Faculty of Medicine

University of Dhaka

Effectiveness of the McKenzie Treatment Protocol booklet for the patients suffering with Lumbar Spondylolisthesis: A Randomized Clinical Trial

Submitted by:

Mst. Humaira Salsabil

B.Sc. in Physiotherapy

DU Roll No: 1506

Registration No: 6364

Session: 2019-20

Bangladesh Health Professions Institute (BHPI)

Department of Physiotherapy

CRP, Savar, Dhaka-1343

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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 the McKenzie treatment protocol booklet for the patients suffering with lumbar spondylolisthesis: A randomized clinical trial"** Submitted by **Mst. Humaira Salsabil**, for the partial fulfillment of the requirements for the degree of Bachelor of Science in Physiotherapy (B.Sc. in PT).

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Declaration

I hereby declare that the research work entitled **"Effectiveness of the McKenzie Treatment Protocol booklet for the patients suffering with Lumbar Spondylolisthesis: A Randomized Clinical Trial"** has been carried out by me as a part of my academic requirements.

This study is original and has not been submitted in any form to any other university or institution for any degree or diploma. All sources of information and data have been duly acknowledged and referenced.

I also declare that ethical approval was obtained and all participants gave informed consent before taking part in the study.

Signature: Mst. Humaira Salsabil Date: 10/08/2025

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List of Abbreviations

ALIF	Anterior Lumber Interbody Fusion
BHPI	Bangladesh Health Professions Institute
BMRC	Bangladesh Medical Research Council
CRP	Centre for the Rehabilitation of the Paralysed
CLBP	Chronic Low Back Pain
EIL	Extension in lying
FIL	Flexion in Lying
IRB	Institutional Review Board
LS	Lumber Spondylolisthesis
MDT	Mechanical Diagnosis and Therapy
MRI	Magnetic Resonance & Imaging
MS	Musculoskeletal
NSAID	Non-Steroidal Anti-Inflammatory Drug
ODI	Oswestry Disability Index
PLID	Prolapse Lumber Intervertebral Disc
PLIF	Posterior Lumber Interbody Fusion
RCT	Randomized Control Trial
SFIL	Sustained Flexion in Lying
SMD	Standardized Mean Difference
SPSS	Statistical Package for Social Science
TB	Tuberculosis
TLIF	Transforaminal Lumber Interbody Fusion
VAS	Visual Analog Scale
WHO	World Health Organization

Abstract

Background: Lumbar spondylolisthesis is a condition characterized by the anterior slippage of one vertebral body over another, often leading to mechanical instability and pain. Congenital abnormalities, degenerative alterations, trauma and stress fractures are some of the causes of this disorder. The L4-L5 and L5-S1 levels of the spine are where it is most frequently seen. Nowadays it was a major problem in our country which has a tendency to recurrent injury where Mckenzie flexion exercise seems to be effective to prevent recurrency. **Objectives:** The objectives of this study to evaluate e the effectiveness of a booklet on Mckenzie treatment protocol for Lumber Spondylolisthesis (LS) patients. **Methodology**: Experimental study design was used in this study. 30 patients with Lumber Spondylolisthesis were randomly allocated into two groups from outdoor musculoskeletal unit, CRP. Among them 15 patients were assigned into experimental group received Mckenzie treatment protocol booklet with conventional physiotherapy and another 15 into control group received only conventional physiotherapy. Total treatment sessions were 4 weeks. Double blinding procedure was used during data collection. Outcome measurement tools: Visual Analog Scale (VAS) was used to measure pain intensity and Oswestry Disability Index (ODI) used to measure functional disability. **Analysis of data**: Inferential statistics such as Mann-Whitney U test for between groups ODI, Unpaired t test for between groups VAS, Paired t test for within group VAS and Wilcoxon test was done for within group ODI using SPSS version 25. **Results:** It was found that pain intensity had reduced and functional disability improved both between and within group. **Conclusion:** Mckenzie treatment protocol booklet along with conventional physiotherapy has the ability to improve the effects than only conventional physiotherapy in Lumber Spondylolisthesis patients. This exercise proved beneficial when combined with conventional physiotherapy to minimize disability level and prevent recurrence, reduction of pain and improvement of function.

Keywords: *Lumber Spondylolisthesis, McKenzie treatment protocol booklet and Conventional physiotherapy*.

Chapter-I INTRODUCTION

1.1 Background

The spinal cord is a cylindrical structure that is situated inside the vertebral canal. The lamina surrounds it on the back, the pedicles on the side and the posterior vertebral body on the front. There are thirty-three vertebrae in the spinal column: seven cervical, twelve thoracic, five lumber, five sacral and four coccygeal vertebrae. (Choi et al.,2019). Lumbar spinal degenerative disease, which includes disorders such lumbar spinal stenosis, disc degeneration, and spondylolisthesis, is a major cause of disability worldwide. Linked to several clinical symptoms, such as low back pain (LBP), weakness, and pain in the lower extremities. Lumbar degenerative spine disease (DSD), which can have different degrees of severity, can lower one's quality of life (Ravindra et al., 2018).

A lumber spondylolisthesis occurs when one vertebra slides or migrates anteriorly in relation to the next lower vertebrae. It usually happens between the L5 and S1 vertebrae, and then there is frequently a slide between the L4 and L5 (Rhajib et al., 2022).

This happens in the lumber column because of trauma, degenerative processes, and a flaw in the construction of the bones. Spondylolisthesis patients experience pain, and as the spinal slippage progresses significantly, they may experience bladder and bowel problems. In 80% of patients with symptoms, hamstring tightness is evident. Sciatica is a frequent walking or standing ailment that radiates from the buttock into the posterior thighs. Based on its aetiology Wilts divided spondylolisthesis into six types: dysplastic, isthmic, degenerative, traumatic, iatrogenic and pathogenic. Meyerding further divided them into grades based on the amount of slippage: Grade 1:0-25%, Grade 2: 26-50%, Grade 3:51-75%, Grade 4:76-100%, Grade 5: exceeding 100% (FAYEZ et al., 2020)

The prevalence of LS is highly age-specific and gender-specific. It is uncommon in individuals under 50 years of age, but its incidence increases significantly after this age, with women experiencing a faster rate of development than men. For instance, in elderly Chinese populations, the prevalence is 25% in women and 19.1% in men, with a female-to-male ratio of 1.3:1. In contrast, elderly Caucasian Americans have a 60-70% higher prevalence than their Chinese counterparts, although the gender ratio

remains similar. (Wang et al., 2017). In terms of the level involved, spondylolisthesis occurs frequently at L4/5 (16.4%), followed by L3/4 (4.7%) and L5/ S1 (3.5%). 84.3% of the spondylolisthesis are Grade I (Meyerding's classification) while the remaining 15.7% are Grade II (FAYEZ et al., 2020).

Lumbar spondylolisthesis can be classified into several types based on its etiology and radiological features. The two most common types are degenerative and isthmic spondylolisthesis, each with distinct characteristics and implications for treatment.

The L4-L5 junction stands as the most common spot for Degenerative Spondylolisthesis (DS) due to natural digital changes in both disc and joint structures (Omidi-Kashani et al., 2014). The new diagnostic scheme introduces five different types that use segmental lordosis plus sagittal balance as their radiological evaluation criteria (Gille et al., 2014).

The L5-S1 area stands as the most frequent target site for the defect or fracture which leads to Isthmic Spondylolisthesis. The surgical risk from performing pedicle screw placement at proximal facet joints increases when treating this condition because it affects treatment results (Wang et al., 2022).

Challenging cases of spondylolisthesis involving multiple levels called as multiple level spondylolisthesis demand extensive surgical treatment and make treatment procedures more difficult (Liu et al., 2015).

The treatment challenges and etiologies differ among these degenerative and isthmic spondylolisthesis types and other conditions including traumatic, pathological and dysplastic spondylolisthesis. Successful treatment of the condition along with proper surgical planning requires identification of exact type and root causes.

Spondylolisthesis of the low back region appears frequently as a pain source that affects mostly elderly adults. The research in Brazzaville demonstrated that low back pain existed in 99.2% of spondylolisthesis cases where patients also frequently experienced radiculalgia and neurological claudication (N'soundhat et al., 2019). The combination of lumbar spondylolysis and isthmic spondylolisthesis generates back pain in athletes who participate in sports requiring repeated lumbar hyperextension.

The occurrence of lumbosacral transitional vertebrae affects the extent of damage in patients who have spondylolisthesis. Sacralization as a kind of transitional lumbar vertebrae shows strong relationships with enhanced vertebral slip levels and worsens motor function thus intensifying low back pain (Mahmoodkhani et al., 2024).

Supporting the development of low back pain among older adults is degenerative spondylolisthesis. Radiculopathy along with neurogenic claudication occurs with this condition which tends to develop at L4-L5 and L5-S1 levels. Surgical procedures become necessary for this condition since conservative methods generally fail to address the progressive nature of the condition (Eismont et al., 2014).

Over time the disc degeneration at the slip level normally induces spondylolisthesis progression that generates rising low back pain (Peng, 2016). Despite moving at a gradual pace spondylolisthesis development produces significant life-quality reduction for affected patients.

The prevalence of facet effusion in lumbar spondylolisthesis patients shows frequently on MRI scans but evidence demonstrates low back pain links weakly to this condition. A research team discovered no meaningful relationship between facet effusion and both low back pain symptoms and spondylolisthesis because other factors potentially contribute more significantly to pain development (Shinto et al., 2019).

The choice of treatment depends on the severity of the condition, the presence of symptoms, and the patient's overall health. Non-surgical treatments are typically the first line of management, but surgical interventions are considered when conservative measures fail.

As a first line non-surgical treatment, Physical therapy that may include stretching, strengthening, and aerobic activities is often recommended to strengthen the muscles around the spine, improve flexibility and reduce pain. Exercises (Eismont et al., 2014). Non-steroidal anti-inflammatory drugs (NSAIDs) and Epidural injections are commonly used to reduce pain and inflammation associated with spondylolisthesis, providing temporary relief (Chung & Jeon, 2009).

Surgical Treatments such as decompression and fusion, circumferential fusion (360-

degree fusion), interbody fusion techniques and Dynamic stabilization are familiar.

Decompression and Fusion is a common surgical approach for patients who do not respond to non-surgical treatments. It involves removing part of the bone or tissue that is pressing on the nerves and fusing the affected vertebrae to stabilize the spine (Briceño-González et al., 2016).

Interbody Fusion Techniques include Posterior Lumbar Interbody Fusion (PLIF), Anterior Lumbar Interbody Fusion (ALIF) and Transforaminal Lumbar Interbody Fusion (TLIF). Each technique has its advantages and is chosen based on the specific needs of the patient (Rayhan et al., 2022) (Sakthivel & Khader, 2023).

Dynamic Stabilization is a newer approach aims to stabilize the spine while preserving some degree of motion, potentially reducing the risk of adjacent segment degeneration (Taranu & Bettany-Saltikov, 2014).

The McKenzie Method of Mechanical Diagnosis and Therapy, or MDT, is a scientifically supported classification system. The effectiveness of the treatment is still up for debate, despite the diagnostic and treatment paradigm's great interexaminer reliability in diagnosing individuals with LBP.

The MDT was created to divide patients into three mechanical subgroups
derangement, dysfunction & postural syndrome "other" subgroup so that treatment could be tailored to each patient. Derangement, most frequent subgroup, is linked to a quick shift in symptoms as a result of exercising a "directional preference."
workout. The direction in which a patient's symptoms improve after repeated movement and/or prolonged position is known as their directional preference.

Centralization, a condition when symptoms gradually disappear along the lower extremities in a distal to proximal manner, may be one of those benefits. For patients with LBP, centralization is linked to a favorable prognosis. (Lam et al., 2018)

1.2 Rationale

Lumbar spondylolisthesis is a common spinal condition characterized by the anterior displacement of a vertebra, often leading to low back pain, functional disability, and reduced quality of life (Dewing et al., 2013). Conservative management remains the first-line treatment, emphasizing pain reduction, improved mobility, and functional restoration (Mannion et al., 2018). The McKenzie Treatment Protocol (MTP) is a well-established method of mechanical diagnosis and therapy that empowers patients through self-management strategies, focusing on repeated movements and posture correction (McKenzie & May, 2003). Despite its proven efficacy in general low back pain populations, evidence specific to lumbar spondylolisthesis remains limited.

The use of an educational booklet to deliver the McKenzie protocol can facilitate patient adherence, improve knowledge, and promote active participation in rehabilitation (Hall et al., 2020). Given the resource constraints in rehabilitation centers such as CRP Savar, a standardized, accessible intervention like the McKenzie booklet may enhance treatment outcomes efficiently. Therefore, this study aims to evaluate the effectiveness of the McKenzie Treatment Protocol booklet in improving pain and functional outcomes among patients with lumbar spondylolisthesis, contributing to evidence-based physiotherapy practice in resource-limited settings.

1.3 Hypothesis

Null Hypothesis:

Mckenzie treatment booklet for the patients suffering with lumber spondylolisthesis is more effective than only conventional physiotherapy.

$$Ho: \mu1-\mu2 = 0 \text{ or,}$$

$$\mu1=\mu2,$$

Where the experimental group and control group initial and final mean difference is same.

