EFFICACY OF MOTOR CONTROL EXERCISE ALONG WITH CONVENTIONAL PHYSIOTHERAPY AMONG PATIENTS WITH CHRONIC NON-SPECIFIC LOW BACK PAIN

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

EFFICACY OF MOTOR CONTROL EXERCISE ALONG WITH CONVENTIONAL PHYSIOTHERAPY AMONG PATIENTS WITH CHRONIC NON SPECIFIC LOW BACK PAIN

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

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DECLERATION

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

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ACRONYMS

BHPI	Bangladesh Health Professions Institute
CLBP	Chronic Low Back Pain
CRP	Centre For the Rehabilitation of the Paralysed
IRB	Institutional Review Board
LBP	Low Back Pain
MCE	Motor Control Exercise
MS	Musculoskeletal
NPRS	Numerical Pain Rating Scale
NSAID	Non-Steroidal Anti-Inflammatory Drug
RMDQ	Roland Morris Disability Questionnaire

TrA Transversus Abdominis

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ABSTRACT

Background: Chronic Non-specific low back pain is reported to be a major health and socioeconomic problem Motor control exercise (MCE) intervention focuses on the activation of the deep trunk muscles and targets the restoration of control and co-ordination of these muscles, progressing to more complex and functional tasks integrating the activation of deep and global trunk muscles. *Objective:* The objective of the study was to observe the effect of MCE along with conventional physiotherapy compared with only conventional physiotherapy for CLBP**.** *Methodology:* This dissertation describes a randomised clinical trial on the effects of motor control exercises along with conventional physiotherapy than only physiotherapy in the treatment of chronic low back pain. The study was conducted in the CRP outdoor Musculoskeletal Unit, Physiotherapy Department encompassed 20 participants with chronic non-specific low back pain .*Intervention:* Patients were randomly assigned to receive either motor control exercise along with physiotherapy or only conventional physiotherapy intervention. Patients in both groups received 12 sessions of individualized, supervised therapy. *Results:* The post intervention assessment showed significant differences in respect of pain (95%, confidence interval [CI] = -0.338 to 0.191; p=0.018) and disability level (95% confidence interval [CI] = -0.147 to 0.040; p = 0.023).Mann-Whitney U test for between group and for within group analysis Wilcoxon Signed Rank test is used at confidence level 95%,($p<0.05$).This proposed intervention improved activity and but its effect on pain is still in doubt. *Conclusion:* Motor Control Exercise (MCE) along with conventional physiotherapy has the potential to improve therapeutic effects than only conventional approach in chronic non-specific low back pain. Motor Control exercise proved efficient when combined with conventional physiotherapy to improve disability level and prevent recurrence.

Keyword: Chronic Non-specific low back, Motor control exercise (MCE), Conventional physiotherapy

CHAPTER-I INTRODUCTION

1.1 Background

Low back pain is an extremely common problem that most people experience at some point in their life. Non-Specific low back pain (LBP) is a major public health problem. Low back pain is a common condition affecting many individuals at some point in their lives. Allegri et al. (2016) expressed the estimation is that between 5.0% and 10.0% of cases will develop chronic low back pain (CLBP), which is responsible for high treatment costs, sick leave, and individual suffering, in addition to being one of the main reasons for people to seek health care services. Although CLBP is highly disabling, information about its prevalence and associated factors are scattered in the literature.

Low back pain may be defined as pain in the area on the posterior aspect of the body from the lower margin of the twelfth ribs to the lower gluteal folds with or without pain referred into one or both lower limbs that lasts for at least one day. Systematic reviews were performed of the prevalence, incidence, remission, duration, and mortality risk of LBP (Hoy et al., 2014). Four levels of severity were identified for LBP with and without leg pain, each with their own disability weights. The disability weights were applied to prevalence values to derive the overall disability of LBP expressed as years lived with disability (YLDs). As there is no mortality from LBP, YLDs are the same as disability-adjusted life years (DALYs).

Chronic pain has different views and definitions all the way but impairing effect of chronic persistent pain on daily living activities is as normal as normal can be and a compelling cause of seeking treatment. In Manchikanti et al. (2009) enunciation, one of the commonest chronic pain conditions definition could be said as, “pain that exists beyond an expected time frame for healing”. Chronic low back pain is complimentary

to this definition if it presents more than consecutive three months. Around the world, low back has been reported as common and a crucial health problem which cause the high costs in care, work absenteeism, and disability and high costs for patients, governments and health insurance companies (Airaksinen et al., 2006; Dagenais et al., 2008).

