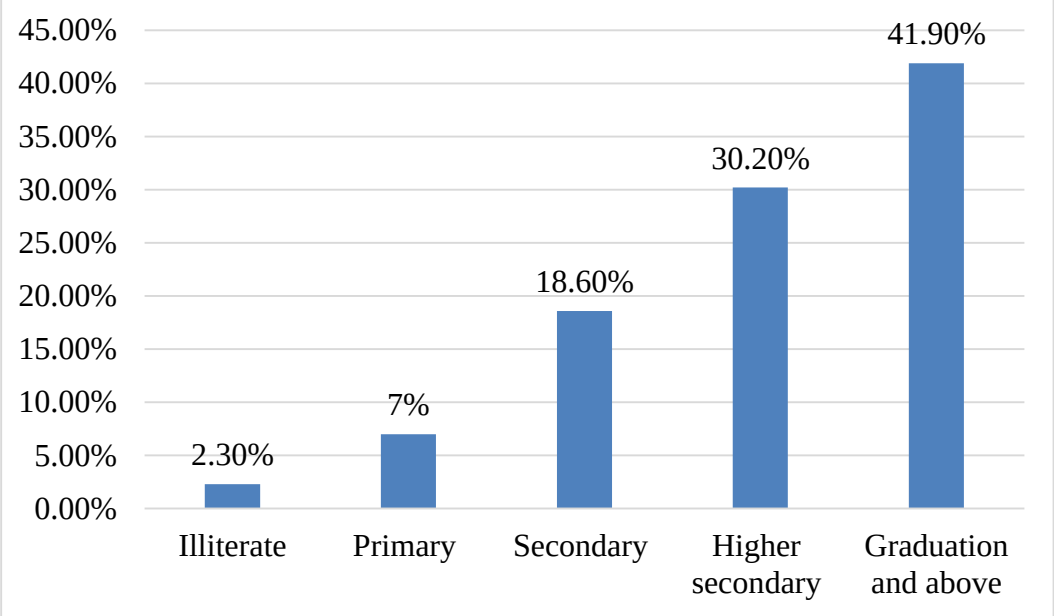



Figure 4.4: Educational status of the participants

### 4.2.5 Monthly Income

Among all the participants the mean monthly income was 24976.74 BDT and subsequent standard deviation was ± 30165.81. The mean monthly income in experimental group was 25380.95 BDT (SD ± 30960.42) and mean monthly income in control group was 24590.91 BDT (SD± 30111. 94). Monthly income were grouped into four categories and in experimental group, monthly income categories (0-25000 BDT), (25001-50000 BDT), (50001-75000 BDT) and (75001-100000 BDT) were 12(57.1%), 06(28.6%), 01 (4.8%) and 02 (4.7%) participants. In control group, monthly income categories (0-25000 BDT), (25001-50000 BDT), (50001-75000 BDT) and (75001-100000 BDT) were 14(63.6%), 05(22.7%), 0 (0%) and 03 (13.6%) participants.

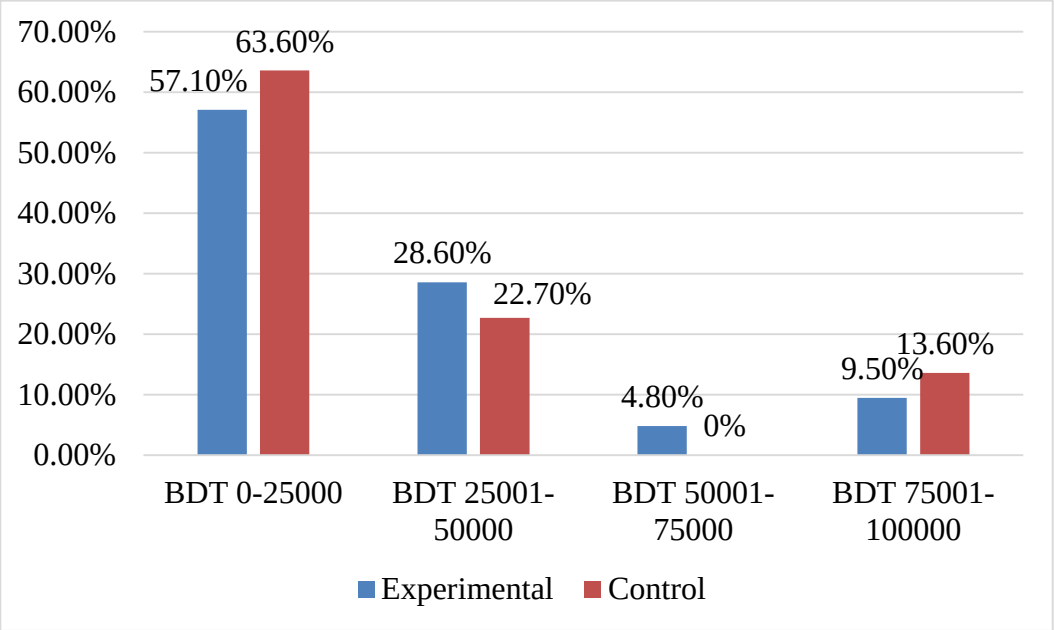



Figure 2.5: Monthly income of the participants

### 4.2.6 Smoking Habit

Among all the participants, 18.6 % (n=8) were smoker (23.8% in experimental group and 13.6% in control group) and 81.4% were non-smoker (76.2% in experimental group and 86.4% in control group).

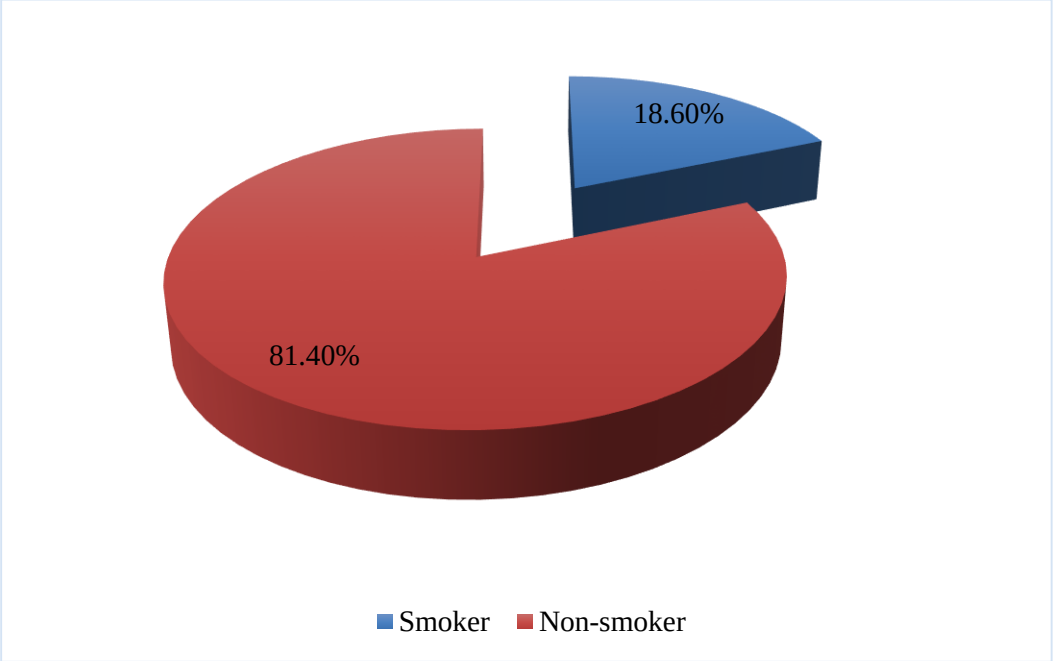



Figure 4.6: Smoking habit among the participants

### 4.2.7 Body Mass Index (BMI)

In this study, among all the participants, the highest Body Mass Index (BMI) was 36.70 (31.30 in experimental group and 36.70 in control group) and the lowest was 18.30 (20.50 in experimental group & 18.30 in control group) with the mean BMI of 25.11 (SD ± 3.57), wherein, (25.03 ± 2.91 in experimental group and 25.19 ±4.15 in control group). However, about half of the participants 48.8% (n=21) had normal BMI (57.1% in experimental group and 40.9% in control group). On the other hand, 2.3% (n=1) participants were in underweight (2.3% in control group and no one in experimental group), whereas, 39.5% (n=17) were in overweight (33.3% were in experimental group and 45.5% in control group) and, 9.3 % (n=4) participants were obese among all participants (9.5% in experimental and 9.1 % in control group).