Alternative Hypothesis:

Mckenzie treatment booklet for the patients suffering with lumber spondylolisthesis is not more effective than only conventional physiotherapy.

$$Ha: \mu1- \mu2 \neq 0 \text{ or,}$$

$$\mu1 \neq \mu2,$$

Where the experimental group and control group initial and final mean difference is not same.

1.4 Aims of the Research

To find out the evidence-based effectiveness of McKenzie Exercise for the treatment of Lumbar Spondylolisthesis.

1.5 Objectives

1.5.1 General Objectives:

- To evaluate the effectiveness of a booklet on McKenzie Treatment Protocol for Lumber Spondylolisthesis (LS) patients.

1.5.2 Specific Objectives:

- To find out the demographic characteristics of participants with Lumbar Spondylolisthesis.
- To understand pain severity among the participants with Lumbar Spondylolisthesis.
- To find the level of disability among participants before physiotherapy intervention and compare after intervention.
- To explore the rate of functional limitations among the participants with Lumbar Spondylolisthesis.
- To find out the relationship between LS patients and the level of disability in their activity of daily livings.
- To recommend the accurate physiotherapy treatment protocol for patients with Lumbar Spondylolisthesis.

1.6 Operational Definition

Lumber Spondylolisthesis

Lumbar spondylolisthesis is a condition characterized by the anterior slippage of one vertebral body over another, often leading to mechanical instability and pain. Congenital abnormalities, degenerative alterations, trauma and stress fractures are some of the causes of this disorder. The L4-L5 and L5-S1 levels of the spine are where it is most frequently seen.

McKenzie Treatment Approach

McKenzie treatment approach refers to a structured and evidence-based method of physiotherapy formally known as Mechanical Diagnosis and Therapy (MDT), developed by Robin McKenzie. This approach emphasizes repeated movements especially lumbar extension exercises—and postural correction techniques aimed at centralizing pain, reducing mechanical stress on spinal structures, and restoring normal function.

Musculoskeletal Disorder

Musculoskeletal disorders are a set of illness that affects the nerves, tendons, muscles and supporting structures such as the intervertebral discs. Musculoskeletal disorders can range in severity from mild to severe.

Directional Preferences

Directional preference is described as repetitive motions in a direction that alleviates, centralizes or eliminates symptoms and/or elicits a favorable mechanical response. Extension, flexion, lateral or combinations of these forms are possible. Although this is subject to alter with therapy.

Basic Physiotherapy Treatment

Basic physiotherapy treatment comprises pelvic floor muscles strengthening; back muscles and leg muscle strengthening with postural and home advice.

ADL

Activities of Daily living (ADL) means activities of personal care and activity such as dressing, bathing, eating, grooming, cleaning, grooming etc

Physical Exercise

Exercise is physical activity that is planned, structured, and repetitive for the purpose of conditioning any part of the body which is used to improve health, maintain fitness and is important as a means of physical rehabilitation.

Poor Posture

Abnormal curvature of cervical, thoracic and lumbar spine, like lordosis or kyphosis or slouched.

Chapter-II LITERATURE REVIEW

Current standard treatment options for managing lumbar spondylolisthesis include both non-surgical and surgical interventions, each with distinct advantages and limitations. Non-surgical treatments often involve physical therapy and pain management, while surgical options range from decompression techniques to various fusion methods. The choice of treatment is influenced by the severity of the condition and patient-specific factors.

The Physical Therapy aims to improve strength and flexibility, often yielding moderate success in pain relief while pain management includes medications such as NSAIDs, which can alleviate symptoms but do not address underlying structural issues.

On the other hand, Decompression alone is effective for low-grade spondylolisthesis, with lower morbidity compared to fusion (Samuel et al., 2017). Also, Decompression with Fusion is commonly performed, particularly for high-grade cases but associated with longer recovery times and higher complication rates (Ferrero & Guigui, 2018). Besides, Minimally Invasive Techniques are Emerging as viable options, showing similar outcomes to traditional methods with reduced postoperative morbidity (Samuel et al., 2017).

Despite the effectiveness of these treatments, limitations include variable outcomes based on patient selection, potential complications, and the need for further research to establish optimal protocols (Jia et al., 2024) (Ferrero & Guigui, 2018). Conversely, some argue that conservative management may suffice in select cases, emphasizing the need for individualized treatment plans.

According to Albert and Mannicle, (2021) in their study monitored 181 severe sciatica patients, who were randomized into groups of either symptom guided exercise or sham exercise to find out active conservation treatment programs were effective for severe sciatica patients. Symptom-guided exercise consisted of back related exercises: directional end range exercises and postural instructions guided by individual patient's directional preference (McKenzie concept), stabilizing exercises and back extensors. Home exercises programs were handed out to all patients. Sham exercises consisted of optional exercises that were not back related but low dose exercises to simulate the increase in systemic blood circulation. In their study main outcome measures were

Danish version of RMDQ (23 questions) to assess activity limitation, Low back pain rating scale used to measure current leg pain, Global improvement and number of neurological signs were measured by 5-point Liker Scale, Generic function (QUALY) was measured by Euro QOL (EQ-5D), Used Patients' self-reported follow up questionnaire for sick leave and Patients' satisfaction, Patients' expectations of outcome were measured by patients' self-report.

In result both active treatment programs had improved but global improvement (most variables), activity limitations were significantly improved at end of treatment and after one year follow up. Root compression signs (Neurological sign) were statistically significant (P< .001) at one year after follow up. Fewer sick leaves taken symptoms guided active exercise group (23.9%) compared sham exercise group (43%). Both groups were satisfaction. Nerve root neurological signs were measured specifically, not mentioned after the treatment the session and also one year follow up, only overall measured. Age range was large and all participants were consecutively enlisted using standardized, pretested procedure and examined that it may selection bias. On the research protocol, permitted to take medicine (mild analgesics and NSAIDs), not analyzed how many patients were taken this medicine in steps of the study in both groups. Only Root compression, sick leave, vocational status and little discuss about activity limitation were supported in the discussion, others like current leg pain, Global improvement did not support clearly. The process of sample allocation, randomization and group in the study and age range and women which might be influenced results. Evidence provided the clear each variable way to testing and purpose of testing. Clearly mentioned the reason of the participants and dropouts in the result and every variable's finding also describes properly. This study proved scientifically that conservative active physiotherapy treatment process is beneficial for severe sciatica patient.

Physiotherapeutic treatment especially McKenzie approach is beneficial in such a type of patients. This treatment is cheap, uses low technology, and has no side effects, easy to perform and good patients' satisfaction that is very suitable for

vertebral dislocation, although both groups are designed by different physiotherapy therapy techniques especially McKenzie treatment approach.

The McKenzie Method, or Mechanical Diagnosis and Therapy (MDT), is a globally recognized system for assessing and managing musculoskeletal disorders, particularly spinal conditions. Developed by Robin McKenzie, this approach focuses on identifying mechanical pain syndromes and using patient-specific exercises to centralize and alleviate symptoms. It has three main core components:

1. **Mechanical Diagnosis:** The method categorizes patients into subgroups based on their response to repeated movements and sustained postures. This classification guides treatment.
2. **Directional Preference:** A key concept in the McKenzie Method is directional preference, where specific movements or postures reduce pain and improve function. For instance, extension exercises are often beneficial for patients with lumbar issues.
3. **Self-Management:** Empowering patients to take an active role in their recovery is central to the McKenzie Method. Educational materials, such as booklets, reinforce adherence to prescribed exercises and postural corrections.

The McKenzie Method has shown effectiveness in treating lumbar spondylolisthesis, particularly when compared to other conservative treatment approaches. This method emphasizes specific exercises and postural training, which can lead to significant improvements in pain and disability levels.

A systematic review indicated that McKenzie therapy resulted in an 8.6-point greater pain reduction and a 5.4-point greater reduction in disability compared to standard treatments in the short term (Clare et al., 2004).

Modifications to the McKenzie approach, such as focusing on extension exercises, have been beneficial for patients with grade I lumbar spondylolisthesis, leading to decreased pain and improved spinal stability (Mohammed, 2014).

Other conservative treatments for degenerative lumbar spondylolisthesis include manipulation, analgesics, and physical methods like bracing and flexion exercises (Sun et al., 2019) (Kalichman & Hunter, 2008).

While manipulation has been widely used, systematic reviews suggest that its

effectiveness may not surpass that of the McKenzie Method in improving lumbar function and pain scores (Sun et al., 2019).

contrast, some studies indicate that while the McKenzie Method is effective, it may not be universally superior to all conservative treatments, as individual responses can vary significantly based on specific patient conditions and preferences.

In a study of Mckenzie effectiveness according to the classical MDT McKenzie protocol, grade (I) spondylolisthesis is mostly corrected with flexion exercises of the spine. This study was designed to investigate the efficacy of a modification done to this treatment, applying extension exercises of the spine -instead of flexion protocol- to a 65 years old female case who had also posterior lumbar disc protrusion at level L4/5. The extension treatment was recommended to relieve the stress fallen on the spinal cord, in spite of the fact that extension exercises of the spine would be stressful and painful for that case and not right in terms of MDT of McKenzie. However, doing such a modification would be much more important and beneficial for that case than following the classical flexion protocols of the spine. (Koes, et al., 2001)

The current review1 has several limitations. Limited data make it difficult to determine whether the reduction in pain associated with McKenzie therapy is clinically meaningful, compared with other therapies (difference of 10 points on a 100-point scale). Studies that scored well on the PEDro scale (7-10) do not exist in great numbers. The most common flaw in those studies scoring less than 7 is lack of randomization and blinding. However, blinding patients and therapists may be impossible to achieve with McKenzie therapy because both the patient and the therapist know whether McKenzie therapy is being performed. Patient populations should also be better defined, as the review failed to identify the subjects' age, sex, activity level, and specific injury. These generalizations make it difficult to determine if McKenzie therapy is applicable to athletes and the demands of their sport.

Clare et al1 indicated that the methodologic quality of randomized controlled trials of McKenzie therapy needs improvement. Although it may be impossible to achieve a perfect score of 10 on the PEDro scale, scores higher than 6 should be attained. Studies rating lower than 7 on the PEDro scale are at risk for biased results.

Future researchers should also delve into the effectiveness of McKenzie therapy when radicular symptoms are present. It is unclear whether patients with neurologic

compromise require different treatment than those patients with nonspecific back pain. It may also be of equal importance to survey certified McKenzie therapists to determine which conditions are most commonly treated with McKenzie therapy, based on the concept that therapists receive referrals as a result of high success rates. Clinical evidence suggests that McKenzie therapy is an effective method for managing back pain in the short term (3 months) compared with other therapies, but only through sound randomized controlled trials will we be able to determine the exact efficacy of McKenzie therapy. A clinician might take this information into consideration before making the significant time and financial commitment necessary to become a certified McKenzie therapist.

McKenzie has extended and the use of spinal mobility exercises based on a consideration of movement direction in the clinical assessment and treatment of LBP (McKenzie and May, 2003; Werneke, et al., 2010). McKenzie's protocol for the initial back assessment involves several repeated spinal movements; 10 or more, performed in various positions and directions such as flexion in lying (FIL) and extension in lying (EIL). Moreover, the prescription for home exercises may include 10 or more repetitions of these directional exercises, performed every 2 hours, thus accumulating 80 to 100 repetitions per day (Petersen, et al., 2011; May and Aina, 2012). McKenzie lumbar spine mobility exercises have been considered safe and of light intensity (Bybee, et al., 2007). Based on McKenzie's protocol, FIL and EIL are performed as progressive dynamic exercises. FIL involves large muscle groups including the abdominals and those of the pelvic floor and upper and lower extremities. During FIL, abdominal stabilization is required to lift the lower extremities to bring the knees to the chest. This results in an increase of intra-thoracic and intra-abdominal pressure, in turn reducing venous return and cardiac output. Compared with FIL, EIL involves fewer upper extremity muscles contracting concentrically to extend and eccentrically lower the trunk. The increase in HR and SBP per unit of workload however is greater during upper-extremity than lower- extremity exercise and is proportional to the torque produced (Barak, et al., 2010; Åstrand, 2003).

Directional preference (based on the McKenzie approach) exercises utilizing repeated end range movements in a specific direction are also recommended in the APTA guidelines (Childs, et al., 2008). Efficacy for MDT and motor control exercises for treatment of chronic LBP has been demonstrated in systematic reviews of the literature

(Machado, et al., 2006). Two specific types of exercises utilized by therapists for managing chronic LBP are Mechanical Diagnosis and Therapy (MDT) commonly known as the McKenzie method and motor control exercises (Haladay et al., 2013).

The principle that underpins MDT is to identify the non-specific mechanical syndromes that spinal pain can be classified into from a thorough examination of the patient (Clare, et al., 2004). Each of the three syndromes: derangement, dysfunction and posture syndrome have typical and distinctive mechanical presentations. Derangement syndrome is characterized by a varied clinical presentation and typical responses to loading strategies, which may consist of changes in pain location centrally or peripherally and in intensity. These findings guide the therapist to implement the most appropriate mechanical therapy according to the patient's classification (McKenzie and May, 2003)

The existing literature indicates that exercise-based interventions, particularly the McKenzie Protocol, are effective in managing pain and improving function in individuals with lumbar spine disorders. The McKenzie Method, which emphasizes mechanical diagnosis and therapy, has shown significant benefits in reducing pain intensity and disability associated with chronic low back pain (CLBP) (Gill et al., 2024).