LBP was defined as pain in the area on the posterior aspect of the body from the lower margin of the twelfth ribs to the lower gluteal folds with or without pain referred into one or both lower limbs that lasts for at least one day (Hoy et al., 2012).

According to World Health Organization establishment on classifications, Low back pain can be acute, sub-acute, or chronic. Though several risk factors have been identified (including occupational posture, depressive moods, obesity, body height and age), the causes of the onset of low back pain remain obscure and diagnosis difficult to make. Back pain is not a disease but a constellation of symptoms .In spite of being that common most of the cases of the low back pain the cause remain complete unknown and as a result there is no definite diagnosis and thus the nightmare term "Non-Specific LBP" ascend but there is one hypothetical cause could be sounded like spinal instability which eventually results in injury to the structures which are immersed in the mechanoreceptors (Bystrom et al., 2013).

LBP causes more global disability than any other condition. It affects people of all ages, from children to the elderly, and is a very frequent reason for medical consultations. The estimation is that between 5.0% and 10.0% of cases will develop chronic low back pain (CLBP), which is responsible for high treatment costs, sick leave, and individual suffering, in addition to being one of the main reasons for people to seek health care services. Although CLBP is highly disabling, information about its prevalence and associated factors are scattered in the literature. (Meucci et al., 2015).

According to Akbari et al. (2008), the prevalence of chronic pain in the adult population ranges from 2% to 40%, with a median point prevalence of 15%. Among chronic pain disorders, pain arising from various structures of the spine constitutes the majority of the problems. The lifetime prevalence of spinal pain has been reported as 54% to 80%. Studies of the prevalence of low back pain and neck pain and its impact in general have shown 23% of patients reporting Grade II to IV low back pain (high pain intensity with disability) versus 15% with neck pain. Further, age related prevalence of persistent pain appears to be much more common in the elderly associated with functional limitations and difficulty in performing daily life activities. Manchikanti et al. (2009) stated that, chronic persistent low back and neck pain is seen in 25% to 60% of patients, one-year or longer after the initial episode. Spinal pain is associated with significant economic, societal, and health impact. Maher et al. (2016) expressed Estimates and patterns of productivity losses and direct health care expenditures among individuals with back and neck pain in the United States continue to escalate. Recent studies have shown significant increases in the prevalence of various pain problems including low back pain.

One of the most wide ranging crucial public health problem is non-specific low back pain and its lifetime prevalence is said to be as climbing as 84%, the prevalence of chronic low back pain is about 23%, and in them the population which is disabled by low back pain are about 11–12%.Genetic constitution plays rather important pathogenic role than mechanical factors such as lifting and carrying (Balague et al., 2012).

The 2010 Global Burden of Disease Study estimated that low back pain is among the top 10 diseases and injuries that account for the highest number of DALYs worldwide (Hoy et al., 2014). The prevalence of chronic, impairing LBP rose significantly over the 14-year interval. Low back pain (LBP) is the second most common cause of

disability in United States adults and a common reason for lost work days (Freburger et al., 2009) and extremely costly causing great economic burden for Australia's health system, and considerable suffering for the individual. Around 60–80% of the population will at some time exhibit low back pain and of these 70 to 80% will have at least one recurrence (Macedo et al., 2008). In Japan, LBP is also widespread among the general population and is the fifth most frequent reason for medical consultation among outpatients and Back pain patients with disability should be focused on and dissemination of guidelines on management of non-specific LBP to health practitioners is needed. (Fujii & Matsudaira, 2013). In the Brazilian older population, chronic low back pain prevalence was 25.4% (Meucci et al., 2015).

However the data on LBP in this professional category is scarce in Bangladesh. After headaches and tiredness, back pain is the third most common health problem reported by individuals (Nahar et al., 2013).

Chronic low back pain prevalence increases linearly from the third decade of life on, until the 60 years of age, being more prevalent in women. Methodological approaches aiming to reduce high heterogeneity in case definitions of chronic low back pain are essential to consistency and comparative analysis between studies (Osborn & Smith, 2015). Despite the enormous amount of resources directed to the treatment of chronic low back pain worldwide, treatment for this health condition continues to have a low success rate. The search for more effective ways to manage chronic low back pain is critical if we are to improve the health and quality of life for many people around the globe (Meucci et al., 2015).