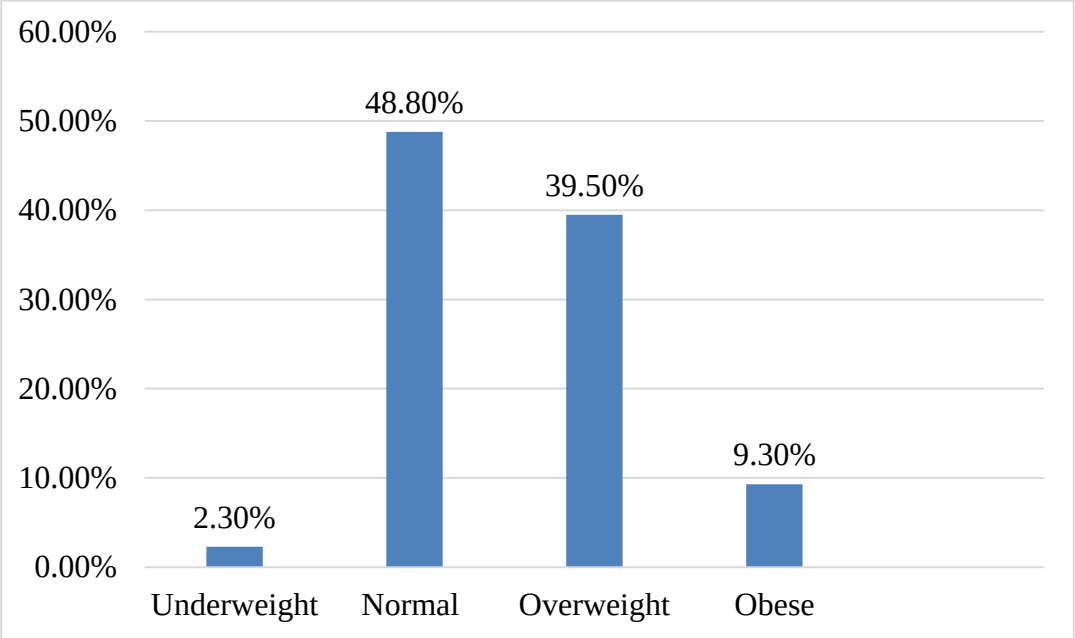



Figure 4.7: Body mass index of the participants

### 4.2.8 Co morbidity of the participants

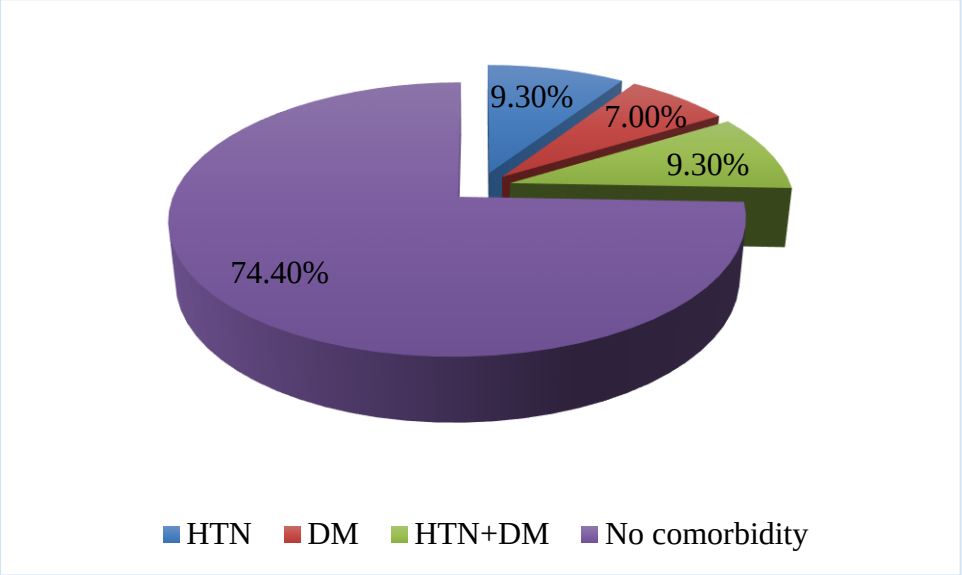



Figure-4.8 Comorbidity of the participants

Among all the participants most of the participants 32 (74.4%) had no co morbidity, 4 (9.3%) had HTN (Hypertension), 03 (7%) had DM (Diabetes Mellitus), 04 (9.3%) had both Diabetes mellitus and Hypertension. In control group 02 (9.1%) had HTN (Hypertension), 01 (4.5%) had DM (Diabetes Mellitus), 03 (9.1%) had both Diabetes mellitus and Hypertension, 17 (77.3%) had no comorbidity. In experimental group 02 (9.5%) had HTN (Hypertension), 02 (9.5%) had DM (Diabetes Mellitus), 02 (9.5%) both Diabetes mellitus and Hypertension, and 15 (71.4%) had no comorbidity.

### 4.3.1. Association between patient's rated pain (cm) and Gender, patient's rated pain (cm) and BMI.

Table 4.2: Cross tabulation between patient rated general pain (cm) and Gender, patient rated general pain (cm) and BMI.

| Variable 1 | Variable 2 | P Value | Interpretation |
|---|---|---|---|
| General Pain Intensity (10 cm VAS) | Gender | 0.37 | No significant association. |
| | BMI | 0.41 | No significant association. |

### 4.3.2. Association between disability status and Gender, disability status and BMI.

Table 4.3: Cross tabulation between ODI and Gender, ODI and BMI.

| Variable 1 | Variable 2 | P Value | Interpretation |
|---|---|---|---|
| ODI | Gender | 0.69 | No significant association. |
| | BMI | 0.41 | No significant association. |

Table-4.2 showed that there was no statistically significant association between patient rated general pretest pain (cm) and Gender (p=0.37), patient rated general pain (cm) and BMI (p=0.41). Table-4.3 showed that there was no statistically significant association between disability status and Gender (p=0.69), disability status and BMI (p=0.41).

### 4.4.1Within group comparison of pain intensity

**Table 4.4: Dallas Questionnaire (Pre and post assessment-paired-t test)**

| | | Experimental Group | | | Control Group | |
|---|---|---|---|---|---|---|
| **Serial No.** | **Variables** | **t** | **Sig (p) value** | **df** | **t** | **Sig (p) value** |
| Pair 1 | Pain Intensity | 6.733 | .001*** | 20 | 4.575 | .001*** |
| Pair 2 | Pain intensity at night | 5.706 | .001*** | 20 | 3.801 | .001*** |
| Pair 3 | Pain interfere with lifestyle | 6.324 | .001*** | 20 | 4.397 | .001*** |
| Pair 4 | Pain severity at forward bending activity | 4.767 | .001*** | 20 | 3.761 | .001*** |
| Pair 5 | Back stiffness | 2.867 | .010** | 20 | -.288 | .776 |
| Pair 6 | Pain severity after walking | 6.231 | .001*** | 20 | 4.453 | .001*** |
| Pair 7 | Pain during walking | 4.071 | .001*** | 20 | 4.460 | .001*** |
| Pair 8 | Pain keep from standing still | 3.700 | .001*** | 20 | 3.363 | .003** |
| Pair 9 | Pain keep away from twisting | 0.949 | .354 | 20 | 2.848 | .010** |
| Pair 10 | Sit in upright hard chair | 4.838 | .001*** | 20 | 2.780 | .012** |
| Pair 11 | Sit in soft arm chair | 5.527 | .001*** | 20 | 3.306 | .004** |
| Pair 12 | Pain in lying | 4.808 | .001*** | 20 | 2.750 | .012** |
| Pair 13 | Pain limit normal lifestyle | 3.771 | .001*** | 20 | 4.959 | .001*** |
| Pair 14 | Interfere with work | 3.969 | .001*** | 20 | 5.274 | .001*** |
| Pair 15 | Change of workplace | 1.458 | .160 | 20 | 1.537 | .140 |

Here, the Level of significance is (<.05), * = 0.05 and ** = 0.01, *** =0.001

### 4.4.2 Pain intensity between group comparisons

**Table 4.5: Dallas Questionnaire (Pre and post assessment-Un paired-t test)**

| | Pre assessment | | | Post assessment | | |
|---|---|---|---|---|---|---|
| **Variables** | **t** | **Sig (p) value** | **df** | **t** | **Sig (p) value** | **df** |
| Pain Intensity | - 0.184 | 0.85 | 41 | -0.766 | 0.45 | 40 |
| Pain intensity at night | -0.473 | 0.63 | 41 | -1.469 | 0.15 | 40 |
| Pain interfere with lifestyle | - 0.242 | 0.81 | 41 | -1.063 | 0.29 | 40 |
| Pain severity at forward bending activity | 0.965 | 0.34 | 41 | -0.484 | 0.63 | 40 |
| Back stiffness | 0.307 | 0.76 | 41 | -2.830 | 0.01** | 40 |
| Pain severity after walking | -1.004 | 0.32 | 41 | -1.113 | 0.27 | 40 |
| Pain during walking | -0.809 | 0.42 | 41 | -0.302 | 0.76 | 40 |
| Pain keep from standing still | 0.208 | 0.84 | 41 | 0.706 | 0.48 | 40 |
| Pain keep away from twisting | -0.295 | 0.77 | 41 | 0.807 | 0.42 | 40 |
| Sit in upright hard chair | 2.124 | 0.04* | 41 | 0.360 | 0.72 | 40 |
| Sit in soft arm chair | 1.796 | 0.08 | 41 | 0.478 | 0.63 | 40 |
| Pain in lying | 0.766 | 0.45 | 41 | -0.645 | 0.52 | 40 |
| Pain limit normal lifestyle | -1.092 | 0.28 | 41 | -0.147 | 0.88 | 40 |
| Interfere with work | -0.792 | 0.43 | 41 | 0.066 | 0.95 | 40 |
| Change of workplace | -0.376 | 0.71 | 41 | -0.463 | 0.65 | 40 |

Here, the Level of significance is (<.05), * = 0.05 and ** = 0.01, *** =0.001

Un-paired “t” test has been used to measure the differences of Pre-test Dallas Pain Questionnaire (10 cm VAS) between control and experimental groups and there were no significant differences found on pre-test Dallas pain score between two groups except sit on upright hard chair: 95% CI (0.062, 2.441), t (41) = 2.124, “p= 0.04”(Table-4.4.2). In this regards, no significant difference found on pretest Dallas pain score between two groups. So, this can be uttered that, between groups analysis found no significant difference on pretest Dallas pain score.

Un-paired “t” test has been used to measure the differences of Post-test Dallas Pain Questionnaire (10 cm VAS) between control and experimental groups and there were no significant differences found on post-test Dallas pain score between two groups except back stiffness: 95% CI (- 3.868, -0.647), t (40) = -2.830, “p= 0.01”(Table-4.4.4). In this regards, no significant difference found on posttest Dallas pain score between two groups (Table-4.4.2). So, the null hypothesis has been accepted and alternative hypothesis rejected. This can be uttered that, between groups analysis found no significant difference on pain.