Some studies consistently report that McKenzie exercises lead to a notable decrease in pain levels, with a standardized mean difference (SMD) of -0.83 compared to other treatments (Singh et al., 2024).

While McKenzie exercises are effective, some studies also suggest that their impact on functional impairment may not be significantly better than other manual therapies (Singh et al., 2024; Khan et al., 2024). Also, the McKenzie Method has been found to be more effective than passive treatments and comparable to other active interventions, such as core stabilization exercises (D et al., 2024; K et al., 2024).

Despite the positive outcomes associated with the McKenzie Protocol, alternative methods like neural mobilization have shown superior results in specific cases, such as lumbar radiculopathy, indicating that individual responses to treatment can vary significantly (D et al., 2024; K et al., 2024).

Although research specifically targeting lumbar spondylolisthesis is limited, existing evidence suggests that McKenzie-based exercises can alleviate symptoms and

improve function in this population. A study by Petersen et al. (2011) found that directional preference exercises effectively reduced pain and enhanced mobility in patients with mechanical back pain, including those with spondylolisthesis.

The McKenzie method is a commonly used classification- based approach for the management of LBP. Classification in the McKenzie method follows a comprehensive clinical examination including examination of posture and range of movement (Clare, et al., 2004). Findings from this Page 15 of 112 examination determine the classification of LBP into one of three syndromes: derangement syndrome, dysfunction syndrome, or postural syndrome (Clare, et al., 2004; Machado, et al., 2005; Hayden, et al., 2005 & Assendelft, et al., 2003). The core component of treatment in the McKenzie method is exercise, which consists of sustained postures or repeated movements. This method also includes other components such as education and postural training. Studies have generally shown the McKenzie approach for back pain to be most useful in acute, sub-acute or even chronicdisc-related pain with associated pain to the limbs. The mechanical assessment determines the direction of pain (central vs. peripheral). When the centralization is obtained, a favorable response to treatment is expected. Previous studies have found that the lack of centralization may be a reliable predictor of the outcome of conservative treatment and the need for surgical intervention (Clare, et al., 2004, Machado, et al., 2005, Machado, et al., 2010). Evidence shows that the effectiveness of some interventions is supported (e.g. exercise) (Hayden, et al., 2005) while other interventions are not effective for chronic LBP (e.g. EPAs). Studies on the efficacy of electro physical agents in chronic LBP are lacking and there is little evidence of their effectiveness in physiotherapy practice (Airaksinen, et al., 2006). A randomized controlled trial was conducted to compare McKenzie therapy to the electro physical agent's therapy; consisted of heat, ultrasound (US), and interferential current (IFT) to determine which was more effective at reducing pain and disability.

Patients with chronic low back pain may be benefited of the therapeutic climbing exercise. Significant improvements in physical functioning and general health perception which may be associated to a stronger progression from pain to physical capabilities of patients in therapeutic climbing exercise. In this study sample size was the small which was difficult inference the result in the population. Participants were not allowed to participate in the sports and dropped out was high in climbing group which also might be influences the result. In interpretation of above two studies has

used physiotherapy treatment nearly same including worm up, strengthening, stretching, mobilization, coordination, and stabilization for the abdominal, back, pelvic, and lower limb muscles used both studies. Actually, manual various treatment options were not specified. The methodological used Modified Roland disability questionnaire and SF-36 questionnaire, but different version used in both studies. The result of two studies was shown the significant improvement in experimental group compared with control group, but control group also improvement, but not statistically significance.

Senna and Machaly, (2011) shown in their study which was "Does Maintained Spinal Manipulation Therapy for Chronic Nonspecific Low Back Pain Result in Better LongTerm Outcome?" to fulfill the aims to assess the effectiveness of spinal manipulation therapy (SMT) for the management of chronic nonspecific low back pain (LBP) and to determine the effectiveness of maintenance SMT in long-term reduction of pain and disability levels associated with chronic low back conditions after an initial phase of treatments. The study design was single placebo randomized controlled trail with single blind to establishment their purpose. They are randomly allocated sixty patients, with chronic, nonspecific LBP lasting at least 6 months, were to receive either (1) 12 treatments of sham SMT over a 1-month period, (2) 12 treatments, consisting of SMT over a 1-month period, but no treatments for the subsequent 9 months, or (3) 12 Page 20 of 112 treatments over a 1-month period, along with "maintenance spinal manipulation" every 2 weeks for the following 9 months. The measured the outcome were pain and disability scores, generic health status, and back-specific patient satisfaction at baseline and at 1- , 4-, 7-, and 10-month intervals. The results were shown that patients in second and third groups experienced significantly lower pain and disability scores than first group at the end of 1-month period ($P = 0.0027$ and 0.0029, respectively). Only the third group that was given spinal manipulations (SM) during the follow-up period was shown more improvement in pain and disability scores at the 10-month evaluation.

The strong evidence to emerge from this review was obtained by gathering the results of several clinically and statistically studies that compared McKenzie physiotherapy approach with others Physiotherapy options in people with lumbar spondylolisthesis associated with radiculopathy. Analyzed studies indicated that others physiotherapy interventions are less effective than McKenzie physiotherapy interventions for producing improvements in lumber disc prolapsed pain intensity, leg pain intensity,

function, and global improvement. Educational materials, such as booklets, play a crucial role in promoting patient adherence to the McKenzie Protocol. These resources provide clear instructions on exercises, posture correction, and self-management strategies, ensuring continuity of care outside clinical settings. Studies have shown that patients who use such materials demonstrate better adherence and outcomes.

Despite the promising results, several gaps exist in the literature. For instance, few studies have specifically evaluated the McKenzie Treatment Protocol's effectiveness in lumbar spondylolisthesis. Additionally, the role of educational tools like booklets in enhancing patient outcomes remains underexplored. This highlights the need for randomized clinical trials to establish evidence-based guidelines.

In conclusion, lumbar spondylolisthesis presents a significant clinical challenge, impacting the daily lives of many individuals. The McKenzie Treatment Protocol, with its emphasis on mechanical diagnosis, directional preference, and self- management, offers a promising conservative approach for managing this condition. While the method has demonstrated efficacy in various spinal disorders, there remains a lack of targeted research evaluating its role specifically in lumbar spondylolisthesis. The use of educational booklets to promote adherence and empower patients is particularly noteworthy, as it aligns with the McKenzie Method's core principle of patient self-management. However, further randomized clinical trials are essential to validate the effectiveness of these booklets and establish robust evidence-based guidelines for clinical practice. Addressing these research gaps will enhance the understanding of the McKenzie Protocol's full potential in improving outcomes for patients with lumbar spondylolisthesis.

Chapter- III METHODOLOGY

3.1. Study design

The aim of this study is to find out the effectiveness of McKenzie physiotherapy treatment booklet for lumber spondylolisthesis at CRP, Savar. Experimental design of quantitative research type of Randomized Clinical Trail (RCT) has been chosen as the study design as RCT are considered the gold standard for evaluating the effectiveness of healthcare interventions (Schulz, Altman and Moher, 2010). So, the experimental study of RCT is the best way to find out the effectiveness of the McKenzie treatment for Spondylolisthesis patients. The researcher has conducted the study with experimental group and control group with an aim to compare in between experimental group and control group.

3.2. Study Area

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

3.3. Study Population

The study population was the patients with Lumbar Spondylolisthesis associated with lower limb and postural disability attended in the Outpatient Musculoskeletal Unit of the Physiotherapy Department at CRP, Savar, Dhaka.

3.4. Selection Criteria

❖ Inclusion Criteria

- People aged between 18 to 70 years of age.
- Patients with neurological deficits such as cauda equina syndrome or severe radiculopathy requiring surgical intervention (Dewing et al., 2013).
- Patients with previous lumbar spine surgery or traumatic spine injury (Sengupta et al., 2015).
- Patients with severe osteoporosis, malignancy, or infection affecting the spine (Mannion et al., 2018).
- Patients currently undergoing other forms of intensive physiotherapy or pharmacological interventions that might confound the results (Hall et al., 2020).

❖ Exclusion Criteria

- Patients with higher grade of Spondylolisthesis (Grade III and IV) and lateral shift will be excluded.
- Patient's having neurological impairments (red flags e.g. Cauda equine syndrome, severe motor weakness or bowel bladder dysfunction), fracture of lumbar spine, spinal tumor or malignancy or TB in their spine will also be excluded.
- Patients with a history of spinal surgery or failed back surgery syndrome.
- Patients who are suffering from significant spinal conditions such as severe spinal scoliosis or spinal stenosis.
- Participants who were unwilling to participate.

(Sullivan et al., 2018)

3.5 Study Period

The duration of the study period was 1st June 2024 to 31st May -2025.

3.6. Sample Size

This study was performed using G*Power statistical software (version 3.1.9.7; Heinrich-Heine-Universität Düsseldorf, Germany). The statistical parameters were set as $\alpha = 0.05$, power $(1-\beta) = 0.80$ (80%), and the effect size (Cohen's d) = 1.01, which was derived from the difference in mean VAS scores between the groups ($Mean_1 = 0.75$, $Mean_2 = 2.0$; $SD_1 = 0.93$, $SD_2 = 1.48$). This calculation was based on pilot data measuring pain intensity via the Visual Analogue Scale (VAS). The results revealed that the required sample size for this study was 34 subjects (17 per group) to detect a statistically significant difference between groups with the specified parameters.

The data had been collected from June -2024 to May-2025. During this time period, the participants who matched the inclusion and exclusion criteria and gave their consent for participation was considered for the study. So, the expected number of participants must be or above 30 (Fifty) because some study shows the accuracy of the study on this number of participations.

3.7. Sampling Technique

The study chose a sample of clinic-based individuals who meet the inclusion criteria within the study time frame. Using simple random sample techniques, that is a subset of a population in which each member has an equal probability of being chosen, and every possible sample of a given size has the same chance of selection (Kumar, 2019, p. 152). The entire number of patients was divided into two groups: Group A and Group B, in a 1:1 ratio. Thus, after randomization, half of the patients were assigned to group A, while the other half was assigned to group B.

3.8. Intervention:

For control Group: **Conventional Physiotherapy**

According to the consultants of the Musculoskeletal Unit of Physiotherapy Department of CRP, the control group Spondylolisthesis patients received conventional treatment only.

- Repeated flexion in lying, repeated flexion in sitting, repeated flexion with therapist overpressure in lying and sitting according to Mckenzie protocol.
- Back muscle, Quadratus lumborum and Gluteal muscle stretching exercise.
- Manual traction of the lumber spine
- Soft tissue mobilization technique
- Lower limb muscle strengthening exercise
- Electrotherapy
- Gym activities (cycling)
- Modalities

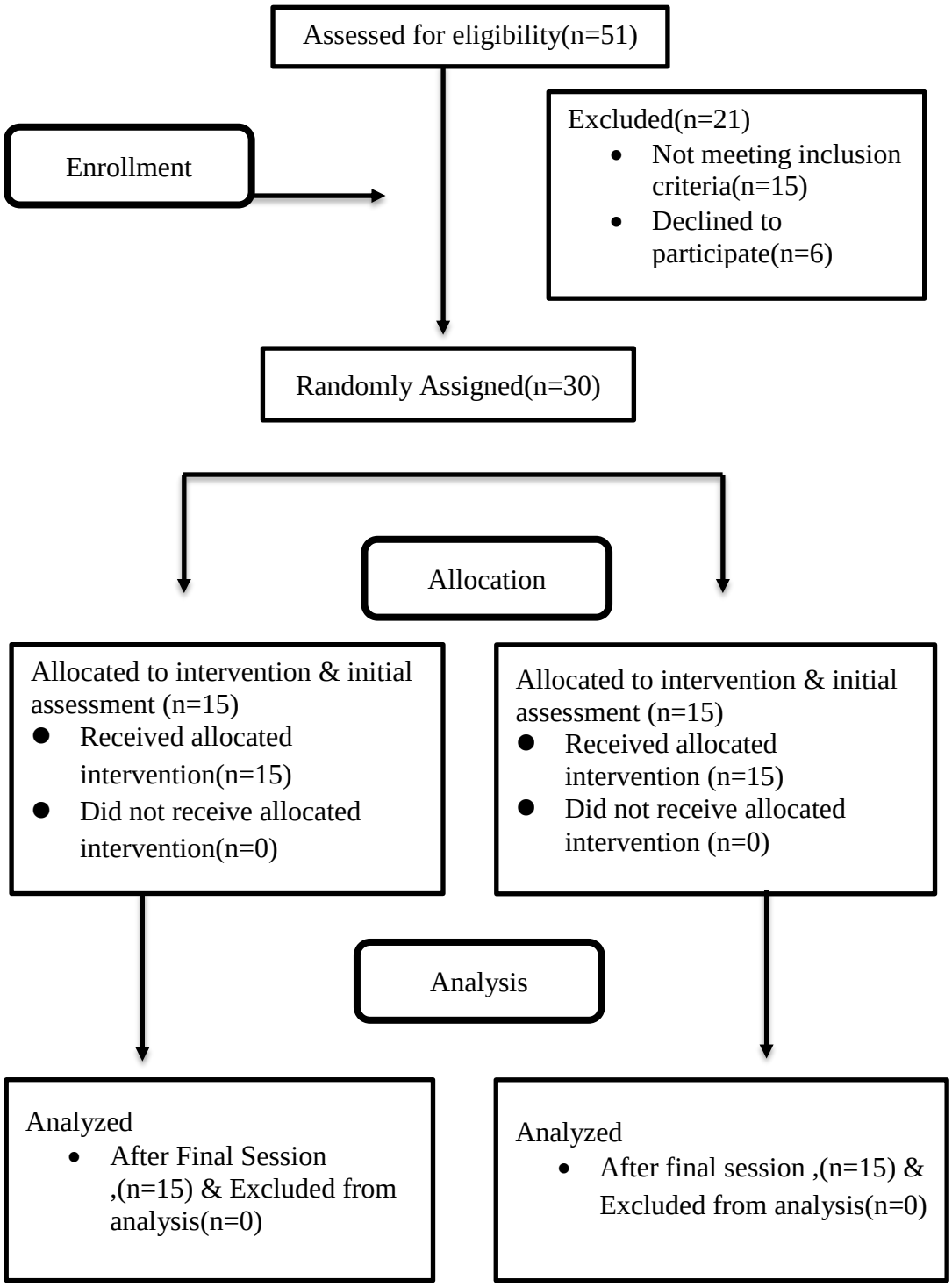
For Experimental Group: Booklet Exercises along with conventional Physiotherapy.