In Michelson et al. (2016) thoughts, patients with LBP can be classified into sub-groups based on assumptions about the neurophysiological mechanisms responsible for generating and maintaining the pain. Nociceptive pain (NP) has been proposed as one

category, where the pain condition is assumed to be predominantly driven by activation of peripheral nociceptive neurons in response to noxious chemical, mechanical or thermal stimuli. In this subgroup, the pain is distinct, with a consistent and proportionate mechanical pattern that can be reproduced by movements. Laird et al. (2012) suggested that movements that are not performed optimally can overload structures in the lumbar spine and/or aggravate an injury, thereby increasing pain perception .Thus comes the motor control exercise theory. There is growing evidence that altered posture and movement patterns are common in patients with low back pain (LBP). It is proposed that the repetition of altered alignments and movements may result in localized regions of tissue stress, which may provide a basis for ongoing nociceptive pain of mechanical character.

According to Shumway-Cook & Woollacott, (2016) expressed in their book that motor control involves the way in which the central nervous system organizes muscles into coordinated movements, sensory information is used to select and control movement, and movement patterns are influenced by perceptions.

One proposed mechanism for non-specific LBP is lack of stability of the spine (Panjabi et al., 2006). Previous studies have demonstrated that patients with LBP may have impairments in the control of the deep trunk muscles (e.g. transversus abdominis and multifidus) responsible for maintaining the coordination and stability of the spine. Based on this principle, motor control exercise (MCE) was developed with the aim of restoring the co-ordination, control and capacity of the trunk muscles (Hodges, 2008). The intervention involves the training of isolated contraction of the deep trunk muscles, with further integration of these muscles into more complex static, dynamic and functional tasks (Ferreira et al., 2007). The intervention also includes the coordination and optimal control of the global trunk muscles (Costa et al., 2009; Macedo et al.,

2012). Physical therapists worldwide commonly use low load motor control (LMC) exercises to correct motor control deficiencies, in order to retrain movement patterns and regain control of spinal motions. In a recent review, the authors concluded that LMC exercises reduce pain more efficiently than general exercises (Bystrom et al., 2013).

Finally, it can be concluded to that patients who recovered from an episode of acute low back pain are more susceptible to recurrence and chronicity if these changes were not treated with motor control exercise (Costa et al., 2009).

1.2 Rationale

A condition like low back pain brings only suffering and the recurrence and chronicity exceeds the limits of distress. Low back pain is extremely common around the world that causes functional limitation in our day to day life and hampers it in all the possible way. Back pain poses an enormous challenge to the physician and other health care providers. The problem in developing countries is even serious due to ignorance and failure of early detection of the actual cause and the treatment options. There are a lot of researches proved that Motor Control Exercise (MCE) help the patient to reduce pain and disability in chronic non-specific low back pain. The Motor Control Exercise (MCE) targets the spinal stability, core muscles and pelvic floor muscle group which plays a crucial role in non-specific chronic low back pain and associated problems and disability with it. Patients with the weakness of these muscles often tend to develop lifelong disability and work absenteeism. There is lack of studies and trails regarding the effectiveness of motor control exercise for chronic non-specific low back pain, ergo arises the need of developing standardize ones.

In Bangladesh, such studies about Motor Control Exercise (MCE) for chronic non-specific low back pain is much needed to find out the effectiveness in case of various conditions. So it is very important to develop an evidence based project study on this topic to strengthen physiotherapy profession and as well as benefit for the patients.

1.3 Aim

To ascertain the efficacy of motor control exercise along with conventional physiotherapy among the patients with chronic non-specific low back pain.

1.4 Objectives

1.4. A General objective

To signify the effectiveness of motor control exercise among the patients with chronic non-specific low back pain.

1.4. B Specific objective

I. To find if socio-demographic factors effect level of pain and disability.
II. To find out the effect of motor control exercise along with conventional physiotherapy on pain and disability among patients with chronic non-specific low back pain.

1.5 Hypothesis

Motor control exercise along with conventional physiotherapy is more effective than only conventional physiotherapy for the treatment of the patients with chronic non-specific low back pain in case of improving pain and disability.

1.6 Null hypothesis

Motor control exercise along with conventional physiotherapy is no more effective than only conventional physiotherapy for the treatment of the patients with chronic non-specific low back pain.