Paired sample “t” test has been determined to measure the changes of Pain intensity between pretest and posttest in experimental group. The test have a significant result according to statistical test revealing changes of Pain Intensity between pretest and posttest of experimental group in 10 cm VAS scale (Table-4.5.1). All the variables (General pain intensity, pain at night, pain interfere with life style, pain at forward bending, back stiffness, pain after walking, pain during walking, pain keep from standing still, sit on upright hard chair, sit on soft arm chair, pain in lying, pain limit normal lifestyle) were changed significantly after intervention except two variables (pain away from twisting and change of workplace). Pain away from twisting 1.21 ± 5.82; t (20) = 0.949, 95% CI (-1.442, 3.851); p=0.35, and change of workplace 1.49 ± 4.68, t (20) = 1.45, 95% CI (-0.64, 3.62); p=0.16. In this regard, the null hypothesis rejected and alternative hypothesis accepted. It has been explored that there were significant change found on Dallas pain score except two variable (pain keep away from twisting and change in workplace variable).

Paired sample “t” test has been used to measure the changes of Pain intensity between pretest and posttest of control group. The test have a significant result

according to statistical test revealing changes of Dallas Pain scores between pretest and posttest of control group in 10 cm VAS scale (Table-4.5.2). All the variables (General pain intensity, pain at night, pain interfere with life style, pain at forward bending, pain away from twisting, pain after walking, pain during walking, pain keep from standing still, sit on upright hard chair, sit on soft arm chair, pain in lying, pain limit normal lifestyle) were changed significantly after intervention except two variables (back stiffness and change of workplace). Back stiffness -0.261 ± 4.162; t (20) = 0.288, 95% CI (-2.156, 1.632); p=0.77, and change of workplace 1.33 ± 3.96, t (20) = 1.54, 95% CI (-0.47, 3.13); p=0.14. In this regard, the null hypothesis rejected and alternative hypothesis accepted. It has been explored that there were significant change found on Dallas pain score except two variables (back stiffness and change in workplace variable).

### 4.4.3 Pretest mean pain intensity between experimental and control group

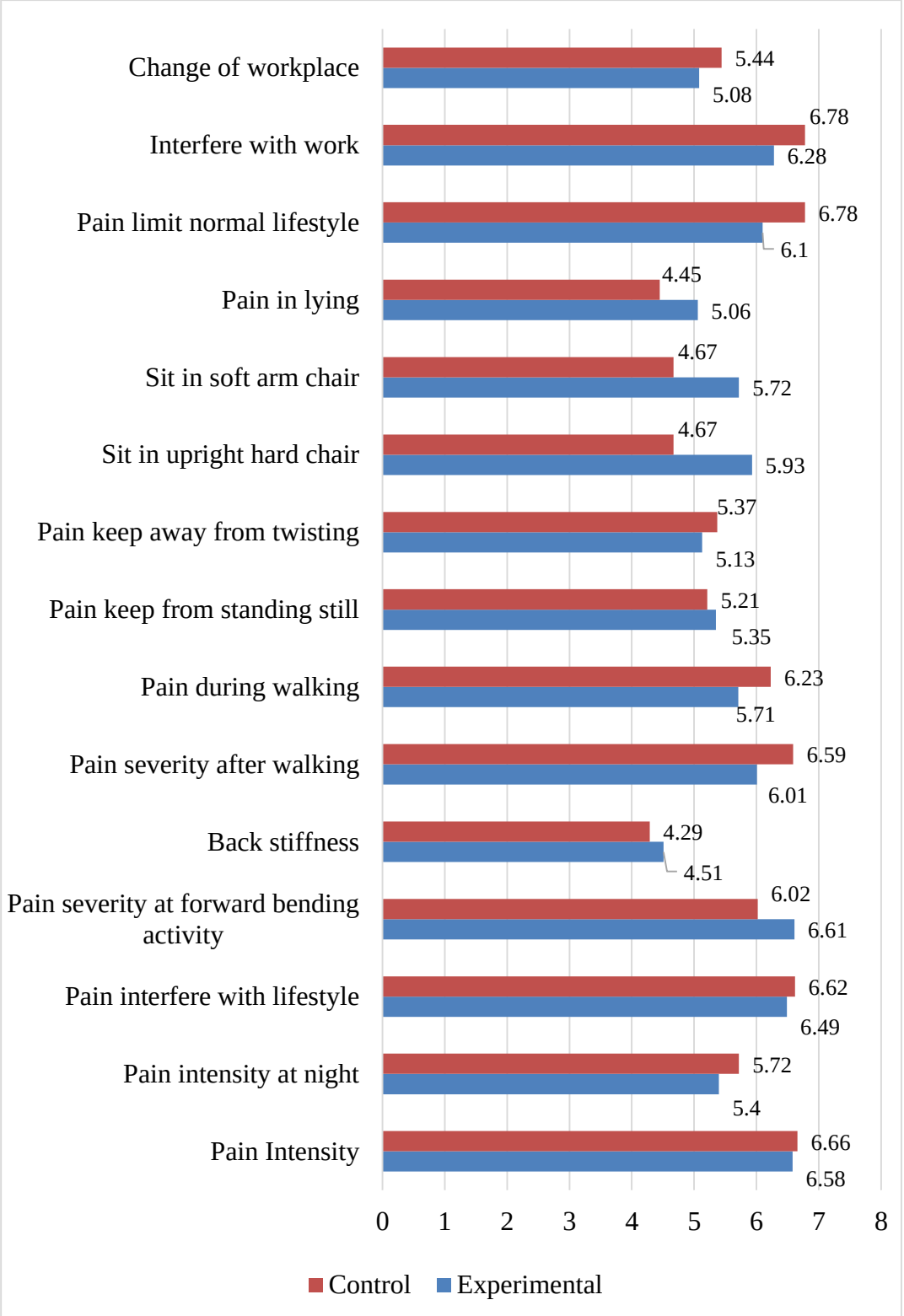



Figure-4.9: Pretest mean pain between both groups

In experimental group, pre-test revealed (figure-4.4.1), mean pain intensity 6.58 ± 1.55, pain at night 5.41 ± 2.21, pain interfere with life style 6.49 ± 1.98, pain at forward bending 6.62 ± 1.85, back stiffness 4.52 ± 2.31, pain after walking 6.00 ± 2.32, pain during walking 5.71 ± 2.27, pain keep from standing still 5.36 ± 2.49, pain keep away from twisting 5.14 ± 3.04, sit in a upright hard chair 5.93 ± 1.81, sit in a soft arm chair 5.72 ± 1.58, pain in lying 5.06 ± 2.86, pain limit normal lifestyle 6.10 ± 2.41, pain interfere with work 6.28 ± 2.47, and change of workplace 5.08 ± 3.07. On the other hand, pre-test in control group revealed (figure-4.4.1), mean pain intensity 6.66 ± 1.38, pain at night 5.73 ± 2.25, pain interfere with life style 6.62 ± 1.72, pain at forward bending 6.02 ± 2.17, back stiffness 4.29 ± 2.45, pain after walking 6.59 ± 1.45, pain during walking 6.23 ± 1.95, pain keep from standing still 5.21 ± 2.02, pain keep away from twisting 5.37 ± 2.22, sit in a upright hard chair 4.68 ± 2.04, sit in a soft arm chair 4.67 ± 2.18, pain in lying 4.45 ± 2.36, pain limit normal lifestyle 6.78 ± 1.66, pain interfere with work 6.78 ± 1.55, and change of workplace 5.44 ± 3.11.