There are 6 exercises included in the booklet that are suitable for the patient as a home exercise-

- Flexion in lying-FIL (Single leg),
- Flexion in lying-FIL (Double leg),
- Flexion in sitting-FIS,
- Flexion in standing-FIS,
- Flexion in step standing-FISS,
- Sustained Flexion in lying-SFIL

The booklet was designed according to patient's classification of MDT and translated to BANGLA as for the easy convenience of the patients.

3.9. CONSORT flow diagram



3.10. Data Processing

3.10.1 Data collection procedure

The study was carried out through direct, face-to-face interviews with the participants. Following the interviews, each patient was assessed by a physiotherapist with graduate-level qualifications. Data collection was structured around three stages: a pre-test, an intervention period, and a post-test. A standardized, written questionnaire was used to gather data. The pre-test was administered prior to the initiation of treatment, during which pain intensity was measured using the Visual Analog Scale (VAS) and the Oswestry Disability Index (ODI) questionnaire. The same protocol was followed for the post-test, which was conducted after the completion of nine treatment sessions. Participants were asked to mark their pain level on the NPRS line before the first session and again after the final session.

All assessments were conducted under the supervision of a qualified physiotherapist, with the presence of an independent witness appointed by the Head of the clinical department to minimize potential bias. At the conclusion of the study, appropriate statistical tests were applied to analyze the collected data.

3.10.2. Data Collection Tools

- Record or data collection form
- Informed consent form
- Structured questionnaire
- Pen, paper

3.10.3. Outcome Measurement Tools

Questionnaire

The questionnaire was developed under the advice and permission of the supervisor following certain guidelines. There were twenty close ended questions with numeric pain rating scale with some objective questions which were measured by examiner and each 23 question was formulated to identify the pain with functional ability and Oswestry Disability Index Questionnaire for measures disability score.

Visual Analogue Scale (VAS)

The researcher in this study utilized a visual analogue scale to determine how severe the pain was. The Visual Analog Scale (VAS) provides a quick and reliable method for gauging an individual's level of pain over a gradient display. Pain is measured along a continuous scale known as a visual analog scale (VAS). With 0 signifying no pain and 10 representing the worst anguish imaginable, the endpoints of the line reflect the extremes of the pain scale. Pain is commonly measured using the visual analog scale (VAS) and a change in the VAS score indicates a relative change in the intensity of the pain experience (Kumar, 2010)

Oswestry disability Index

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

3.10.4. Data Analysis:

Data analysis was performed using descriptive statistics to summarize the demographic information, while inferential statistics were applied to examine differences between groups. The Statistical Package for the Social Sciences (SPSS) version 25 was utilized for all statistical calculation (IBM Corp,2017).

3.10.5 Statistical Analysis:

According to recent methodological standards, the selection of statistical tests depends on the data type and study design. For between-group comparisons involving continuous variables with normal distribution, the Independent Samples t-test is appropriate, whereas non-normally distributed or ordinal data are better analyzed using non-parametric alternatives like the Mann-Whitney U test (Kim, 2015). In this study, between-group analysis of Visual Analog Scale was performed using an independent t-test, while Oswestry Disability Index scores being ordinal or non-normally distributed were analyzed using the Mann-Whitney U test.

For within-group analysis, the Wilcoxon signed-rank test was applied to assess pre- and post-treatment changes in Oswestry Disability Index. Additionally, the paired related t-test was used for evaluating within-group differences in Visual Analog Scale where the data met parametric assumptions (Laerd Statistics, 2018).

3.10.6. Level of significance

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

3.11. Ethical issues:

The proposal of the dissertation including methodology was approved by Institutional Review Board and obtained permission from the concerned authority of ethical committee of Bangladesh Health Professions Institute (BHPI). The whole process of this research project was done by following the Bangladesh Medical Research Council (BMRC) guidelines and World Health Organization (WHO) Research guidelines. Again, before the beginning of the data collection, the researcher obtained the permission ensuring the safety of the participants from the concerned authorities of the clinical setting and was allotted with a witness from the authority for the verification of the collected data. The researcher strictly maintained the confidentiality regarding participant's condition and treatments.

3.12. Informed Consent:

The researcher obtained informed consent to participate from every subject. A signed informed consent form was received from each participant. The participants were informed that they are completely free to decline answering any question during the study and are free to withdraw their consent and terminate participation at any time. Withdrawal of participation from the study should not affect their treatment in the physiotherapy department and they should still get the same facilities. Every subject had the opportunity to discuss their problem with the senior authority or administration of CRP and have any questioned answer to their satisfaction.

Chapter-VI RESULT

Table- 1: Baseline characteristics of the participants

Variable(s)	Experimental group (n=15)	Control group(n=15)	P value
Age, mean (SD), years	48.13 ± 13.244	52.67 ± 13.87	0.368
Gender	Male10; 66.7% Female:5; 33.3%	Male 9; 60% Female:6; 40%	0.716
Weight (kg), mean (SD)	67.07 ± 10.39	65.07 ± 9.339	0.584
Height (cm), mean (SD)	156 ± 9.69	155.13±7.07	0.639
BMI (kg/m2), SD	27.77 ± 6.9	27.07± 4.09	0.746

Table 1 compares the baseline characteristics of participants between trial and control group. In addition, two groups did not show significant differences at baseline regarding demographic characteristics and disease-related parameters. In experimental group, the mean age (± SD) of the participants was 48.13 (± 13.244) years and in control group 52.67(± 13.87) years. In experimental group, the mean ratio of male was 66.7 and female ratio was 33.3 and in control group the man ratio was 60 and female was 40. In addition, mean weight (± SD) in experimental group was 67.07 (± 13.26) kg and 65.07 (±9.94) kg. Mean height (± SD) was 156 (± 9.69) cm in experimental group and in contrast 155.13 (± 7.07) in control group participants. Mean (± SD) BMI in trial group was 27.77 (± 6.9) and in contrast mean (± SD) in control was 27.o7(± 2.23. 21.)

4.1. Sociodemographic information

Table – 2

Variable(s)	Experimental group (n=15)			Control group (n=15)		
Educational status	Illiterate	4	26.7%	Illiterate	2	13.3%
	Primary	4	26.7%	Primary	6	40.0%
	Secondary	4	26.7%	Secondary	3	20.0%
	Higher-secondary	2	13.3%	Higher-secondary	2	13.3%
	Graduate	1	6.7%	Graduate	2	13.3%
Occupation	Student	1	6.7%	Farmer	3	20.0%
	Farmer	7	46.7%	Business	3	20.0%
	Business	3	20%	Labour	4	26.7%
	Labour	1	6.7%	Teacher	2	13.3%
	Housewife	1	6.7%	Student	3	20.0%
	Teacher	2	13.3%			
Marital Status	Married	13	86.7%	Married	12	80.0%
	Unmarried	1	6.7%	Divorced	2	13.3%
	Divorced	1	6.7%	Widowed	1	6.7%
Residential area	Village	8	53.3%	Village	5	33.3%
	Town	7	46.7%	Town	10	66.7%
Smoking	Yes	1	6.7%	Yes	4	26.7%
	No	14	93.3%	No	11	73.3%

The sociodemographic characteristics of the experimental and control groups, each comprising 15 participants, reveal notable differences across various parameters.

Educational Status: In the experimental group, 26.7% were illiterate, 26.7% had primary education, another 26.7% had secondary education, 13.3% had higher secondary education, and 6.7% were graduates. Conversely, the control group had 13.3% illiterate participants, 40.0% with primary education, 20.0% with secondary education, 13.3% with higher secondary education, and 13.3% graduates.

Occupation: The experimental group predominantly comprised farmers (46.7%), followed by businesspersons (20.0%), teachers (13.3%), and one participant each (6.7%) in student, labour, and housewife categories. In contrast, the control group had a more diverse occupational distribution: students (20.0%), farmers (20.0%), businesspersons (20.0%), labourers (26.7%), and teachers (13.3%).

Marital Status: A majority in both groups were married, with 86.7% in the experimental group and 80.0% in the control group. The experimental group also included one unmarried (6.7%) and one divorced (6.7%) participant, while the control group had two divorced (13.3%) and one widowed (6.7%) participant.

Residential Area: In terms of residence, 53.3% of the experimental group lived in villages and 46.7% in towns. The control group had 33.3% village residents and a higher proportion of town residents at 66.7%.

Smoking Status: Smoking prevalence was lower in the experimental group, with only 6.7% smokers compared to 26.7% in the control group. Non-smokers constituted 93.3% of the experimental group and 73.3% of the control group.

4.1.1 Gender Distribution of the Participants

In among participants, the number of males was 19 & the number of females was 11.

In experimental group, among the 15 participants, there were male 10 (66.7%) & female 5 (33.3%). In control group, among the participants, male 9 (60%) & female 6 (40%).

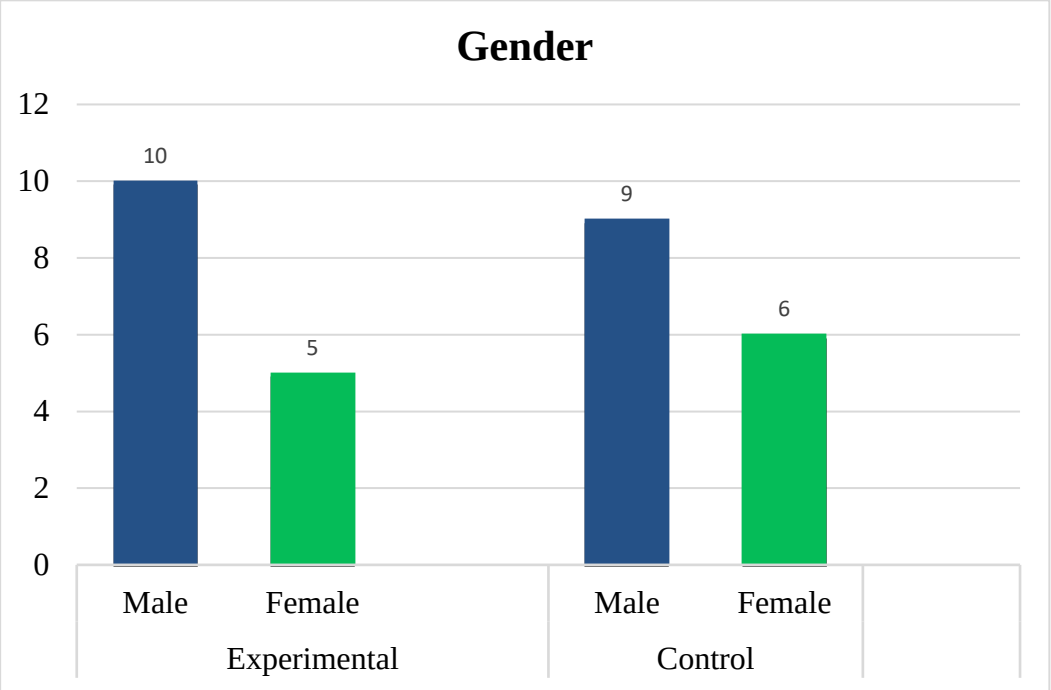
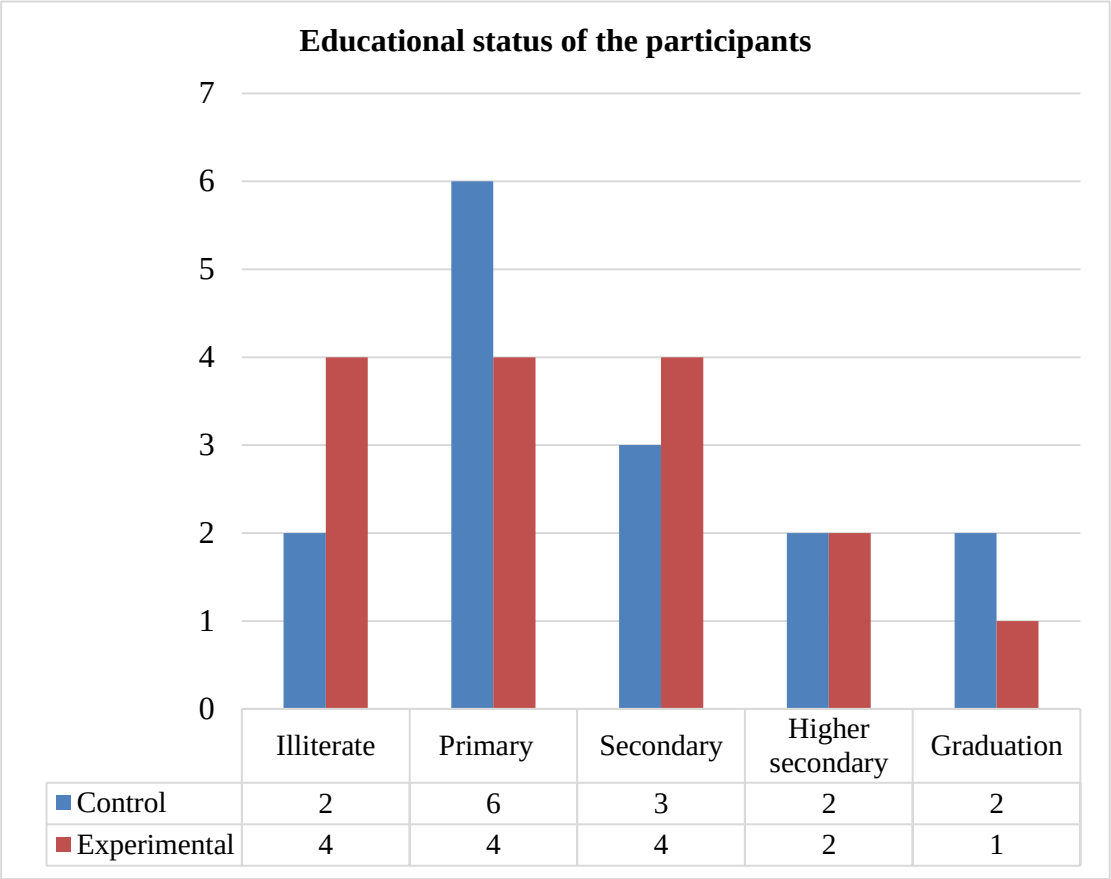