1.7 List of variable

- Independent variable: Motor control exercise and conventional physiotherapy.
- Dependent variable: Low back pain and disability

1.8 Operational Definition

A Motor control exercise

Motor control exercises for the deep trunk muscles were introduced for patients with chronic LBP based on evidence of motor control dysfunction, including delayed onset of activity in the transversus abdominis (TrA) and internal oblique abdominal muscles and segmental hypertrophy of the lumbar multifidus muscle. Motor control program is to retrain the core muscles of the lumbar spine, comprising transversus abdominis, lumbar multifidus and the pelvic floor, to maintain a tonic and automatic contraction at less than 30% of maximum voluntary contraction in daily activities.

Chronic non-specific low back pain

LBP is usually defined as pain localized below the margin of the last ribs (costal margin) and above the inferior gluteal lines, with or without lower limb pain. LBP may be classified as mechanical, non-mechanical, and psychogenic. Mechanical LPB may be specific or non-specific. Non-specific LBP is characterized by the absence of structural change; that is, there is no disc space reduction, nerve root compression, bone or joint injuries, marked scoliosis or lordosis that may lead to back pain. In non-specific LBP, imbalance typically occurs between the functional load - which is the effort required for work and activities of daily living, and ability - which is the potential for performing these activities. Despite the lack of structural change in non-specific LBP, it can limit daily activities and cause temporary or permanent inability to work.

Conventional physiotherapy

Conventional therapy means treatments that are widely accepted and practiced by the mainstream medical community. It is a cluster of approaches, group of selected treatment techniques practiced by experienced physiotherapists on the basis of evidences that are widely used to treat specific conditions. In case of chronic low back

pain management these conventional physiotherapeutic approach decrease the pain, decrease disability level and increase the strength of involved muscles, but results in frequent recurrence rates because of their effectiveness only up to one year and patients are left out with some residual pain and disability.

CHAPTER- II LITERATURE REVIEW

The lumbar spine consists of five vertebrae (L1–L5). The complex anatomy of the lumbar spine is a combination of these strong vertebrae, linked by joint capsules, ligaments, tendons, and muscles, with extensive innervation. The spine is designed to be strong, since it has to protect the spinal cord and spinal nerve roots. At the same time, it is highly flexible, providing for mobility in many different planes stated by Allegri et al. (2016).

Low back pain is a highly prevalent health condition responsible for considerable suffering across the world. Recent research shows that low back pain causes more years lived with disability than any other health condition. Many people with low back pain have ongoing and recurrent complaints, (Henschke et al., 2008; Stanton et al. 2009) and these people bear the greatest proportion of the disease burden. Kampar et al. (2015) mentioned at a societal level, low back pain is also responsible for substantial costs by way of healthcare expenditure, disability insurance, and work absenteeism.

According to (Borenstein, 2013), pain located between the twelfth rib and the crease of the buttocks (the common definition for the low back) is a symptoms associated with over 60 different medical condition. Phansopkar & Kage, (2014) stated that the term low back pain refers to the pain in the lumbosacral area of the spine to the 1st sacral vertebrae, the precise location is the lordotic curve formation area. Low back pain may or may not pass on to the lower limb and into the groin or perineum. When pain is referred in the lower limb associated with LBP then it may either somatic referred pain or radicular pain. Pain extending across relatively wide region and felt deeply, in a relatively constant or fixed location and it is called somatic referred pain. Pain that move by the side of the length of the lower limb, along a narrow band and it is called

radicular pain or sciatica. When pain is persist in the buttock or proximal thigh extending below the knee is not necessarily radicular pain.

A patient does not necessarily have to exhibit neurological features to be suffering from radicular pain, but the presence of neurological features (motor weakness, sensory deficit, or numbness) favors the diagnosis of radicular (sciatic) pain. Somatic referred pain indicates when patient feel deep aching pain (Kilpikoski, 2010).

The number of spinal disorders is large, particularly those related to posture, inadequate body movements, and working conditions that may affect the spine. LBP may be classified as mechanical, non-mechanical, and psychogenic (Morone et al., 2016). Mechanical LPB may be specific or nonspecific. According to its duration, LBP may be acute (sudden onset and lasting less than six weeks), sub-acute (lasting 6 to 12 weeks), chronic (lasting longer than 12 weeks), and recurrent (reappears after lull periods). Mechanical - or nonspecific - LBP is the most commonly reported by the population.