### 4.4.4 Posttest mean pain intensity between experimental and control group

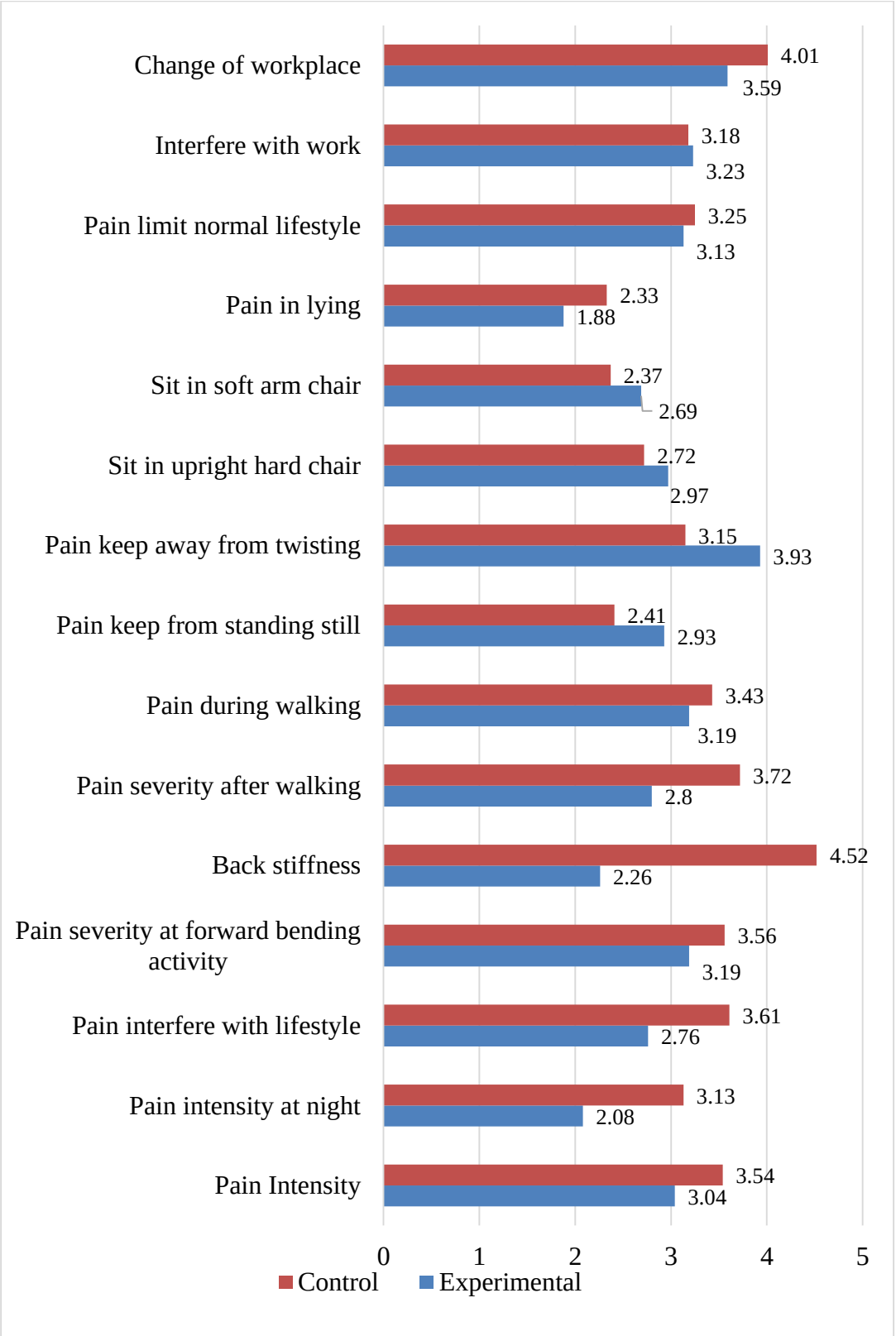



Figure-4.10: Posttest mean pain between both groups

In experimental group, post-test revealed (figure-4.4.2), mean pain intensity 3.04 ± 1.42, pain at night 2.08 ± 1.50, pain interfere with life style 2.76 ± 2.22, pain at forward bending 3.19 ± 2.55, back stiffness 2.26 ± 2.13, pain after walking 2.81 ± 2.61, pain during walking 3.19 ± 2.56, pain keep from standing still 2.91± 2.14, pain keep away from twisting 3.93 ± 3.84, sit in a upright hard chair 2.97 ± 1.93, sit in a soft arm chair 2.69 ± 1.77, pain in lying 1.88 ± 1.65, pain limit normal lifestyle 3.13 ± 2.29, pain interfere with work 3.23 ± 2.37, and change of workplace 3.59 ± 3.31. On the other hand, post-test in control group revealed (figure-4.4.2), mean pain intensity 3.54 ± 2.63, pain at night 3.14 ± 2.93, pain interfere with life style 3.61 ± 2.90, pain at forward bending 3.56 ± 2.35, back stiffness 4.51 ± 2.96, pain after walking 3.71 ± 2.71, pain during walking 3.43 ± 2.54, pain keep from standing still 2.41 ± 2.56, pain keep away from twisting 3.15 ± 2.16, sit in a upright hard chair 2.71 ± 2.64, sit in a soft arm chair 2.37 ± 2.55, pain in lying 2.33 ± 2.72, pain limit normal lifestyle 3.25 ± 2.73, pain interfere with work 3.18 ± 2.72, and change of workplace 4.01 ± 2.51.

### 4.4.5 Disability status:

**Table 4.6: ODI (Pre and post assessment-paired-t test)**

| | | Experimental Group | | | Control Group | |
|---|---|---|---|---|---|---|
| **Serial No.** | **Variables** | **t** | **Sig (p) value** | **df** | **t** | **Sig (p) value** |
| Pair 1 | ODI | 6.053 | .001*** | 20 | 4.820 | .001*** |

Here, the Level of significance is (<.05), * = 0.05 and ** = 0.01, *** =0.001

In experimental group, ODI mean was 31.906 ± 24.153, 95% CI (20.911, 42.899); t (20) = 6.053 "P=0.001". That means the null hypothesis has been rejected and alternative hypothesis accepted. It has been explored that there is a significant change found on ODI score in experimental group.

In control group pretest posttest ODI mean score was 24.762 ± 23.541, 95% CI (14.046, 35.477), t (20) = 4.820 "P=.001". In this regard, the null hypothesis rejected and alternative hypothesis accepted. It has been explored that there is a significant change found on ODI score in control group.

### 4.4.6 Disability status -between Group comparisons

**Table 4.7: ODI (Pre and post assessment-Un paired-t test)**

| | Pre assessment | | | Post assessment | | |
|---|---|---|---|---|---|---|
| **Variables** | **t** | **Sig (p) value** | **df** | **t** | **Sig (p) value** | **df** |
| ODI | 0.362 | 0.72 | 41 | -0.565 | 0.57 | 40 |

Here, the Level of significance is (<.05), * = 0.05 and ** = 0.01, *** =0.001

Pre-test mean ODI in experimental group was 54.429 ± 18.484 and 52.636 ± 13.751 was in control group. According to statistical test revealing no significant difference between pre-test of experimental and control group in ODI score; t (41) = 0.362, "p =0.72"; 95% CI (-8.209, 11.794). That means there is no significance difference found between experimental and control group on pre-test ODI.

Post-test mean ODI in experimental group was 24.476 ± 18.471 and 27.714 ± 18.658 was in control group. The test has a significant result according to statistical test revealing changes between posttest of experimental and control group in ODI score; t (40) = -0.565, "p =0.57"; 95% CI (-14.817, 8.341). That means the null hypothesis has been accepted and alternative hypothesis has been rejected. Shacklock's neural mobilisation has no significant (<.05) impact on disability status.

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### 4.4.7 ODI score (percentage) between two groups

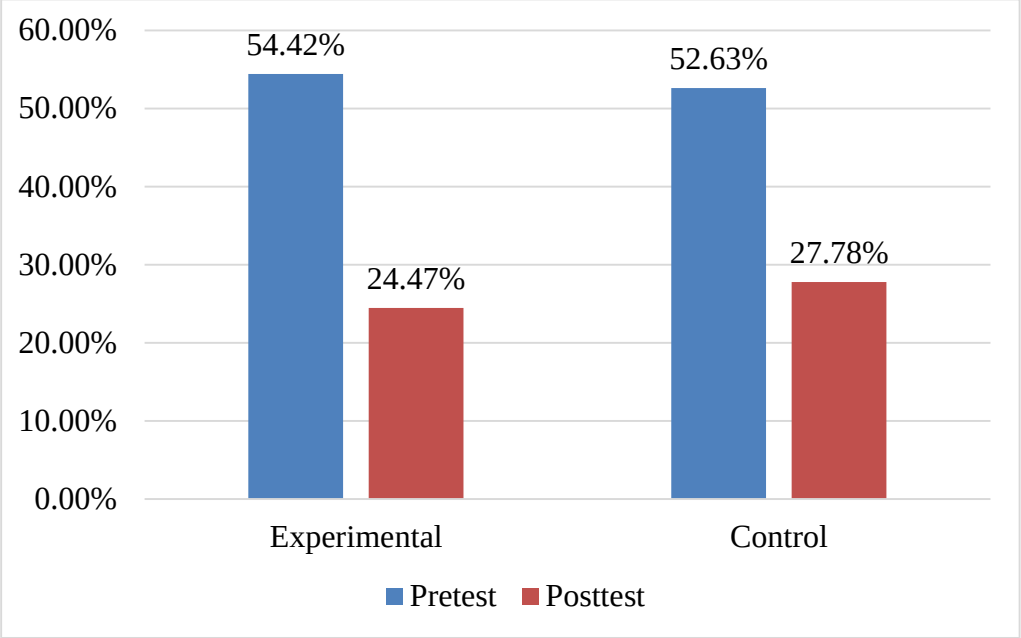


Figure-4.11 Mean ODI score (percentage) between two groups

In experimental group, pretest mean ODI score 54.42% and posttest mean ODI 24.47%. On the other hand, in control group pretest mean ODI 52.63% and, posttest mean ODI score 27.78%.

# CHAPTER-V DISCUSSION

The purpose of the study was to find out the effectiveness of Shacklock's neural mobilization for acute and sub-acute lumbar disc prolapsed. The result of the study revealed that pain and disability status significantly improved in both groups, wherein, between groups analysis showed no significant changes. However, the baseline characteristics of all the subjects were similar in both experimental and control group.

In this study, mean age was 40.42 years, minimum age was 19 years and maximum was 55 years. The mean age of participants were 41.48 years in experimental group and 39.41 years in control group. Age ranges were grouped into four categories as in experimental group, between 19-34 years age group were, n = 04 (19%), 35-40 years were, n = 05 (23.8%), 41-47 years were, n = 08 (38.1%), 48- 55 years were, n = 04 (19%) and in control group, age group between 19-34 years were, n = 06 (27.3%), 35-40 years were, n = 06 (27.3%), 41-47 years were, n = 4 (18.2%), 48- 55 years were, n = 06 (27.3%). In this study found that, n = 27 (62.8%) participants were male and n = 16 (37.2%) participants were female. Whereas, male participants were, n = 13 (61.9%) and female participants were, n = 08 (38.1%) in experimental group and male participants were, n = 14 (63.6%) and female participants were, n = 08 (36.4%) in control group.