Figure-1: Gender distribution of the participants

4.1.2 Educational status of the participants

Among 30 participants, 4 (26.7%) participants illiterate in experimental group & 2 (13.3%) participants illiterate in control group. Also 4 (26.7%) participants passed in primary education in experimental group, 6 (40%) passed in primary education in control group. There were 4 (26.7%) who passed secondary in experimental group & 3 (20.0%) participants passed secondary in control group. 2 (13.3%) passed in higher secondary in both groups. 1 (6.7%) completed graduation in experimental group & 2 (13.3%) completed graduation in control group.



	Illiterate	Primary	Secondary	Higher secondary	Graduation
Control	2	6	3	2	2
Experimental	4	4	4	2	1

Figure-2: Educational status of the participants

4.1.3 Occupation among the participants

Among 30 participants, 1 participant (6.7%) student, 7 participants (46.7%) farmer, 3 businessman (20%), labor was 1 (6.7%), housewife was 1 (6.7%) & teacher was 2 (13.3%) in the experimental group. And in the control group 3 participants are farmer (20.0%), 3 participants are businessmen (20.0%),4 participants are labor (26.7%),2 participants are teacher (13.3%) & students are 3 (20.0%) among the participants.

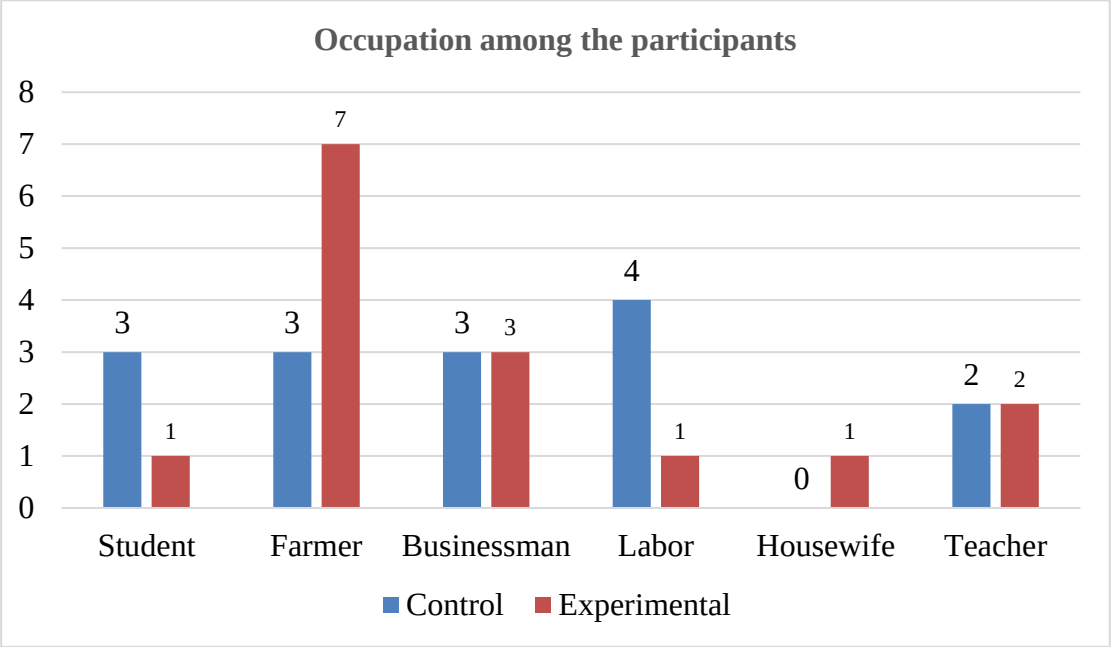


Figure-3: Occupation among the participates

4.1.4 Marital Status of the participants

In the experimental group, 13 participants are married (86.7%), 1 participant are unmarried (6.7%) & divorced were 1 (6.7%). And in the control group, 12 participants are married (80%), 2 participants were (13.3%) are divorced were 1 (6.7%) are widowed.

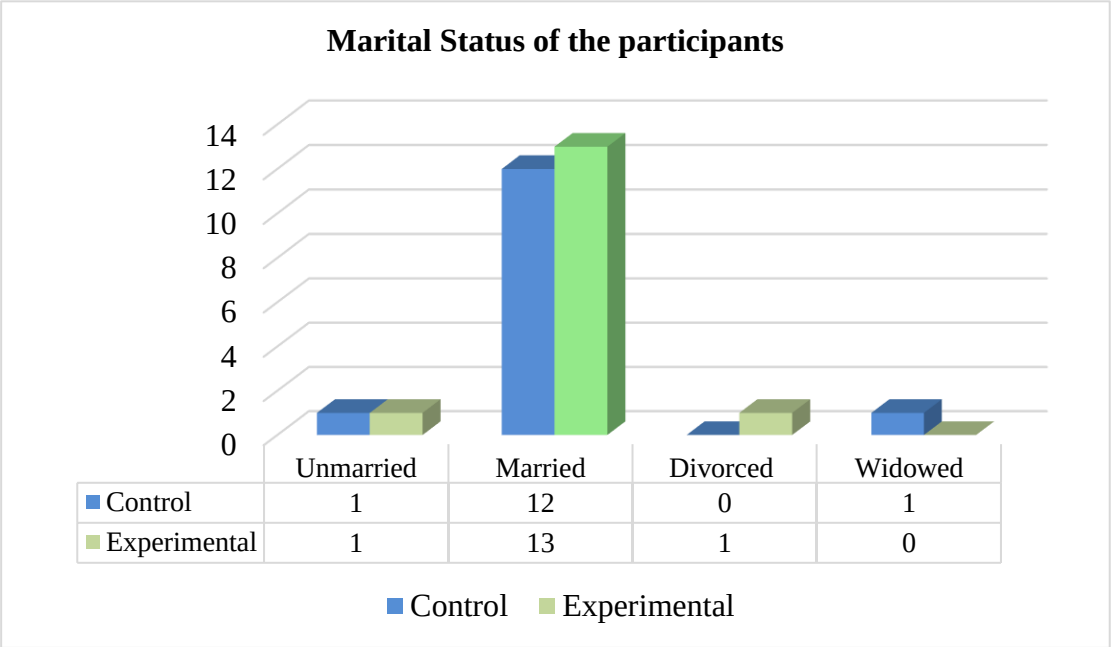


Figure-4: Marital status of the participants

4.1.5 Residential Area of the Participants

Among the participants, 18.6% people lived in a village and 17.56% people lived in a town. In the experimental group, 5.17% participants lived in a village, 10.33 % participants are lived in town. In the control group, 8. 27% participants lived in village 7.23% participants lived in a town.

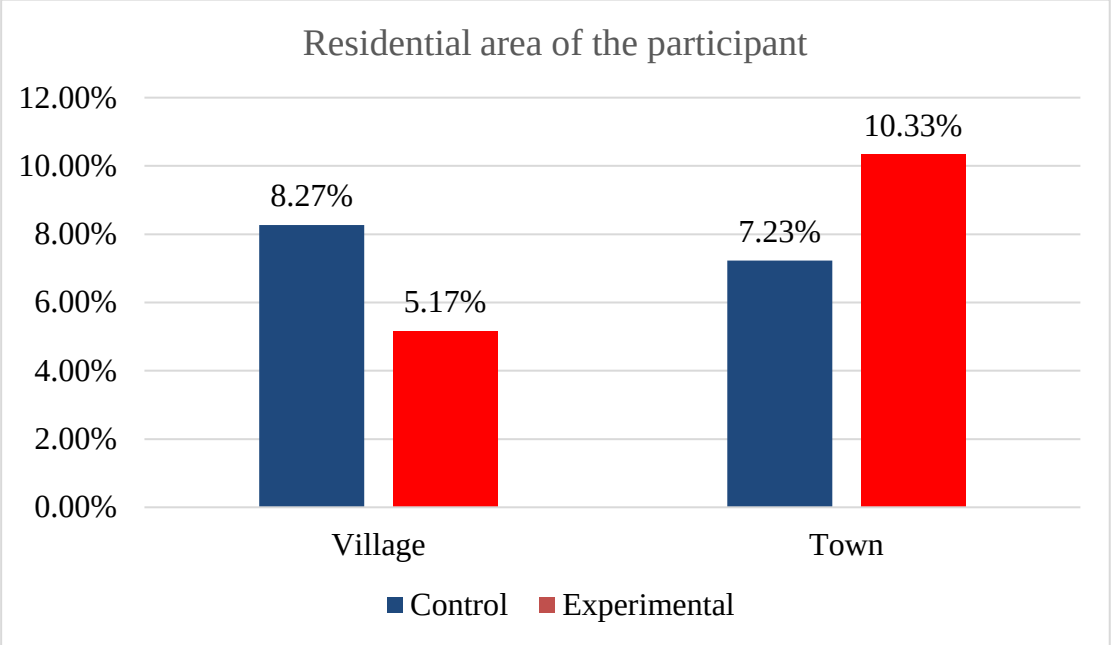


Figure-5: Residential area of the participant

4.1.6 Smoking among the participants

In the experimental group, 1 (6.7%) participant addicted in smoking,14 peoples (93.3%) are not addicted to smoke. And 4 peoples (36.7%) are addicted in smoking & 11 (73.3%) participants are not addicted to smoke in the control group.

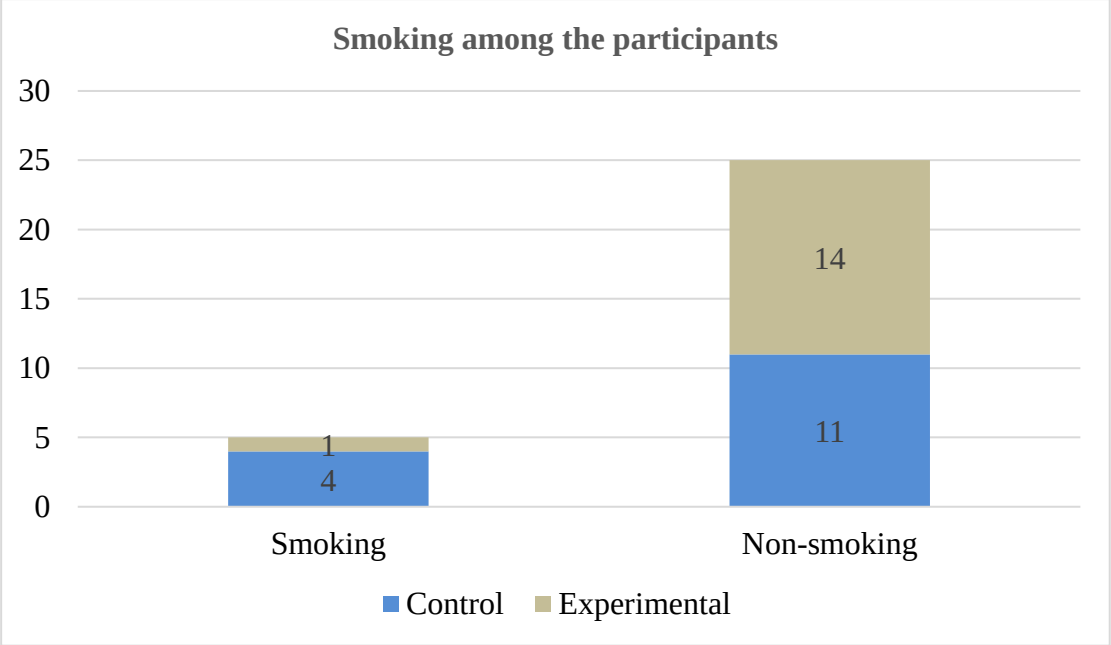


Figure-6: Smoking ratio among the participants

4.2. Visual analog scale (VAS) within group analysis

Table 3: Paired sample t-test within group analysis of VAS scale

Group	Mean ± SD (Pre)	Mean ± SD (Post)	t-value	p-value
Experimental	7.607 ± 0.9595	4.493 ±1.2424	10.357	0.000
Control	6.940 ± 1.4176	5.467 ± 1.6088	5.489	0.000

The paired sample t-test was conducted to evaluate the within-group effectiveness of interventions on the Visual Analogue Scale (VAS) scores for pain in both the experimental and control groups. In the experimental group, the mean VAS score significantly decreased from 7.607 ± 0.9595 before the intervention to 4.493 ± 1.2424 after the intervention, with a t-value of 10.357 and a p-value of 0.000, indicating a highly significant reduction in pain following the use of the McKenzie Treatment Protocol booklet. Similarly, in the control group, the mean VAS score reduced from 6.940 ± 1.4176 to 5.467 ± 1.6088, with a t-value of 5.489 and a p-value of 0.000, also indicating a statistically significant reduction in pain. However, the magnitude of improvement was greater in the experimental group, suggesting that the McKenzie Treatment Protocol booklet was more effective in reducing pain in patients with lumbar spondylolisthesis compared to the standard care received by the control group.