In nonspecific LBP, imbalance typically occurs between the functional load - which is the effort required for work and activities of daily living, and ability - which is the potential for performing these activities. Michelson et al. (2016) expressed Nonspecific LBP is characterized by the absence of structural change; that is, there is no disc space reduction, nerve root compression, bone or joint injuries, marked scoliosis or lordosis that may lead to back pain.

Despite the lack of structural change in nonspecific LBP, it can limit daily activities and cause temporary or permanent inability to work. The causes of low back pain include exertion or lifting, postural strain (improper position when sitting, standing and bending), infection nerve dysfunction, osteoporosis, tumors, and congenital problem. Spinal stenosis, rheumatoid arthritis, prostate trouble in men, problems with

reproductive organs in women, kidney disease, such as an infection or kidney stone, diseases of the intestines or pancreas such as cancer or a blockage, cancer that has spread to the spine, multiple myeloma, a form of cancer of the bone and bone marrow, curvature of the spine, rarely a tumor on the spinal cord are the other cause of low back pain.

Low back pain is a major problem worldwide and is associated with enormous socio-economic and health costs to society .Estimates suggest that in European countries the direct and indirect costs of low back pain range from 2 billion to 4 billion euros annually (van Tulder et al., 2006).

In Australia, the costs associated with low back pain exceed AU dollars 1 billion/ yearly; in the United States they were estimated at more than USD 50 billion per year (Dagenais et al., 2008).

Although low back pain rarely indicates a serious underlying disorder, people with low back pain that lasts for longer than one or two months have an increased risk of developing longer-term disability and repeated care-seeking. Moreover, the recovery process of people with chronic low back pain is slow, and their demands on the healthcare system are both large and costly (Henschke et al., 2008).

To the date, several treatments are available for people with chronic low back pain. However, these treatments have a moderate effect (Airaksinen et al., 2006; Delitto et al., 2012). Furthermore, there are still discrepancies between countries in clinical guidelines and therapeutic recommendations for people with low back pain (Parreira et al., 2015).

Chronic low back pain is defined by symptoms that persist for a period of greater than three months (Furlan et al., 2009). Along with pain and impaired function, people with chronic low back pain frequently experience anxiety and depression, as well as effects

on social, recreational, and work life (Koes et al., 2006). Recognition of this widespread impact led to the formulation of the bio psychosocial model of low back pain, as well as efforts to develop interventions that target all facets of the disorder. These multidisciplinary bio psychosocial rehabilitation programs involve a combination of physical, psychological, educational, and/or work related components and are often delivered by a team of healthcare providers with expertise in different fields (Kamper et al., 2015).

In opinion of Meucci et al. (2015) the estimation is that between 5.0% and 10.0% of cases will develop chronic low back pain (CLBP), which is responsible for high treatment costs, sick leave, and individual suffering in addition to being one of the main reasons for people to seek health care services. Although CLBP is highly disabling, information about its prevalence and associated factors are scattered in the literature (Liao et al., 2009; Melloh et al., 2008; Meucci et al., 2013).

Low back pain can be classified as specific and non-specific; back pain caused by a specific pathophysiologic mechanism like disc herniation, inflammation, infection, tumor, fracture, rheumatoid arthritis and osteoporosis is regarded as specific LBP and only about 10% people have the specific low back pain whereas 90% patients have no specific structural diagnosis which attributing the term non-specific low back pain (Mamin & Islam, 2015).

In Fuentes et al. (2013) opinion, Non-Specific low back pain (LBP) is defined as pain, muscle tension, or stiffness localized below the costal margin of the back and above the inferior gluteal folds, with or without leg pain (sciatica).Non-specific low back pain (LBP) is a major public health problem in industrialized societies, with lifetime prevalence between 60% and 85%. Reviews point to beneficial effects of supervised exercises in people with chronic LBP (Airaksinen, 2006; van Middelkoop et al., 2010)

but there is no clear evidence that any specific type of exercise is better than other forms of exercise.

The term "specific exercise" has been used to describe quite different types of exercises, such as stabilization exercises and abdominal drawing-in maneuver (ADIM) individualized exercises, supervised exercises, and even what appear to be general exercises. It is plausible, therefore, that specifically targeted exercises with potential benefits relative to more general exercises may be concealed when different studies are summarized in reviews according to Unsgaard-Tondel et al. (2010).

Macedo et al. (2012) stated that, supervised exercise therapies are among the most commonly advocated treatments for chronic non-specific low back pain. However, despite the growing number of studies evaluating the effectiveness of exercise interventions, there is still considerable debate with regard to the most appropriate form of exercise.