This study showed that, 32.6% (n=14) were housewives (38.1% in experimental group and 27.3% in control group), 18.6% (n=8) were service holder (9.5% in experimental group and 27.3% in control group), 14% (n=6) were businessman (14.3% in experimental group and 13.6% in control group), 4.7% (n=2) were farmer ( 4.8% in experimental and 4.5% in control), 4.7% (n=2) were student ( no one in experimental group but 9.1 % in control, 4.7% (n=2) were driver ( 4.8% in experimental whereas, 4.5% in control group, 7% (n=3) were unemployment (9.5% in experimental and, 4.5% in control group and 14% (n=6) were the others (19% in experimental and 9.1 % in control). In this study, among all the participants, 2.3% (n=1) were illiterate (0% in experimental group and 2.3% in control group), 07% (n=3) had completed primary level (9.5% in experimental group and 4.5% in control group), 18.6 % ( n=8) had completed secondary level (9.5% in experimental group and 27.3% in control group), 30.2% (n=13) has completed higher secondary (47.6% in experimental group and

13.6% in control group) and 41.9% (n=18) completed graduation and further studies (33.3% in experimental group and 50% in control group). Among all the participants the mean monthly income was 24976.74 BDT and subsequent standard deviation was ± 30165.81. The mean monthly income in experimental group was 25380.95 BDT (SD ± 30960.42) and mean monthly income in control group was 24590.91 BDT (SD± 30111. 94). Monthly income were grouped into four categories and in experimental group, monthly income categories (0-25000 BDT), (25001-50000 BDT), (50001-75000 BDT) and (75001-100000 BDT) were 12(57.1%), 06(28.6%), 01 (4.8%) and 02 (4.7%) participants. In control group, monthly income categories (0-25000 BDT), (25001-50000 BDT), (50001-75000 BDT) and (75001-100000 BDT) were 14(63.6%), 05(22.7%), 0 (0%) and 03 (13.6%) participants.

Study revealed that, 18.6 % (n=8) were smoker (23.8% in experimental group and 13.6% in control group) and 81.4% were non-smoker (76.2% in experimental group and 86.4% in control group). In this study, among all the participants, the highest Body Mass Index (BMI) was 36.70 (31.30 in experimental group and 36.70 in control group) and the lowest was 18.30 (20.50 in experimental group & 18.30 in control group) with the mean BMI of 25.11 (SD ± 3.57), wherein, (25.03 ± 2.91 in experimental group and 25.19 ±4.15 in control group). However, about half of the participants 48.8% (n=21) had normal BMI (57.1% in experimental group and 40.9% in control group). On the other hand, 2.3% (n=1) participants were in underweight (2.3% in control group and no one in experimental group), whereas, 39.5% (n=17) were in overweight (33.3% were in experimental group and 45.5% in control group) and, 9.3 % (n=4) participants were obese among all participants (9.5% in experimental and 9.1 % in control group).

Study found that, most of the participants 32 (74.4%) had no co morbidity, 4 (9.3%) had HTN (Hypertension), 03 (7%) had DM (Diabetes Mellitus), 04 (9.3%) had both Diabetes mellitus and Hypertension. In control group 02 (9.1%) had HTN (Hypertension), 01 (4.5%) had DM (Diabetes Mellitus), 03 (9.1%) had both Diabetes mellitus and Hypertension, 17 (77.3%) had no comorbidity. In experimental group 02 (9.5%) had HTN (Hypertension), 02 (9.5%) had DM (Diabetes Mellitus), 02 (9.5%) both Diabetes mellitus and Hypertension, and 15 (71.4%) had no comorbidity. Two types disc prolapse patients were selected for this study. LBP is considered to be acute if it has been present from 0-4 weeks and sub-acute if the pain persist from 5 to 12

weeks. In this study about two third of the participants 34 (79.1%) were suffering from sub-acute LBP whereas, 09 (20.9%) were suffering from acute LBP. In control group, 06 (27.3%) had Acute LBP, whereas, 16 (72.7%) had Sub-acute LBP, and in experimental group 06 (14.3%) had acute pain, wherein, 18 (41.9%) had sub-acute pain.

One descriptive study on bankers in Dhaka city conducted by Ali et al., (2020) revealed that there were 57.7% males and 42.3% females complained LBP, wherein 59.02% of the participants were between the ages of (31- 40) years and about half of the workers were either overweight or obese 50.3%. Most of the participants 83.8% were married during this study and they seemed to complain more about LBP compared to unmarried participants. Another study on Bankers in Dhaka city carried out by Amin et al., (2016), found that the mean age of the respondents were 33.58 years and more than half of the respondents 59.8% were married, more than two-third 69.2% was male and 30.8% were female. Majority of the respondents 58.25% and 33.0% belonged to the level of education was graduate and post graduate. 51.5%, 42.0% and 6.5% of the respondents belonged to use computers from 1-5 hours, 6-10 hours, 11 hours and above daily respectively. Investigation on Bankers in Lahore, Pakistan carried out by Tauquer et al., (2018) explore that mean age of respondents was 30.46 years. The prevalence of low back pain in bankers was 52.4%, more prevalent in males 53.5% as compared to females 46.5%.

Research carried out by Workneh et al., (2021) among bank workers in Gondar City, Northwest Ethiopia, found that nearly two-thirds 65.6% of the respondents were male and 60.4% of them were married. The mean age of the respondents was 30.24 years and more than three-fourths 78.9% of the respondents were BSc holders and 73.3% of them were costumer caregivers. More than two-thirds 67% of the respondents were in the normal weight and nearly one fifth 21.1% of the respondents had work-related stress. According to Goncharenko, Komleva, & Chekhonatsky (2020), Low back pain is associated with increasing age and working length. 50 % people over the age of 50 are mostly suffered by LBP. Low physical activity at the workplace significant increase the risk of developing LBP.

In this study, there were no significant differences found on pre-test Dallas pain score between two groups except sit on upright hard chair: 95% CI (0.062, 2.441), t (41) = 2.124, “p= 0.04”. In this regards, no significant difference found on pretest Dallas pain

score between two groups. So, this can be uttered that, between groups analysis found no significant difference on pretest Dallas pain score. On the other hand, there were no significant differences found on post-test Dallas pain score between two groups except back stiffness: 95% CI (- 3.868, -0.647), t (40) = -2.830, "p= 0.01". In this regards, no significant difference found on posttest Dallas pain score between two groups. So, this can be uttered that, between groups analysis found no significant difference on pain.

Paired sample "t" test has been determined to measure the changes of Pain intensity between pretest and posttest in experimental group. The test have a significant result according to statistical test revealing changes of Pain Intensity between pretest and posttest of experimental group in 10 cm VAS scale. All the variables (General pain intensity, pain at night, pain interfere with life style, pain at forward bending, back stiffness, pain after walking, pain during walking, pain keep from standing still, sit on upright hard chair, sit on soft arm chair, pain in lying, pain limit normal lifestyle) were changed significantly after intervention except two variables (pain away from twisting and change of workplace). Pain away from twisting 1.21 ± 5.82; t (20) = 0.949, 95% CI (-1.442, 3.851); p=0.35, and change of workplace 1.49 ± 4.68, t (20) = 1.45, 95% CI (-0.64, 3.62); p=0.16. In this regard, the null hypothesis rejected and alternative hypothesis accepted. It has been explored that there were significant change found on Dallas pain score except two variable (pain keep away from twisting and change in workplace variable).

The statiscal test revealing changes of Dallas Pain scores between pretest and posttest of control group in 10 cm VAS scale. All the variables (General pain intensity, pain at night, pain interfere with life style, pain at forward bending, pain away from twisting, pain after walking, pain during walking, pain keep from standing still, sit on upright hard chair, sit on soft arm chair, pain in lying, pain limit normal lifestyle) were changed significantly after intervention except two variables (back stiffness and change of workplace). Back stiffness -0.261 ± 4.162; t (20) = 0.288, 95% CI (-2.156, 1.632); p=0.77, and change of workplace 1.33 ± 3.96, t (20) = 1.54, 95% CI (-0.47, 3.13); p=0.14. It has been explored that there were significant change found on Dallas pain score except two variables (back stiffness and change in workplace variable).

Pre-test mean ODI in experimental group was 54.429 ± 18.484 and 52.636 ± 13.751 was in control group. According to statistical test revealing no significant difference between pre-test of experimental and control group in ODI score; t (41) = 0.362, “p =0.72”; 95% CI (-8.209, 11.794). That means there is no significance difference found between experimental and control group on pre-test ODI.

Post-test mean ODI in experimental group was 24.476 ± 18.471 and 27.714 ± 18.658 was in control group. The test has a significant result according to statistical test revealing changes between posttest of experimental and control group in ODI score; t (40) = -0.565, “p =0.57”; 95% CI (-14.817, 8.341). That means the null hypothesis has been accepted and alternative hypothesis has been rejected. Shacklock’s neural mobilisation has no significant (<.05) impact on disability status.

In experimental group, ODI mean was 31.906 ± 24.153, 95% CI (20.911, 42.899); t (20) = 6.053 “P=0.001. That means the null hypothesis has been rejected and alternative hypothesis accepted. It has been explored that there is a significant change found on ODI score in experimental group.

In control group pretest posttest ODI mean score was 24.762 ± 23.541, 95% CI (14.046, 35.477), P (20) = 0.001. In this regard, the null hypothesis rejected and alternative hypothesis accepted. It has been explored that there is a significant change found on ODI score in control group.

According to Plaza-Manzano et al. (2020), investigate the effects of the inclusion of neural mobilization into a motor control exercise program on pain, related disability, neuropathic symptoms, straight leg raise, and pressure pain threshold in lumbar radiculopathy whereas, neural mobilization was administered in addition to the motor control exercises, to the experimental group by experienced physiotherapist 2 days a week for 8 weeks. Control group received only motor control exercises twice a week for 8 weeks. So, it was concluded that the addition of neurodynamic mobilization to a motor control exercise program leads to reductions in neuropathic symptoms in subjects with lumbar disc herniation.

Another study investigated the short-term effect of slider and tensioner exercises on pain and range of motion (ROM) of straight leg raise (SLR) and slump tests in patients with low back-pain. Compared with controls, patients in the slider and tensioner groups demonstrated greater improvements in the ROM of slump test at all sessions compared with controls (mean difference: ≥12.5°; 95% CI, -32.1 to -6.4) whereas, there were no significant differences found between the slider and tensioner groups in any outcome at any session (Alshami, Alghamdi, & Abdelsalam, 2021).