4.3. Visual analog scale (VAS) between experimental and control group

Table -4: Independent t-test between group analysis of VAS scale

Group	Mean difference	df	t-value	p-value
Between group	-1.64	28	-4.069	0.000

The independent t-test results for the Visual Analogue Scale (VAS) between the experimental and control groups indicate a statistically significant difference in pain reduction following the intervention. The mean difference in VAS scores between groups was -1.64, with a t-value of -4.069 and a p-value of 0.000. This highly significant p-value ($p < 0.05$) suggests that the observed difference is not due to chance. The negative mean difference indicates that the experimental group, which received the McKenzie Treatment Protocol booklet, experienced a greater reduction in pain compared to the control group. These findings support the effectiveness of the McKenzie protocol in reducing pain among patients with lumbar spondylolisthesis.

4.4. Oswestry Disability Index (ODI) within group analysis

Table -5 Paired sample t-test within group analysis of ODI scale

Group	Mean ± SD (Pre)	Mean ± SD (Post)	t-value	p-value
Experimental	26.53 ± 7.945	9.87 ± 3.420	10.305	0.000
Control	23.47 ± 4.307	15.8 ± 2.424	9.345	0.000

The paired sample t-test analysis of the Oswestry Disability Index (ODI) scores within each group revealed statistically significant improvements following the intervention. In the experimental group, the mean ODI score decreased markedly from 26.53 ± 7.945 at baseline to 9.87 ± 3.420 post-intervention, with a t-value of 10.305 and a p-value of 0.000, indicating a highly significant reduction in disability levels after receiving the McKenzie Treatment Protocol booklet. Similarly, the control group also showed a statistically significant reduction in ODI scores, from 23.47 ± 4.307 pre-treatment to 15.8 ± 2.424 post-treatment, with a t-value of 9.345 and a p-value of 0.000. Although both groups experienced improvements, the greater reduction in mean ODI scores in the experimental group suggests that the McKenzie protocol was more effective in reducing disability associated with lumbar spondylolisthesis.

4.5. Oswestry Disability Index (ODI) between group analysis

Table 6 Independent t-test between group analysis of ODI scale

Group	Mean difference	df	t-value	p-value
Between group	-9.00	28	-4.963	0.000

The independent t-test analysis for the Oswestry Disability Index (ODI) scores between the experimental and control groups in this randomized clinical trial revealed a statistically significant difference. The mean difference in ODI scores was -9.00, with a t-value of -4.963 and a p-value of 0.000, which is well below the standard significance threshold of 0.05. This indicates that participants in the experimental group, who received the McKenzie Treatment Protocol booklet, experienced significantly greater improvement in disability levels related to lumbar spondylolisthesis compared to those in the control group. The negative mean difference suggests that the experimental group had lower (better) ODI scores post-intervention, supporting the effectiveness of the McKenzie protocol in reducing disability.

Chapter-V DISCUSSION

The current randomized clinical trial was conducted to evaluate the effectiveness of the McKenzie Treatment Protocol booklet on pain intensity and functional disability in patients suffering from lumbar spondylolisthesis. The findings indicate that patients in the experimental group, who followed the McKenzie protocol in addition to basic physiotherapy management, showed significantly greater improvements in both pain reduction and disability levels compared to the control group who received only the standard physiotherapy treatment. These outcomes are consistent with the established literature and further strengthen the evidence base supporting the McKenzie method, particularly for lumbar spine conditions.

Baseline Characteristics

The demographic and baseline clinical characteristics, such as age, gender, BMI, height, and weight, were statistically comparable between the two groups ($p > 0.05$). This ensures that observed post-treatment differences can be attributed to the intervention itself rather than to any pre-existing group disparities. Such demographic comparability strengthens the internal validity of the study. Similar methodology is observed in the work of Sharma et al. (2021), who also ensured group homogeneity when studying McKenzie therapy in chronic low back pain (CLBP) patients.

VAS Score Analysis

The within-group analysis revealed a highly significant reduction in pain levels in both groups ($p = 0.000$). However, the between-group comparison showed a significantly greater reduction in VAS scores in the experimental group (mean difference = -1.64, $p = 0.000$). These findings affirm the superior efficacy of the McKenzie protocol in managing pain associated with lumbar spondylolisthesis.

This result is consistent with the study by Vahdatpour et al. (2022), which evaluated the effect of McKenzie exercises on pain in patients with mechanical low back pain and reported that patients who followed the McKenzie protocol experienced faster and greater pain relief compared to those undergoing conventional therapy. Similarly, Halliday et al. (2021) noted that directional preference exercises, a cornerstone of the McKenzie method, reduced pain intensity more effectively than non-specific low back

pain interventions.

Another study by Alotaibi and Awad (2020) demonstrated that lumbar extension exercises based on the McKenzie principles significantly lowered VAS scores in participants with discogenic back pain, which shares several symptomatic characteristics with lumbar spondylolisthesis. Their study confirmed that McKenzie exercises promote centralization of symptoms and pain reduction, especially in extension responders, which many spondylolisthesis patients are.

ODI Score Analysis

The Oswestry Disability Index (ODI), a validated tool for measuring functional disability related to back pain, showed statistically significant improvements within both groups. However, the experimental group demonstrated a much larger decrease in ODI scores from pre-treatment (26.53 ± 7.945) to post-treatment (9.87 ± 3.420), with a mean reduction of 16.66 points. In contrast, the control group saw a more modest reduction from 23.47 ± 4.307 to 15.8 ± 2.424. The between-group comparison confirmed a statistically significant mean difference of -9.00 in favor of the experimental group ($p = 0.000$).

These findings align with those of Dehghan et al. (2023), who evaluated ODI outcomes following a 4-week McKenzie-based intervention in CLBP patients. They reported an average improvement of 14.5 points on the ODI, supporting the current study's outcome. The mechanism underlying these improvements may be attributed to mechanical loading strategies employed in McKenzie therapy that promote self-treatment and empower patients to control their symptoms independently, thus improving their functional capacity (Heneghan et al., 2021).

Further corroboration comes from the research conducted by Silva et al. (2021), which emphasized that structured McKenzie exercises significantly improved activities of daily living (ADLs) in patients with chronic mechanical low back pain, suggesting that its benefits extend beyond pain control to functional restoration.

Comparison with Previous Studies on Lumbar Spondylolisthesis

Although much of the existing literature on the McKenzie method focuses on non-specific low back pain, the principles are particularly applicable to lumbar spondylolisthesis. This is because McKenzie-based protocols involve postural

correction, targeted exercises, and progressive loading, all of which are essential for spinal stabilization and pain modulation.

According to Kim and Lee (2022), McKenzie extension-based exercises improved lumbar lordosis and pain perception in elderly patients with degenerative spondylolisthesis, leading to enhanced stability and functional capacity. Their study also pointed out improvements in lumbar flexion-extension range of motion and reduced fear-avoidance behavior, which often compounds disability in spondylolisthesis.

Moreover, an RCT by Roy et al. (2021) compared core stabilization training with McKenzie exercises in patients with low-grade spondylolisthesis. The authors found that while both groups improved significantly, the McKenzie group exhibited faster symptom centralization and earlier functional gains, echoing the pattern observed in the present study.

Mechanism of Action

The McKenzie method emphasizes patient education, posture correction, and repeated movements into a directional preference, often extension for spondylolisthesis. The rationale is that these movements help in mechanical repositioning of spinal structures, redistribution of intradiscal pressure, and desensitization of peripheral nociceptors. According to May and Donelson (2020), patients exhibiting a directional preference often benefit from fewer clinic visits and experience better long-term outcomes due to self-management skills fostered by the McKenzie approach.

Furthermore, the centralization phenomenon observed in McKenzie therapy, as documented by Werneke and Hart (2020), plays a crucial role in the effectiveness of the treatment. Centralization of symptoms leads to better prognostic outcomes and is a reliable predictor of positive treatment response, particularly in patients with radiculopathy or segmental instability like spondylolisthesis.

Patient Empowerment and Adherence

Another key advantage of the McKenzie Treatment Protocol is its emphasis on self-treatment, which fosters patient independence and adherence. This was evident in the current study, where participants in the experimental group were more engaged with the treatment process via the structured booklet, which guided their home-based

exercises.

This finding is consistent with the conclusions of Alrwaily and Schneider (2021), who noted that the success of mechanical diagnosis and therapy (MDT) approaches such as McKenzie heavily depends on patient compliance and education. Providing written or visual material, such as a booklet, has been shown to increase adherence, especially in low-resource settings where frequent clinical supervision may not be feasible.

Clinical and Public Health Implications

Given the significant burden of chronic low back pain and degenerative spinal conditions like spondylolisthesis in both developed and developing countries, incorporating cost-effective and evidence-based protocols like McKenzie can be highly beneficial. In regions with limited access to specialized care, self-directed rehabilitation programs such as McKenzie, when supported with booklets or visual aids, may provide a scalable solution to reduce disability and healthcare costs.

Moreover, community-level rehabilitation programs can incorporate McKenzie principles with minimal resource investment. The simplicity, repeatability, and adaptability of the protocol make it especially useful in rural and underserved areas, such as the setting of this study.

Chapter-VI CONCLUSION

This randomized clinical trial was designed to investigate the effectiveness of the McKenzie Treatment Protocol booklet as an adjunct to standard physiotherapy in managing pain and disability among patients with lumbar spondylolisthesis. The findings of the study provide compelling evidence that incorporating McKenzie-based exercises, delivered through a structured and easy-to-follow booklet, significantly improves clinical outcomes in this patient population.

The study demonstrated that both the experimental and control groups experienced statistically significant reductions in pain and disability as measured by the Visual Analogue Scale (VAS) and the Oswestry Disability Index (ODI), respectively. However, the magnitude of improvement was notably greater in the experimental group that received the McKenzie protocol booklet. The mean VAS and ODI scores decreased more substantially in this group, and between-group comparisons confirmed that these differences were statistically significant ($p < 0.05$). These results affirm that the McKenzie method, when properly taught and followed, is more effective than conventional therapy alone in managing symptoms of lumbar spondylolisthesis.

The McKenzie method emphasizes patient education, self-treatment, and directional preference exercises, particularly lumbar extension movements. These principles are especially relevant to lumbar spondylolisthesis, where mechanical dysfunction and segmental instability are primary contributors to pain and disability. By encouraging patients to take an active role in their recovery through a standardized protocol, the intervention not only improved physical outcomes but may also have fostered greater treatment adherence and patient empowerment.

From a broader perspective, the results of this study are consistent with the growing body of literature supporting the McKenzie approach for chronic mechanical low back pain. In addition to being clinically effective, the method is cost-efficient, easy to implement, and well-suited for both clinical and home-based rehabilitation programs. This is particularly valuable in resource-limited settings, where frequent clinical supervision may not be feasible. The use of a structured booklet further enhances accessibility and consistency of the intervention, allowing patients to continue their rehabilitation outside the clinical environment.

Despite the positive outcomes, this study acknowledges several limitations, including a small sample size, short follow-up duration, and reliance on subjective outcome measures. Future research should aim to include larger, multi-center samples and evaluate the long-term sustainability of the benefits observed. Incorporating objective assessments, such as spinal imaging or functional performance tests, and accounting for psychosocial factors would further strengthen the evidence base.

In conclusion, the findings of this study strongly support the integration of the McKenzie Treatment Protocol booklet into the conservative management of lumbar spondylolisthesis. The approach not only alleviates pain and reduces disability but also promotes patient independence and engagement in their own care. As the burden of chronic spinal disorders continues to rise globally, cost-effective and patient-centered strategies like this one will play a crucial role in improving health outcomes and quality of life.