Motor control exercises for the deep trunk muscles were introduced for patients with chronic LBP based on evidence of motor control dysfunction, including delayed onset of activity in the transversus abdominis (TrA) and internal oblique abdominal muscles and segmental hypertrophy of the lumbar multifidus muscle (Unsgaard-Tondel et al., 2010).

MCEs are designed to re-educate the co-activation pattern of abdominals, paraspinals, gluteals, pelvic floor musculature and diaphragm (Akuthota et al., 2008; Shamsi et al., 2015).

The biological rationale for MCEs is primarily based on the idea that the stability and control of the spine are altered in patients with LBP (Costa et al., 2009). A MCE programme begins with recognition of the natural position of the spine (mid-range between lumbar flexion and extension range of motion), considered to be the position

of balance and power for improving performance in various sports. Initial low-level sustained isometric contraction of trunk-stabilising musculature and their progressive integration into functional tasks is the requirement of MCEs (Shamsi et al., 2015). MCE is usually delivered in 1:1 supervised treatment sessions and sometimes includes palpation, ultrasound imaging and/or the use of pressure biofeedback units to provide feedback on the activation of trunk musculature (Saragiotto et al., 2016).

The MCE approach uses motor learning principles to facilitate coordination of the deep-trunk musculature of the spine. It seems that a MCE can alleviate pain, improve functional capacity, restore motor control, enhance the size of the CSA and strengthen trunk, abdominal and paraspinal musculature (Pourahmadi et al., 2016).

The goal of the motor control program is to retrain the core muscles of the lumbar spine, comprising transversus abdominis, lumbar multifidus and the pelvic floor, to maintain a tonic and automatic contraction at less than 30% of maximum voluntary contraction in daily activities.

In most cases this requires initial training in non-weight bearing positions using a lower abdominal drawing in maneuver which has been shown to selectively activate transversus abdominis.Lumbar multifidus and the pelvic floor muscles, including pubococcygeus, have been shown to co-contract with transversus abdominis to provide a “corset” for the lumbo-pelvic area and practitioners should aim to achieve such a result in association with the lower abdominal drawing in maneuver. Training should initially focus on quality of movement and precise isolation of the relevant core muscles which has been shown to be important in restoring normal motor control in people with LBD (Costa et al., 2009).

Once adequate motor control of the core muscles is achieved in non-weight bearing positions, subsequent progression to functional activities can be made. Importantly this

progression involves integration of the global muscles of the spine with the core muscles during specific functional exercises as well as during strength training of the trunk (Saragiotto et al., 2016). There is emerging evidence that functional retraining of normal lumbo-pelvic kinematics can improve motor control and clinical outcomes and these methods should also be considered during functional motor control exercises.

CHAPTER - III METHODOLOGY

The study is a randomized controlled trial to distinguish the efficacy of motor control exercise along with conventional physiotherapy rather than only conventional physiotherapy for patients with chronic non-specific low back pain.

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

3.1 Study design

The particular design for this study is the Randomized Controlled Trial (RCT).