One systemic review by Peacock, Douglas, & Nair, (2023), was evaluated the effectiveness of neural mobilization in pain, disability, and function in adults with low back pain. Six of the eight studies found positive effects on pain, disability and function and one study found improvements in pain not in disability and function. But, one study found positive impacts on neural sensitivity, but not on overall pain and disability. It is concluded that neural mobilization is an effective tool for short-term improvements in pain, function, and disability associated with low back pain.

# CHAPTER-VI LIMITATION OF THE STUDY

- Generalizability of the result is quite difficult due to small sample size.
- Researcher used four assessors for data collection, it might influence the result.
- Data was collected from two clinical settings, one was CRP-Savar and another one was CRP-Mirpur; so it can also influence the findings.
- Sometimes treatment sessions were interrupted due to public holiday and, sometimes recruited physiotherapists taken leave during the intervention period which might interrupt the result.
- About 25% participants had some kind of co-morbidity (such as DM, Hypertension, or both DM & HTN), it might influence the outcome.
- All the Clinical physiotherapist who provided neural mobilization were not expert in neural mobilization. Researcher, who is a certified neural mobilization specialist, trained them all regarding Shacklock's Neural Mobilisation approach. It might be influence the intervention as well as result.

# CHAPTER-VII CONCLUSION AND RECOMMENDATION

The result of this study revealed that the Shacklock's neural mobilization along with usual physiotherapy intervention has no significant effect on pain and disability after eight sessions of treatment for patients with acute and sub-acute lumbar disc prolapsed. Considering the assessment, the pain in different positions reduced in both group while comparing to the initial assessment but, between group comparisons showed no significant difference. Initial and after eight session of intervention, the between group comparisons found no significant change on Dallas pain questionnaire and Oswestry Disability Index whereas, within group comparison found significant change on Dallas Pain Questionnaire and Oswestry Disability Index. Neural Mobilization is a newly developed treatment approach where, therapist can mobilize the nerve in different musculoskeletal systems. So, further study is needed to improve the evidence based clinical practice, as well as knowledge and skill.

So, investigator recommended some further steps for future research which include; different musculoskeletal problems with different measurement tools need to be included in future studies, assess range of motion (ROM) and psychological state of the participants, similar studies with large sample size and a follow up session need to be involved in future studies. Different stages of Lumber disc prolapsed (acute, sub-acute and, chronic) patients need to involve. Study regarding the specific neural mobilization techniques with specific doses, financial analysis need to be included. Further study should be done in more specific treatment or placebo treatment in control group compared with neural mobilization approach to find out the effectiveness of Neural Mobilization for patients with lumbar disc prolapsed.

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# ANNEXURE- I: IRB

BANGLADESH HEALTH PROFESSIONS INSTITUTE

বাংলাদেশ হেল্‌থ প্রফেশন্স ইনস্টিটিউট (বিএইচপিআই)

**Bangladesh Health Professions Institute (BHPI)**

*(The Academic Institute of CRP)*

Ref: CRP-BHPI/IRB/10/2022/668 Date: 25/10/20222

To
Zahid Bin Sultan Nahid
M.Sc. in Physiotherapy (Part-II)
Session: 2020-2021, Student ID: 111200087
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

**Subject:** Approval for the study entitled **"Effectiveness of Shacklock's Neural Mobilization for Acute & Sub-acute Lumbar Disc Prolapsed"** by ethics committee.

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

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

The purpose of the study is to investigate the effectiveness of Shacklock's Neural Mobilization for acute and sub-acute lumbar disc prolapsed. The study involves face-to-face interview by using a semi-structured questionnaire to explore the effects of Shacklock's Neural Mobilization on patients with acute and sub-acute lumbar disc prolapsed whereas one group will receive usual physiotherapy intervention and another group will take Shacklock's Neural Mobilization with usual physiotherapy interventions and there is no likelihood of any harm to the participants.

His data collection sites are Head Office and Mirpur Branch Office of the Centre for the Rehabilitation of the Paralysed (CRP) at Savar and Mirpur respectively in Dhaka, Bangladesh. However, the investigator is required to receive permissions from respective data collection sites' authorities to use their facilities for data collection. The members of the Ethics committee have approved the study to be conducted in the presented form at the meeting held at 09.00 AM on 24th September 2022 at BHPI.

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

Best regards,

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

সিআরপি-চাপাইন, সাভার, ঢাকা-১৩৪৩, বাংলাদেশ। ফোন: +৮৮ ০২ ২২৪৪৪৫৪৬৪-৫, +৮৮ ০২ ২২৪৪৪১৪০৪, মোবাইল: +৮৮ ০১৭৩০ ০৫৯৬৪৭
CRP-Chapain, Savar, Dhaka-1343, Bangladesh. Tel: +88 02 224445464-5, +88 02 224441404, Mobile: +88 01730059647
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# ANNEXURE-II: Permission letter for data collection

**Permission Letter**

19th November 2022

To

Head of Physiotherapy Department

Centre for the Rehabilitation of the Paralyzed (CRP),

Savar, Dhaka-1343.

Subject: Prayer for permission to collect data from the musculoskeletal unit of CRP-Savar and CRP-Mirpur to conduct a research project.

Sir,

With due respect and humble submission to state that I am a student of M.Sc. in Physiotherapy at Bangladesh Health Professions Institute (BHPI). As a part of our course curriculum, we have to conduct a research project for the partial fulfillment of the requirement for the degree of M.Sc. in Physiotherapy. My research title is **"Effectiveness of Shacklock's Neural Mobilization for Acute & Sub-acute Lumbar Disc Prolapsed" and the aim of the study is** to identify the effectiveness of Shacklock's Neural Mobilization for acute and sub-acute lumbar disc prolapsed. This is a randomized control trial under the supervision of Mohammad Anwar Hossain, Associate Professor of BHPI. I have chosen the musculoskeletal unit of CRP-Mirpur and CRP-Savar to collect data from the acute and sub-acute disc-prolapsed patients who will come to CRP for Physiotherapy treatment.

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

Yours Faithfully

Zahid Bin Sultan Nahid

M.Sc. in Physiotherapy (Part II)

Session: 2020-2021

BHPI, CRP, Savar, Dhaka-1343.

Appoved

20/11/22

MOHAMMAD ANWAR HOSSAIN
Senior Consultant &
Head of Physiotherapy Dept
Associate Professor, BHPI
CRP, Savar, Dhaka-1343

## ANNEXURE-III: Informed Consent

Assalamualikum/Namasker, my name is Zahid Bin Sultan Nahid; I am doing M. Sc in Physiotherapy from the Bangladesh Health profession Institute. With the help of my supervisor, I am conducting a research project which is a part of my course curriculum. That is entitled as "Effectiveness of Shacklock's Neural Mobilization for Acute & Sub-acute Lumbar Disc Prolapsed". The aim of the study to identify the effectiveness of Shacklock's neural mobilization for acute and sub-acute lumbar disc prolapsed. The design of this study is true experimental and data will be collected by structured questionnaire. If you agree to participate, then I will ask you some question that would take maximum of 15-20 minutes for each session and need two sessions of interview. If you feel any discomfort or uncomfortable or want to skip a question, and then just tell me I will go on. You will be not paid for the participation of my study. The participants have the right to withdrawal consent and discontinue participation at any time. Information of this s study will be collected and never be shared with others without participant's permission. Information will be kept safely and confidentiality will be maintained. The participants do not get direct benefit from the study but we hope we will identify the effects of Shacklock's neural mobilization for acute & sub-acute lumbar disc prolapsed. The results of the study could give rise to some adaptations to the rehab program. If you have any question about the research, please ask me.

I agree to participate in the research project without any force.

Signature of the patient: ---------- Date: ----------

Signature of the Interviewer: ---------- Date: ----------

Signature of the Witness: ---------- Date: ----------

**ANNEXURE-IV: Questionnaire (English)**

Title: **"Effectiveness of Shacklock's Neural Mobilization for Acute & Sub-acute Lumbar Disc Prolapsed."**

Code no:

**Part: 1- Personal details:**

| | | | |
|---|---|---|---|
| 1.1 Patient's name: | | | |
| 1.2 Age: | | | |
| 1.3 Gender: | 1. Male | 2. Female | |
| 1.4 Height: | | | |
| 1.5 Weight: | | | |
| 1.6 Address:: | Village: | Post office: | |
| | Thana: | District | |

**Part: 2-Socio-demographic information**

| | | | |
|---|---|---|---|
| 2.1 Occupation: | | | |
| | 1. Farmer | 2. Day labor | 3.Service holder |
| | 4. Garments worker | 5. Driver | 6. Rikshawola |
| | 7.Businessman | 8. Unemployment | 9. Housewife |
| | 10.Teacher | 11.Student | 12.Others |
| 2.2 Marital status | 1. Married | 2. Unmarried | 3.Widow |
| | 4. Divorce | | |
| 2.3 Family size: | 1. Small family | 2. Large family | |
| 2.4 Number of Children: | | | |
| 2.5 Living place: | 1. Urban | 2. Rural | |
| 2.6 Educational status | 1. Illiterate | 2.Primary | 3.Secondary |
| | 4. HSC passed | 5. Graduate & Masters | |
| 2.7 Religion: | 1. Islam | 2. Hindu | |
| | 3. Christen | 4.Boddho | |
| 2.8 Smoking | 1. Yes | 2. No | |
| 2.9 Monthly Income: | | | |

1.10 Co-morbidity:

**Part: 4- Dallas Pain questionnaire**

4.1How bad is your pain?