Chapter-VI LIMITATIONS

- **Small sample size:** The study included only 30 participants (15 in each group), which may limit the generalizability of the results.
- **Short intervention and follow-up period:** The outcomes were measured over a short duration, making it difficult to determine the long-term effectiveness of the McKenzie Treatment Protocol**.**
- **Lack of blinding:** The study did not mention whether outcome assessors or participants were blinded, which may introduce bias in the results.
- **Limited objective measures:** The study primarily relied on self-reported tools (VAS and ODI) and did not include objective physical assessments (e.g., ROM, spinal alignment).
- **Single-center study:** Conducting the study in one setting limits the ability to apply findings to broader populations or different healthcare environments.
- **No long-term recurrence tracking:** The study did not assess whether improvements were sustained over time or if symptoms recurred after the intervention ended.
- **Potential variations in exercise adherence:** As the McKenzie protocol was provided via booklet, participant adherence to the prescribed home exercises may have varied and was not objectively monitored.
- **No psychological assessment:** Psychosocial factors such as fear-avoidance beliefs, depression, or anxiety—which may influence pain and disability—were not considered.

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Appendix-1: IRB Approval Letter from BHPI

BANGLADESH HEALTH PROFESSIONS INSTITUTE

বাংলাদেশ হেলথ্ প্রফেশন্স ইনস্টিটিউট (বিএইচপিআই)

Bangladesh Health Professions Institute (BHPI)

(The Academic Institute of CRP)

Ref: CRP-BHPI/IRB/12/2024/1048 Date: 15/12/2024

To
MST. Humaira Salsabil
4th Year B.Sc. in Physiotherapy
Session: 2019-2020, Student ID: 112190534
BHPI, CRP, Savar, Dhaka-1343, Bangladesh.

Subject: Approval of the thesis proposal "Effectiveness of McKenzie Treatment Protocol booklet for the patients suffering with Lumber Spondylolisthesis: A Randomized Clinical Trial."

Dear MST. Humaira Salsabil,
Congratulations.
The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application to conduct the above-mentioned dissertation, with you, as the principal investigator and Dr. Shamima Islam Nipa, Associate Professor, Department of Physiotherapy, BHPI as thesis supervisor. The following documents have been reviewed and approved:

Sl. No.	Name of the Documents
1	Research Proposal
2	Questionnaire (English version)
3	Information sheet & consent form.

The purpose of the study is to find out the effectiveness of McKenzie treatment protocol booklet for the treatment of Lumbar Spondylolisthesis. The study involves the use of Visual Analogue Scale (VAS), Oswestry Disability Index (ODI) and Goniometry questionnaire to explore Lumbar Spine Range of motion that may take 30 to 40 minutes to fill in the questionnaire any instruction or precaution for collection of specimen. There is no likelihood of any harm to the participants and participation in the study may benefit the participants or other stakeholders by knowing the effectiveness of McKenzie treatment protocol booklet for the treatment of Lumbar Spondylolisthesis as this study helps to develop an effective rehabilitation program and create awareness among patients about physiotherapy treatment. The members of the Ethics Committee have approved the study to be conducted in the presented form at the meeting held at **9 AM on 15 July 2024 at BHPI (44th IRB Meeting).**

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

Best regards,
Millat Hossain
Muhammad Millat Hossain
Associate Professor & Course Coordinator, MRS
Member Secretary, Institutional Review Board (IRB)
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

সিআরপি-চাপাইন, সাভার, ঢাকা-১৩৪৩, বাংলাদেশ। ফোন: +৮৮ ০২ ২২৪৪৪৫৪৪৪

Appendix-ii: Data Collection Permission Letter

18th January, 2025

Head

Department of Physiotherapy

Centre for the Rehabilitation of the Paralysed (CRP)

Chapain, Savar, Dhaka-1343

Through: Head, Department of Physiotherapy, BHPI.

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

Sir,

With due to respect and humble submission to state that I am MST. Humaira Salsabil, a student of 4th year B.Sc. in physiotherapy at Bangladesh Health Professions Institute (BHPI). The Ethical committee has approved my research project entitled: "Effectiveness of McKenzie Treatment Protocol booklet for the patients suffering with Lumber Spondylolisthesis: A Randomized Clinical Trial" under the supervision of Dr. Shamima Islam Nipa, Assistant Professor, Department of Physiotherapy, BHPI. I want to collect data for my research project from the Department of Physiotherapy at CRP. So, I need permission for data collection from the Musculoskeletal Unit of Physiotherapy Department at CRP-Savar, Dhaka-1343. I would like to assure that anything of the study will not be harmful for the participants and the Department itself.

I, therefore pray and hope that you would be kind enough to grant my application and give me permission for data collection and oblige thereby.

Forwarded
Sd/-

Yours faithfully,

Humaira

MST. Humaira Salsabil

4th Year B.Sc. in Physiotherapy

Class Roll: 41; Session: 2019-20

Bangladesh Health Professions Institute (BHPI)

(An academic Institution of CRP)

CRP-Chapain, Savar, Dhaka-1343.

Forwarded & Recommended

3199

Approved

21/1/25

Prof. Dr. Mohammad Anwar Hossain, PhD
Professor Physiotherapy Department BHPI
Senior Consultant & Head
Physiotherapy Department
CRP, Savar, Dhaka-1343

Appendix-iii: Experimental Group Intervention

Experimental Group Intervention

স্পন্ডাইলোলিস্থেসিস এর চিকিৎসায় ফিজিওথেরাপিস্ট এর পরামর্শ অনুযায়ী ম্যাকেঞ্জি ফিজিওথেরাপি কোর্সসমূহ

১. এক হাটু ভাঁজ করে বুকের কাছে নিয়ে আসা

চিত হয়ে শুয়ে দুই হাত দিয়ে এক পা ধরে হাঁটু ভাঁজ করা অবস্থায় বুকের দিকে টানুন। খেয়াল রাখতে হবে যেনো অন্য পা সোজা থাকে এবং মাথা বিছানাতে লাগানো থাকে। ২ সেকেন্ড করে ধরে রেখে ছেড়ে দিন।

মাত্রাঃ ১০/ ১৫ বার করে দিনে ৩/ ৪/ ৫ বার।

২. দুই হাটু ভাঁজ করে বুকের কাছে নিয়ে আসা

চিত হয়ে শুয়ে দুই হাত দিয়ে দুই পা ধরে হাঁটু ভাঁজ করা অবস্থায় বুকের দিকে টানুন। খেয়াল রাখতে হবে যেনো অন্য পা সোজা থাকে এবং মাথা বিছানাতে লাগানো থাকে। ২ সেকেন্ড করে ধরে রেখে ছেড়ে দিন।

মাত্রাঃ ১০/ ১৫ বার করে দিনে ৩/ ৪/ ৫ বার।

৩. চেয়ারে বসে নিচের দিকে ঝুঁকা

চেয়ারে বসা অবস্থায় দুই পায়ের উপর ভর দিয়ে সামনের দিকে ঝুঁকার চেষ্টা করুন এবং আস্তে আস্তে চেয়ারের পিছনের পা ধরার চেষ্টা করুন। খেয়াল রাখতে হবে যেনো সামনের দিকে ঝুঁকার সময় দুই হাঁটু ছড়ানো থাকে এবং কোমড় উঠে না যায়। ২ সেকেন্ড ধরে রেখে তারপর আবার সোজা হয়ে বসুন।

অগ্রগতিঃ পরবর্তী ধাপে গোড়ালি ধরে সামনের দিকে টেনে ধরে চাপ বাড়ানো যেতে পারে।

মাত্রাঃ ১০/ ১৫ বার করে দিনে ৩/ ৪/ ৫ বার।

৪. দাঁড়িয়ে সামনে ঝুঁকা

সোজা হয়ে দাঁড়ানো অবস্থায় সামনের দিকে কোমড় ভাঁজ করে ঝুঁকে প্রথমে পায়ের আঙুল, পরবর্তীতে মেঝে ছোয়ার চেষ্টা করতে হবে। এভাবে ২ সেকেন্ড ধরে রেখে আবার সোজা হয়ে দাঁড়াতে হবে।

মাত্রাঃ ১০/ ১৫ বার করে দিনে ৩/ ৪/ ৫ বার।

৫. এক পা টুলে রেখে সামনে ঝুঁকা

কোনো টুল বা উঁচু জায়গায় এক পা সামনে নিয়ে রাখতে হবে এবং আরেক পা মেঝেতে রাখতে হবে। এবার টুলের উপর রাখা পা টিকে সামান্য বাইরের দিকে কাত করে রেখে কোমড় বাঁকা করে সামনে ঝুঁকে পায়ের গোড়ালি ২ হাত দিয়ে ধরতে হবে। এভাবে ২ সেকেন্ড ধরে আবার সোজা হয়ে দাঁড়াতে হবে।

মাত্রাঃ ১০/ ১৫ বার করে দিনে ৩/ ৪/ ৫ বার।

৬. পেটের নিচে বালিশ দিয়ে শুয়ে থাকা

উপুড় হয়ে পেটের নিচে বালিশ দিয়ে শুয়ে থাকতে হবে যাতে কোমড় পিছনের দিকে বাঁকা হয়ে থাকে।

মাত্রাঃ ১০/ ১৫ মিনিট করে দিনে ৩/ ৪/ ৫ বার।

Weekly Follow Up Chart

Date: _____

Signature: _____

Day	Repetations, Sets & Times per Exercise						Pain Level (0-10)	Symptoms Centralize (Yes/No)	Comments
	Exercise 1	Exercise 2	Exercise 3	Exercise 4	Exercise 5	Exercise 6			
Saturday									
Sunday									
Monday									
Tuesday									
Wednesday									
Thursday									
Friday									

স্পন্ডাইলোলিস্থেসিস চিকিৎসায় ম্যাকেঞ্জি

উপদেশ পত্র

ফিজিওথেরাপি বিভাগ, সিআরপি

CRP
Centre for the Rehabilitation of the Paralysed

ম্যাকেঞ্জি ফিজিওথেরাপি বা মেকানিক্যাল ডায়াগনোসিস অ্যান্ড থেরাপি (MDT) পিঠ, ঘাড় এবং হাত-পা এর ব্যথা নিরসনে একটি ফিজিওথেরাপি পদ্ধতি। নিউজিল্যান্ডের ফিজিওথেরাপিস্ট রবিন ম্যাকেঞ্জি ১৯৫০ এর দশকের শেষের দিকে এই পদ্ধতি তৈরি করেন।

ম্যাকেঞ্জি ফিজিওথেরাপির বৈশিষ্ট্য:

- এটি একটি নন-ইনভেসিভ, স্ব-নির্দেশিত চিকিৎসা পদ্ধতি এবং এতে ব্যথা কমানোর জন্য ওষুধ, সার্জারি বা ইলেকট্রনিক্স যন্ত্রপাতি বা পদ্ধতির প্রয়োজন নেই।
- এটি রোগীর সক্রিয় অংশগ্রহণ এবং শিক্ষার উপর ভিত্তি করে কাজ করে।

যাদের জন্য উপযোগিঃ

- লোয়ার ব্যাক পেইন (Lower Back Pain)
- ঘাড় ব্যথা (Neck Pain)
- ডিস্ক প্রলাপ্স বা স্লিপড ডিস্ক
- সায়াটিকা

Appendix-iv: Control Group Intervention

CRP
Centre for the Rehabilitation of the Paralysed

P.O. CRP-Chapain, Savar, Dhaka-1343
Tel +880 2 7745464-5, Fax +880 2 7745069
Email contact@crp-bangladesh.org
Web www.crp-bangladesh.org

Patient Prescription

Diagnosis Code	:	Prescription Date	:	Patient Code	:
Prescription Code	:	Patient's Name	:	Marital Status	:
Patient's Age	:	Sex	:	Phone No	:
Reffered By	:	Blood Group	:		
Village	:	Post Office	:	Police Station	:
District	:	Patient's Category	:	E-mail	:

Conventional Physiotherapy management for Spondylolisthesis:

- Repeated flexion in lying, Repeated flexion in sitting, Repeated flexion with therapist overpressure in lying and sitting according to the Mckenzie protocol.
- Back muscle, Quadratus lumborum and Gluteal muscle stretching exercise.
- Manual traction of the lumbar spine.
- Soft tissue mobilization technique.
- Electrotherapy
- Lower limb muscle strengthening exercises.
- Gym activities (Cycling)

Jr. Consultant, PT
29-09-24

Jr. consultant
CRP. 28.09.24

Signature with Seal

Appendix-v: consent form with Questionnaire

Questionnaire (English)

Patient Introduction

ID No:	
Name of the patient:	
Age:	
Gender:	□ Male □ Female
Weight (in kg):	
Height (in meter):	[1 Feet = 0.3048 Meter]
Body Mass Index (BMI):	□ 1 = Under weight (<18.50 kg/m^2) □ 2 = Normal weight (18.50-24.99 kg/m^2) □ 3 = Heavy weight (25-29.99 kg/m^2) □ 4 = Obesity (≥30 kg/m^2)
Mobile No:	
Address:	

Chapter-1
Socio-Demographic Information

(N.B. Put tick mark on correct Answer)