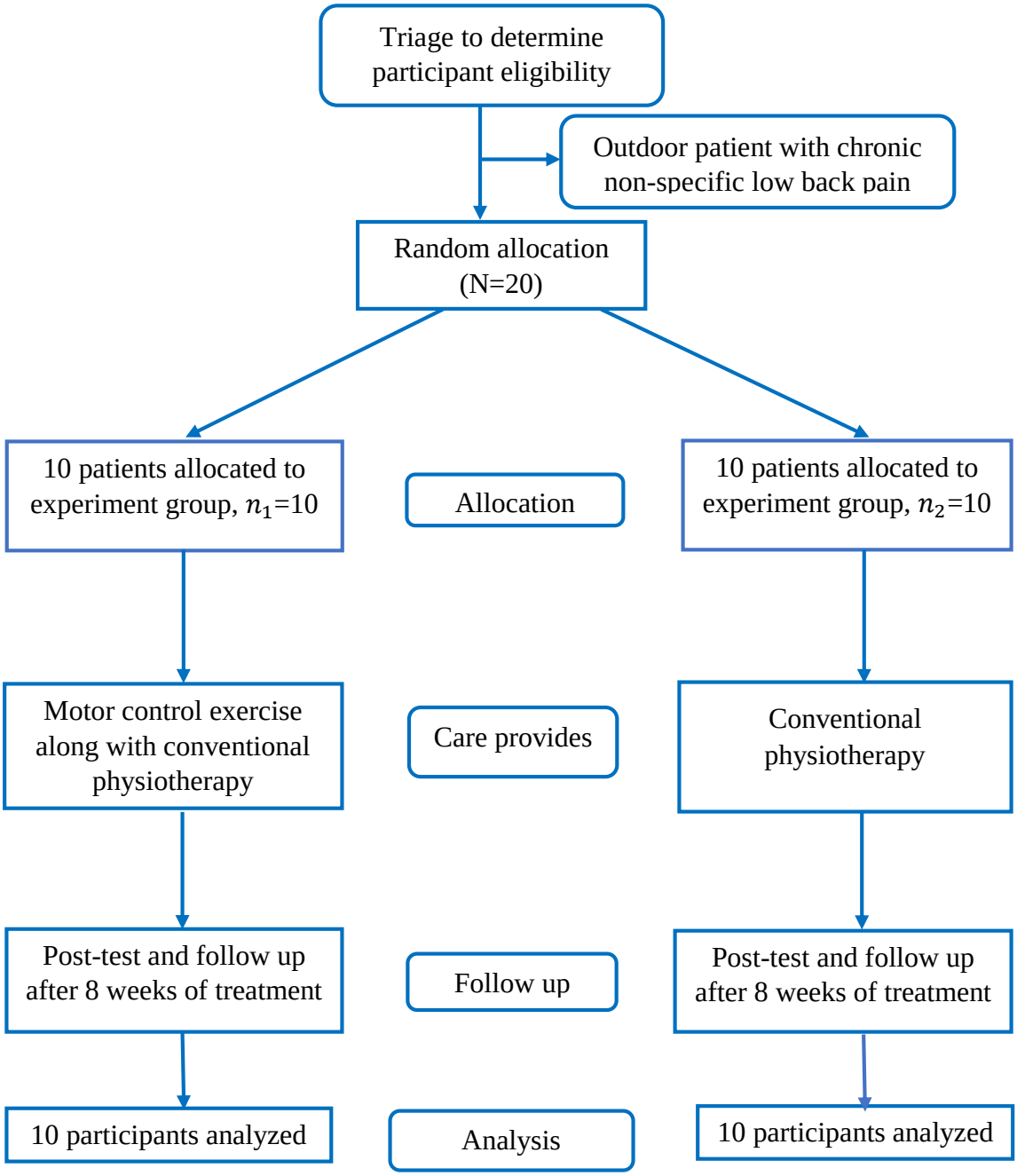
20 Patients were selected by simple random sampling from the musculoskeletal outpatient unit to be begun with. They were assigned by a randomization process done by using computer generated randomization technique in Microsoft Office Excel 2013 plus. This study was a single blinded study. 10 patients with chronic non-specific low back pain were assigned randomly as the trail group receiving motor control exercise along with conventional physiotherapy and other 10 patients were assigned to the control group who were receiving only conventional physiotherapy treatment for their condition. Data was collected by two data collector who weren't involved in this study.

A pretest screening (before intervention) and a post test screening (after intervention) are carried out for all the subject of the both groups to distinguish between the pain intensity and the disability level before and after the treatment.

This design could be shown by – r 0 x 0 (experimental group)

r 0 0 (control group)

Figure 1: Study flow and schematic sequence of the study procedure:



CONSORT: A flowchart for a randomized controlled trial of conventional physiotherapy along with motor control exercise and only conventional physiotherapy for patient with chronic non-specific low back pain.

3.2 Study area

The study area was musculoskeletal outpatient physiotherapy unit, Centre for the Rehabilitation of Paralysed (CRP), Savar, Dhaka.

3.3 Study population

The patients with chronic non-specific low back pain seeking care in the CRP outdoor was my study population.

3.4 Sample Selection

Sample size, $n = \frac{z^2 \times pq}{e^2}$

Here,

p= 50% = 0.50 (considered the sample proportion or percentage of incidence or prevalence as 50%)

q= 1-p = 1-0.50= 0.50

Margin of error, e=0.05

Z-score = z (for 95%= 1.96)

Therefore, n = $\frac{(1.96^2 \times 0.50 \times 0.50)}{0.05^2}$

The required sample is 384.16

But only 20 participants were selected. 10 Patients for trail and 10 patients for control group chronic non-specific low back pain patients allocated from musculoskeletal outpatient physiotherapy unit, Centre for the Rehabilitation of Paralysed (CRP), Savar, Dhaka at between March 2016 and October 2016.