No pain Severe pain

4.2 How bad is the pain at night?

No pain Severe pain

4.3 Does the pain interfere with your lifestyle?

No problem Total change in lifestyle

4.4. How severe pain you feel during forward bending activity?

No pain Severe pain

4.5. How stiff is your back?

No stiffness Worse possible stiffness

4.6. Does your pain interfere with walking?

No problem Cannot walk

4.7. Do you hurt when walking?

No problem Worse possible pain

4.8. Does your pain keep you from standing still?

Can stand as long as I want Cannot stand at all

4.9. Does your pain keep you from twisting?

No problem Cannot twist

4.10. Does your pain allow you to sit in an upright hard chair?

Sit as long as I like Cannot use a hard chair at all

4.11. Does your pain allow you to sit in a soft arm chair?

Sit as long as I like Cannot use a soft chair at all

4.12. Do you have back pain when lying in a bed?

No Pain Worse Pain

4.13. How much does your pain limit your normal lifestyle?

No pain No relief at all

4.14. Does your pain interfere with your work?

No problem Totally cannot walk

4.15. How much have you had to change your work place because of back pain?

No change So much that I cannot keep my job

**Part: 5-Oswestry Low Back Pain Disability Questionnaire**

5. 1: Pain Intensity

- I can tolerate the pain I have without having to use pain killers.
- The pain is bad but I manage without taking pain killers.
- Medicine give complete relief from pain.
- Medicine give moderate relief from pain.
- Medicine give very little relief from pain
- Medicine have no effect on the pain and I do not use them.

5.2: Personal Care

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

5. 3: Lifting

- I can lift heavy weights without extra pain.
- 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 positioned for example 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 only very light weights
- I cannot lift or carry anything at all

5.4: Walking

- Pain does not prevent me walking any distance
- Pain prevents me walking more than 1 mile
- Pain prevents me walking more than 0.5 miles
- Pain prevents me walking more than 0.25 miles
- I can only walk using a stick or crutches
- I am in bed most of the time and have to crawl to the toilet.

5.5 Sitting

- I can sit in any chair as long as I like
- I can only sit in my favorite chair as long as I like
- Pain prevents me sitting more than 1 hour
- Pain prevents me from sitting more than 0.5 hours
- Pain prevents me from sitting more than 10 minutes
- Pain prevents me from sitting at all

5.6: 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

5.7: Sleeping

- Pain does not prevent me from sleeping well.
- I can sleep well only by using tablets
- Even when I take tablets I have less than 6 hours sleep
- Even when I take tablets I have less than 4 hours sleep

- Even when I take tablets I have less than 2 hours of sleep
- Pain prevents me from sleeping at all

5.8 Sex life

- 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

5.9: 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 energetic interests such as dancing
- Pain has restricted my social life and I do not go out as often
- Pain has restricted my social life to my home
- I have no social life because of pain.

4.10: Traveling

- I can travel anywhere without extra pain.
- I can travel anywhere but it gives me extra pain
- Pain is bad but I manage journeys over 2 hours
- Pain restricts me to journeys of less than 1 hour
- Pain restricts me to short necessary journeys under 30 minutes.
- Pain prevents me from traveling except to the doctor or hospital

## ANNEXURE V: মৌখিক সম্মাতিপত্র

আস্সালামু আলাইকুম, আমি জাহিদ বিন সুলতান নাহিদ, বাংলাদেশ হেল্থ প্রফেশন্স ইন্সটিটিউট এর এম, এস, সি, ইন ফিজিওথেরাপি বিভাগের দ্বিতীয় বর্ষের একজন ছাত্র। আমি আমার সুপারভাইজার এর সহায়তায় একটি গবেষণা প্রকল্প করছি যা আমার কোর্স কারিকুলাম এর অংশ বিশেষ। আমার গবেষণার বিষয় হল "কোমরের একিউট এবং সাব-একিউট ডিস্ক প্রলাপ্স এর চিকিৎসায় শ্যাক্লকের নিউরাল মুবিলাইজেশন এর কার্যকারিতা"।

এই গবেষণার উদ্দেশ্য হল কোমরের একিউট এবং সাব-একিউট ডিস্ক প্রলাপ্স এর চিকিৎসায় শ্যাক্লকের নিউরাল মুবিলাইজেশন এর কার্যকারিতা বের করা।

এই গবেষণাটি একটি পরীক্ষামূলক গবেষণা এবং রোগীদের তথ্য উপাত্ত সংগৃহীত হবে কাঠামোগত প্রশ্নের মাধ্যমে এবং যারা গবেষণার জন্য উপযোগী তাদের নির্বাচন করা হবে। যদি আপনি অংশগ্রহনে আগ্রহী হন, তাহলে আমি আপনাকে কিছু প্রশ্ন করব যা ১৫-২০ মিনিট সময় লাগবে একবারের জন্য, যেটা আমি দুইবার পূরণ করব। অংশগ্রহণকারীরা প্রশ্ন চলাকালীন যেকোনো সময়ই এই প্রশ্নোত্তর পর্ব ত্যাগ করতে পারবেন। এই গবেষণার জন্য কিছু তথ্য উপাত্ত সংগ্রহ করা হবে যা রোগীর অনুমতি ছাড়া অন্য কাউকে প্রদান করা হবেনা। তথ্যগুলো নিরাপদে রাখা হবে এবং গোপনীয়তা রক্ষা করা হবে। সব ধরনের গোপনীয়তা রক্ষা করে পরবর্তীতে আরও গবেষণার কাজে এই ডাটা ব্যাবহার করা হতে পারে। অংশগ্রহণকারীরা সরাসরি কোন উপকার পাবে কিনা সেটা নিশ্চিত না হলেও, এই গবেষণার মাধ্যমে আমরা কোমরের ডিস্ক প্রলাপ্স রোগীদের জন্য নিউরাল মুবিলাইজেশন এর কার্যকরিতা বের করতে পারব। আপনার যদি এই গবেষণা সম্পর্কে বিস্তারিত জানার থাকে তাহলে আমার সাথে যোগাযোগ করে জানতে পারবেন।

আমি সেচ্চাই এই গবেষণাই অংশগ্রহন করতে রাজি আছি।

অংশগ্রহনকারীর নাম ও স্বাক্ষরঃ .....

কোড নংঃ.....

ডাটা সংগ্রহকারীর নাম ও স্বাক্ষর.....

## ANNEXURE-VI: প্রশ্নাবলী (বাংলা)

**গবেষণার শিরোনামঃ "কোমরের একিউট এবং সাব-একিউট ডিস্ক প্রলাপ্স এর চিকিৎসায় শ্যাক্লকের নিউরাল মুবিলাইজেশন এর কার্যকারিতা।**

**অধ্যায়ঃ এক- পরিচিতি**

১.১ বয়সঃ

১.২ লিঙ্গ ১। পুরুষ ২। মহিলা

১.৩ উচ্চতাঃ

১.৪ ওজনঃ

**অধ্যায়ঃ দুই- আর্থসামাজিক ও জনসংখ্যাতাত্ত্বিক তথ্যঃ**

**২.১ পেশাঃ**

| | | |
|---|---|---|
| ১। কৃষক | ২। দিনমজুর | ৩। চাকুরীজীবি |
| ৪।গার্মেন্টস কর্মী | ৫। গাড়িচালক | ৬। রিকশাচালক |
| ৭। ব্যবসায়ী | ৮। বেকার | ৯। গৃহিণী |
| ১০। শিক্ষক | ১১। ছাত্র | ১২। অন্যান্য |

**২.২ বৈবাহিক অবস্থাঃ**

১। বিবাহিত ২।অবিবাহিত ৩।আলাদা ৪। তালাকপ্রাপ্ত

**২.৩ পরিবারের আকারঃ**

১। ছোট পরিবার ২। যৌথ পরিবার

**২.৪ ছেলে মেয়ের সংখাঃ**

**২.৫ আবাসিক এলাকাঃ** ১। ২। গ্রাম

শহর

**২.৬ শিক্ষাগত যোগ্যাটাঃ**

| | | |
|---|---|---|
| ১। কখনো স্কুলে যায়নি | ২। প্রাথমিক শিক্ষা | ৩। মাধ্যমিক শিক্ষা |
| ৪। উচ্চ মাধ্যমিক শিক্ষা | ৫। স্নাতক/ স্নাকোত্তর | |

**২.৭ ধর্মঃ** ১।ইসলাম ২। হিন্দু ৩। খ্রিস্টান ৪। বৌদ্ধ

**২.৭ ধূমপানঃ** ১। হ্যা ২। না

**২.৮ মাসিক আয়ঃ**

**২.৯ ব্যথার ধরনঃ**

**২.১০ অন্য কোন রোগ**

**অধ্যায়ঃ ৩- ডালাস ব্যথাজনিত প্রশ্নাবলী**

৩.১ আপনার ব্যথা কতটুকু?

কোন ব্যথা নাই তীব্র ব্যথা

৩.২ রাতের বেলায় আপনার ব্যথা কতটুকু?

কোন ব্যথা নাই তীব্র ব্যথা

৩.৩ আপনার ব্যথা কি আপনার জীবন যাত্রাকে বাধাগ্রস্থ করে?

কোন বাধাগ্রস্থ করে না অনেক বাধাগ্রস্থ করে

৩.৪ ব্যথার ওষধ খেলে কি আপনার ব্যথা কমে?

সম্পূর্ণ কমে কমে না

৩.৫ আপনার কোমর কতটুকু শক্ত মনে হয়?

শক্ত মনে হয় না শক্ত মনে হয়

৩.৬ হাঁটলে কি আপনার ব্যথা বাড়ে?

কোন ব্যথা নাই অনেক ব্যথা

৩.৭ আপনার ব্যথার জন্য কি সোজা হয়ে দাঁড়াতে পারেন?

সোজা হয়ে দাঁড়াতে পারি  সোজা হয়ে দাঁড়াতে পারি না

৩.৮ হাঁটার সময় কি আপনি ব্যথা অনুভব করেন?