1.1 Occupation

□ Farmer	□ Businessman	□ Employee
□ Day laborer	□ Teacher	□ Unemployment
□ Service holder	□ Student	□ House-wife
□ Garments worker	□ Driver	□ Others

1.2 Marital Status

□ Married	□ Divorced	□ Widow
□ Unmarried	□ Separated	

1.3 Religion

□ Islam	□ Hindu	□ Christian
□ Buddhist	□ Others	

1.4 Educational Status

□ No education	□ Primary education	□ Secondary
□ Higher education	□ Graduation	□ Others

1.5 Family size

□ United family □ Joint family

1.6 Number of child: ☐

1.7 Living area

□ Urban □ Rural

1.8 Smoking

□ Yes □ No

Chapter 2: Assessment of pain intensity by Visual Analog Scale

Chapter-3
Oswestry Disability Index (ODI)

3.1 Pain intensity

□ I have no pain at the moment
□ The pain is very mild at the moment
□ The pain is moderate at the moment
□ The pain is fairly severe at the moment
□ The pain is very severe at the moment
□ The pain is the worst imaginable at the moment

3.2 Personal care (washing, dressing etc)

□ 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

3.3 Weight 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 placed eg. on a table
□ Pain prevents me from lifting heavy weights, but I can manage light to medium weights if they are conveniently positioned
□ I can lift very light weights
□ I cannot lift or carry anything at all

3.4 Walking

□ Pain does not prevent me walking any distance
□ Pain prevents me from walking more than 2 kilometres
□ Pain prevents me from walking more than 1 kilometre
□ Pain prevents me from walking more than 500 metres
□ I can only walk using a stick or crutches
□ I am in bed most of the time

3.5 Sitting

□ I can sit in any chair as long as I like
□ I can only sit in my favourite chair as long as I like
□ Pain prevents me sitting more than one hour
□ Pain prevents me from sitting more than 30 minutes
□ Pain prevents me from sitting more than 10 minutes
□ Pain prevents me from sitting at all

Initial	Final
3.1 Pain intensity	
0	0
1	1
2	2
3	3
4	4
5	5
3.2 Personal Care	
0	0
1	1
2	2
3	3
4	4
5	5
3.3 Lifting	
0	0
1	1
2	2
3	3
4	4
5	5
3.4 Walking	
0	0
1	1
2	2
3	3
4	4
5	5
3.5 Sitting	
0	0
1	1
2	2
3	3
4	4
5	5

3.6 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 3 minutes
□ Pain prevents me from standing for more than 10 minutes
□ Pain prevents me from standing at all

3.7 Sleeping

□ My sleep is never disturbed by pain
□ My sleep is occasionally disturbed by pain
□ Because of pain I have less than 6 hours sleep
□ Because of pain I have less than 4 hours sleep
□ Because of pain I have less than 2 hours sleep
□ Pain prevents me from sleeping at all

3.8 Sexual 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

3.9 Social Life

□ My social life is normal and gives me no extra pain
□ My social life is normal but increases the degree of pain
□ Pain has no significant effect on my social life apart from limiting my more energetic interests eg, sport

□ 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

3.10 Travelling

□ I can travel anywhere without pain
□ I can travel anywhere but it gives me extra pain
□ Pain is bad but I manage journeys over two hours
□ Pain restricts me to journeys of less than one hour
□ Pain restricts me to short necessary journeys under 30 minutes
□ Pain prevents me from travelling except to receive treatment

Initial	Final
3.6 Standing	
0 1 2 3 4 5	0 1 2 3 4 5
3.7 Sleeping	
0 1 2 3 4 5	0 1 2 3 4 5
3.8 Sexual Life	
0 1 2 3 4 5	0 1 2 3 4 5
3.9 Social Life	
0 1 2 3 4 5	0 1 2 3 4 5
3.10 Travelling	
0 1 2 3 4 5	0 1 2 3 4 5
Date:	

প্রশ্নাবলী(বাংলা)

রোগীর পরিচিতি

আইডি নংঃ	
রোগীর নামঃ	
বয়সঃ	
লিঙঃ	□ পুরুষ □ মহিলা
ওজন (কেজিতে):	
উচ্চতা (মিটারে):	[১ ফিট = ০.৩০৪৮ মিটার]
বিএমআই (BMI):	□ ১ = অতি কম ওজন (<১৮.৫০ কেজি/মি^{২}) □ ২ = স্বাভাবিক ওজন (১৮.৫০-২৪.৯৯ কেজি/মি^{২}) □ ৩ = অতিরিক্ত ওজন (২৫-২৯.৯৯ কেজি/মি^{২}) □ ৪ = স্থুলতা (≥৩০ কেজি/মি^{২})
মোবাইল নংঃ	
ঠিকানাঃ	

অধ্যায়-১

আর্থ-সামাজিক এবং জনসংখ্যাতাত্ত্বিক তথ্য

(বিঃ দ্রঃ নির্ধারিত ঘরে টিক দিয়ে সঠিক উত্তর নিতে হবে।)

১.১ পেশা

কৃষক	ব্যবসায়ী	কর্মচারী
দিনমজুর	শিক্ষকতা	বেকার
চাকুরিজীবী	ছাত্র	গৃহিণী
গার্মেন্টস কর্মী	গাড়ি চালক	অন্যান্য

১.২ বৈবাহিক অবস্থা

□ বিবাহিত □ তালাকপ্রাপ্ত □ বিধবা

□ অবিবাহিত □ আলাদা

১.৩ ধর্ম

□ ইসলাম □ হিন্দু □ খ্রিস্টান

□ বৌদ্ধ □ অন্যান্য

১.৪ শিক্ষাগত যোগ্যতা

□ স্কুলে যায় নি □ প্রাথমিক □ মাধ্যমিক □ উচ্চ-মাধ্যমিক

□ উচ্চশিক্ষা □ স্নাতক/স্নাতকোত্তর □ অন্যান্য

১.৫ পরিবারের আকার

□ একক পরিবার □ যৌথ পরিবার

১.৬ সন্তান সংখ্যাঃ ☐

১.৭ আবাসিক এলাকা

□ গ্রাম □ শহর

১.৮ ধূমপান

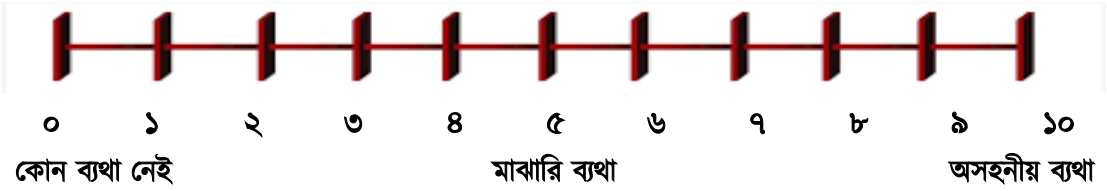
□ হ্যাঁ □ না

অধ্যায়-২ (VAS স্কেল)

সামগ্রিকভাবে রোগী কর্তৃক নির্ণীত ব্যথার হার

ব্যাথার তিব্রতা নির্ণয়ক স্কেল VAS স্কেল ব্যাবহৃত

(বিঃদ্রঃ যদি আপনার ব্যাথা ০ থেকে ১০ এর মধ্যে বলতে বলা হয় যেখানে ০ মানে কোন ব্যাথা নেই এবং ১০ মানে তিব্র ব্যাথা তবে আপনি আপনার ব্যাথাকে কতো দিবেন)



অধ্যায়-৩

অস-ওয়েস্ট্রি কোমড় ব্যথার অক্ষমতা সংক্রান্ত প্রশ্নাবলী

৩.১ ব্যথার তীব্রতা

- □ আমি কোনো ব্যথা অনুভব করি না।
- □ আমার ব্যথা খুব মৃদু।
- □ আমার ব্যথা মাঝারি।
- □ আমার ব্যথা খুব বেশি।
- □ আমার ব্যথা অত্যন্ত বেশি এবং সহ্য করা কঠিন।
- □ আমার ব্যথা অসহনীয়।

৩.২ ব্যক্তিগত যত্ন(ওয়াশিং, ড্রেসিং ইত্যাদি)

- □ আমি কোনো সমস্যার সম্মুখীন হই না।
- □ আমি মৃদু সমস্যা অনুভব করি।
- □ আমার যত্ন নিতে মাঝারি সমস্যার সম্মুখীন হই।
- □ আমি খুব বেশি সমস্যার সম্মুখীন হই।
- □ অন্য কেউ আমার যত্ন নেয়।
- □ আমি নিজেকে একদমই যত্ন নিতে পারি না।

৩.৩ উত্তোলন

- □ আমি সহজেই ভার বহন করতে পারি।
- □ আমি মৃদু ভার বহনে সমস্যা অনুভব করি।
- □ মাঝারি ওজন বহনে সমস্যা হয়।
- □ আমি কেবল হালকা ওজন বহন করতে পারি।
- □ ভার বহন করা আমার জন্য অত্যন্ত কষ্টকর।
- □ আমি কোনো ওজন বহন করতে পারি না।

৩.৪ হাটা

- □ আমি কোনো সমস্যা ছাড়াই হাঁটতে পারি।
- □ আমি ১ কিলোমিটার হাঁটতে পারি।
- □ আমি ৫০০ মিটার হাঁটতে পারি।
- □ আমি ১০০ মিটার হাঁটতে পারি।
- □ আমি একেবারে কম হাঁটতে পারি।
- □ আমি হাঁটতে পারি না।

৩.৫ বসা: আমি কোনো সমস্যা ছাড়াই বসতে পারি।

- □ আমি কিছুক্ষণ বসতে পারি, তবে সমস্যার সম্মুখীন হই।
- □ দীর্ঘ সময় বসে থাকলে অস্বস্তি অনুভব করি।
- □ আমার খুব কম সময় বসা সম্ভব।
- □ আমি বসতে গেলে অনেক সমস্যা হয়।
- □ আমি বসতে পারি না।

চিকিৎসার শুরুতে	চিকিৎসা শেষে
৩.১ ব্যথার তীব্রতা	
০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫
৩.২ ব্যক্তিগত যত্ন	
০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫
৩.৩ উত্তোলন	
০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫
৩.৪ হাটা	
০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫
৩.৫ বসা	
০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫

৩.৬ দাঁড়ানো

- □ আমি কোনো সমস্যা ছাড়াই দাঁড়াতে পারি।
- □ আমি কিছুক্ষণ দাঁড়িয়ে থাকতে পারি।
- □ আমার দীর্ঘ সময় দাঁড়াতে সমস্যা হয়।
- □ আমি কম সময় দাঁড়াতে পারি।
- □ আমার দাঁড়ানো অত্যন্ত কষ্টকর।
- □ আমি দাঁড়াতে পারি না।

৩.৭ ঘুমানো

- □ আমি কোনো সমস্যা ছাড়াই ঘুমাতে পারি।
- □ আমার ব্যথা মাঝে মাঝে ঘুমের সমস্যা তৈরি করে।
- □ ব্যথার কারণে ঘুমানো কঠিন হয়।
- □ ব্যথার জন্য আমি ভালো ঘুমাতে পারি না।
- □ ব্যথার কারণে ঘুমানো প্রায় অসম্ভব।
- □ আমি একেবারে ঘুমাতে পারি না।

৩.৮ যৌনজীবন

- □ আমার যৌনজীবন স্বাভাবিক এবং কোন ব্যথা তৈরি করে না
- □ আমার যৌনজীবন স্বাভাবিক এবং কিছুটা ব্যথা তৈরি করে
- □ আমার যৌনজীবন স্বাভাবিক কিন্তু অনেক ব্যথা তৈরি করে
- □ আমার যৌনজীবন গুরুতরভাবে সীমাবদ্ধ
- □ আমার যৌনজীবন ব্যথার জন্য অনেকটাই গুরুতরভাবে সীমাবদ্ধ
- □ আমার যৌনজীবন ব্যথার জন্য পুরোটাই গুরুতরভাবে সীমাবদ্ধ

৩.৯ সামাজিক জীবন

- □ আমার সামাজিক জীবনে কোনো প্রভাব নেই।
- □ আমার সামাজিক জীবনে অল্প প্রভাব পড়েছে।
- □ ব্যথার কারণে আমার সামাজিক জীবনে মাঝারি প্রভাব পড়েছে।
- □ ব্যথার কারণে আমি সামাজিক জীবন উপভোগ করতে পারি না।
- □ আমার সামাজিক জীবন অত্যন্ত সীমিত।
- □ আমি কোনো সামাজিক জীবনে অংশ নিতে পারি না।

৩.১০ ভ্রমণ

- □ আমি ভ্রমণে কোনো সমস্যা অনুভব করি না।
- □ আমার মৃদু সমস্যা হয়।
- □ আমি মাঝারি সমস্যার সম্মুখীন হই।
- □ ভ্রমণ আমার জন্য অনেক কষ্টকর।
- □ আমি ভ্রমণ একদম কম করি।
- □ আমি ভ্রমণ করতে পারি না।

চিকিৎসার শুরুতে	চিকিৎসা শেষে
৩.৬ দাঁড়ানো	
০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫
৩.৭ ঘুমানো	
০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫
৩.৮ যৌনজীবন	
০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫
৩.৯ সামাজিক জীবন	
০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫
৩.১০ ভ্রমণ	
০ ১ ২ ৩ ৪ ৫	০ ১ ২ ৩ ৪ ৫
তারিখঃ	