কোন ব্যথা নাই  তীব্র ব্যথা

৩.৯ ব্যথার জন্য কি আপনি সামনের দিকে ঝুঁকতে পারেন?

ঝুঁকতে পারি  ঝুঁকতে পারি না

৩.১০ ব্যথার জন্য আপনি শক্ত চেয়ারে সোজা হয়ে বসতে পারেন?

বসতে পারি  বসতে পারি না

৩.১১ ব্যথার জন্য আপনি নরম চেয়ারে সোজা হয়ে বসতে পারেন?

বসতে পারি  বসতে পারি না

৩.১২ আপনি কি শোয়ার সময় ব্যথা অনুভব করেন?

কোন ব্যথা নাই  অনেক ব্যথা

৩.১৩ ব্যথা আপনার স্বাভাবিক জীবন যাত্রাকে কতটুকু বাঁধাগ্রস্ত করেছে?

কোন বাঁধাগ্রস্ত করে নাই অনেক বাঁধাগ্রস্ত করেছে

৩.১৪ ব্যথা আপনার স্বাভাবিক কাজকর্মকে কতটুকু বাঁধাগ্রস্ত করেছে?

কোন বাঁধাগ্রস্ত করে নাই অনেক বাঁধাগ্রস্ত করেছে

৩.১৫ আপনার কোমর ব্যথার জন্য কর্মস্থল কতটুকু পরিবর্তন করেছেন?

কোন পরিবর্তন করি নাই সম্পূর্ণ পরিবর্তন করেছি

**অধ্যায়ঃ ৪- অস্ওয়েস্ট্রি কোমর ব্যথার অক্ষমতা সংক্রান্ত প্রশ্নাবলী**

**৪.১ ব্যথার তিব্রতাঃ**

- আমার এই মুহূর্তে কোন ব্যথা নেই
- এই মুহূর্তে ব্যথা খুবই হালকা
- এই মুহূর্তে ব্যথা মধ্যপন্থী
- এই মুহূর্তে ব্যথা মোটামুটি তীব্র
- এই মুহূর্তে ব্যথা গুরুতর
- এই মুহূর্তে ব্যথা অচিন্তনীয়

**৪.২ ব্যাক্তিগত যত্ন (গোসল করা, কাপড় পরা ইত্যাদি)**

- আমি সাধারণত নিজেকে দেখাশুনা করতে পারি, ব্যথা ছাড়া।
- আমি সাধারণত নিজেকে দেখাশুনা করতে পারি, কিন্তু এটা কিছুটা ব্যথাদায়ক।
- নিজেকে দেখাশুনা করা ব্যথাদায়ক কিন্তু আমি কিছুটা সতর্কতা অবলম্বন করি।
- আমার কিছু সাহায্য প্রয়োজন হয় কিন্তু অধিকাংশ কাজ আমি নিজে করতে পারি।
- আমার নিজের কাজকর্মের জন্য সারাদিন অন্যের সাহায্যের প্রয়োজন হয়।
- আমি কষ্ট করেও কাপড় পরতে বা পরিস্কার করতে পারিনা এবং বিশ্রামে থাকি।

**৪.৩ ভার উত্তোলনঃ**

- আমি ব্যথা ছাড়া ভারী ওজন উত্তোলন করতে পারি।

- আমি ভারী ওজন উত্তোলন করতে পারি কিন্তু কিছুটা ব্যথা অনুভব হয়।
- আমি ব্যথার জন্য ভারী ওজন উত্তোলন করতে পারিনা, কিন্তু আমি সুবিধামত স্থান থেকে ভার উত্তোলন করতে পারি, যেমনঃ টেবিল হতে।
- আমি ব্যথার জন্য ভারী ওজন উত্তোলন করতে পারিনা, কিন্তু আমি সুবিধামত স্থান থেকে হালকা ভার উত্তোলন করতে পারি।
- আমি খুবই অল্প ওজন উত্তোলন করতে পারি।
- আমি কোন ওজন উত্তোলন বা বহন করতে পারি না।

**৪.৪ হাঁটাঃ**

- ব্যথা আমকে যেকোনো দূরত্বে হাঁটার জন্য বাঁধার সৃষ্টি করেনা।
- ব্যথা আমকে এক মাইলের বেশি হাটতে বাঁধার সৃষ্টি করে।
- ব্যথা আমকে আধা মাইলের বেশি হাটতে বাঁধার সৃষ্টি করে।
- ব্যথা আমকে ১০০ গজের বেশি হাটতে বাঁধার সৃষ্টি করে।
- আমি শুধু লাঠি অথবা ক্র্যাচ ব্যবহার করে হাঁটতে পারি।
- আমি বেশীরভাগ সময়ই বিছানায় থাকি এবং হামাগুড়ি দিয়ে বাথরুমে যায়।

**৪.৫বসাঃ**

- আমি যেকোন চেয়ারে নিজের ইচ্ছামত বসতে পারি।
- আমি শুধু আমার পছন্দের চেয়ারে নিজের ইচ্ছামত বসতে পারি।
- আমি ব্যথার জন্য এক ঘন্টার বেশি বসতে পারিনা।
- আমি ব্যথার জন্য আধা ঘন্টার বেশি বসতে পারিনা।
- আমি ব্যথার জন্য দশ মিনিটের বেশি বসতে পারিনা।
- আমি ব্যথার জন্য সবসময় বসতে পারিনা।

**৪.৬ দাঁড়ানোঃ**

- আমি ব্যথা ছাড়া আমার ইচ্ছামত দাঁড়িয়ে থাকতে পারি।
- আমি আমার ইচ্ছামত অনেকক্ষণ দাঁড়িয়ে থাকতে পারি কিন্ত এটা কিছুটা ব্যথার সৃষ্টি করে।
- আমি ব্যথার জন্য এক ঘণ্টার বেশি দাঁড়িয়ে থাকতে পারিনা।
- আমি ব্যথার জন্য আধা ঘণ্টার বেশি দাঁড়িয়ে থাকতে পারিনা।
- আমি ব্যথার জন্য ১০ মিনিটের বেশি দাঁড়িয়ে থাকতে পারিনা।
- আমি ব্যথার জন্য সবসময় দাঁড়িয়ে থাকতে পারিনা।

**৪.৭ ঘুমানোঃ**

- ব্যথা আমার ঘুমের কোন সমস্যা তৈরি করেনা।
- আমি একমাত্র বিছানাই ভালোমতো ঘুমাতে পারি।
- আমি বিছানাই ছয় ঘণ্টার কম ঘুমাতে পারি।
- আমি বিছানাই চার ঘণ্টার কম ঘুমাতে পারি।
- আমি বিছানাই দুই ঘণ্টার কম ঘুমাতে পারি।
- আমি ব্যথার জন্য সবসময় ঘুমাতে পারিনা।

**৪.৮ যৌন জীবনঃ**

- আমার যৌন জীবন স্বাভাবিক এবং এটা কোন ব্যথা তৈরি করেনা।
- আমার যৌন জীবন স্বাভাবিক এবং কিছুটা ব্যথা তৈরি করে।
- আমার যৌন জীবন স্বাভাবিক এবং অনেক ব্যথা তৈরি করে।
- আমার যৌন জীবন ব্যথার জন্য গুরুতরভাবে সীমাবদ্ধ।
- আমার যৌন জীবন ব্যথার জন্য অনেকটাই গুরুতরভাবে সীমাবদ্ধ।
- আমার যৌন জীবন ব্যথার জন্য পুরুটাই গুরুতরভাবে সীমাবদ্ধ।

**৪.৯ সামাজিক জীবনঃ**

- আমার সামজিক জীবন স্বাভাবিক এবং এটা কোন ব্যথা তৈরি করেনা।
- আমার সামজিক জীবন স্বাভাবিক কিন্ত এটা কিছুটা ব্যথা তৈরি করে।
- ব্যথা আমার সামজিক জীবন এর উপর কোন প্রভাব ফেলে না স্কিন্ত উদ্দীপনামূলক কাজকর্ম থেকে বিরত রাখে।
- ব্যথা আমার সামজিক জীবনকে বাধাগ্রস্থ করে এবং আমি বাহিরে যেতে পারিনা।
- ব্যথা আমার জীবনকে চার দেয়ালের মধ্যে সীমাবদ্ধ করেছে।
- ব্যথার জন্য আমার কোন সামাজিক জীবন নেই।

**৪.১০ ভ্রমনঃ**

- আমি ব্যথা ছাড়াই যেকোন জায়গায় ভ্রমন করতে পারি।
- আমি ব্যথা ছাড়াই যেকোন জায়গায় ভ্রমন করতে পারি কিন্তু এটা কিছুটা ব্যথা তৈরি করে।
- আমি অতিরিক্ত ব্যথা নিয়ে দুই ঘণ্টার বেশি ভ্রমন করতে পারি ।
- ব্যথার জন্য আমি ২০ মিনিট এর বেশি ভ্রমন করতে পারিনা।
- আমি অতিরিক্ত ব্যথা নিয়ে দুই ঘণ্টার বেশি ভ্রমন করতে পারি কিন্তু এটা কিছুটা ব্যথা তৈরি করে।
- ব্যথার জন্য আমি চিকিৎসার প্রয়োজন ছাড়া ভ্রমন করিনা।

# ANNEXURE-VII : Protocol of Usual Physiotherapy Intervention

CRP
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*Ref:* *Date:*

**Usual Physiotherapy intervention protocol**

- Education about posture and home exercises.
- McKenzie Approach (Directional Preference) - 1 set of 10 repetition performed in every 2 hours.
- Lumbar spinal mobilisation: 30-60 oscillation per minute in every segments performed in each session.
- Soft tissue technique-performed 10 minutes in each session.
- Lower back, pelvic floor and core muscles stabilization exercises: 8-12 repetition of 1 set with 10 seconds hold twice daily.

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