3.5 Inclusion criteria

1. The participants had to have non-specific low back pain which is defined in terms as pain and discomfort localized below the costal margin and above the inferior gluteal folds, with or without referred leg pain of at least 3 months of duration and at this moment seeking medical attention for low back pain (Costa et al., 2009).
2. Must be aged between 18 and 80 years, and give written informed voluntary consent. (Ferreira et al., 2007)
3. Both male and female patients were included.
4. Patients suitable for active exercise.((Ferreira et al., 2007)
5. Potential participants underwent a baseline clinical assessment to ensure motor control exercise is indicated for this chronic non-specific low back pain condition. A specific trunk muscle task-drawing in of the lower abdomen while maintaining an isometric contraction of the medial back muscles performed to evaluate the motor control strategy of the individual patient. The following criteria constitute correct performance of the task:
    - Moderate and sustained activation (> 10 seconds) of transversus abdominis
    - Moderate and sustained activation (> 10 seconds) of the lumbar multifidus muscles
    - Little or no activation of the global trunk muscles
    - No spinal or rib cage movement.
    - Normal breathing

Physiotherapist's clinical skill and experience will be used to determine the task performance level of the participants and patients would be considered eligible for motor control exercise if they are unable to perform this task (Maher, et al., 2005).

3.6 Exclusion Criteria

Participants was excluded if they have any of the following:

1. Suspected or confirmed serious spinal pathology (fracture, metastatic, inflammatory or infective diseases of the spine, cauda equina syndrome/widespread neurological disorder)
2. Pregnancy (Costa et al., 2009)
3. Nerve root compromise (at least 2 of the following signs: weakness, reflex changes, or sensation loss, associated with the same spinal nerve).
4. Presence of comorbid health conditions that would prevent active participation in exercise programs (Macedo et al., 2012).
5. Scheduled for major surgery during treatment or follow up period or a history of spinal surgery.

The presence of any pathology or contraindication to the treatment, these subjects should be further investigated and participation will be reconsidered as per assessor's decision. (Maher et al., 2005)

3.7 Pilot study

Pilot study is a preliminary run of the main study to highlight any problems which can be corrected and it is important always to run some pilot study before beginning the experiment. So, a pilot study is carried out before beginning the main study and the aim of this pilot study was to translated the English NPRS and RMDQ questionnaire translation in native language and replenish the list of conventional physiotherapy treatment is provided by Musculoskeletal department of CRP for managing the cases of chronic non-specific low back pain.

Researcher took one week for pilot study and visited the CRP Musculoskeletal department of Physiotherapy and consulted with Physiotherapist involved in the study.

A pilot study was carried out prior to the main data collection procedure to determine the responsiveness and side effect of the exercise as it is applied to the chronic non-specific low back pain patients. Using same questionnaire and measurement tools (linguistic validation in native language) the pilot study is conducted among available patients and by improvisations, corrections and careful supervision the final translated form and questionnaire is prepared for the study.

3.8 Treatment regime

Randomization and intervention:

After the participants gave their consent, the randomization procedure was performed. The randomization sequence was computer generated by an investigator not involved in recruitment or treatment allocation. Allocation was concealed in sequentially numbered, sealed forms by an investigator not involved in the study. Eligible patients were allocated to the treatment groups by the physical therapist who drew the next available envelope at the first treatment session. Because of time constraints due to funding and because we were able to recruit 10 patients for control and 10 patients for experiment group. The randomization schedule was known only to one investigator who was not involved in recruiting participants, and it was concealed from patients and the other investigators. No attempt was made to evaluate the effect of anything on trial outcomes.

The motor control exercise program is based upon the treatment approach reported by Richardson et al., 2004; Moseley, 2002 and similar to the protocol we used in an earlier trial and the protocol was developed by Costa et al., (2009).

The treatment protocol that is used in this study is developed by Costa et al., (2009) in association with long establish treatment protocols for Motor Control Exercise (MCE) and based on ‘Science of stability: Clinical Application to Assessment and Treatment

of Segmental Spinal Stabilisation for Low Back Pain' in accordance with The University of Sydney. The original protocol is procured from Prof. Leonardo O P Costa, Coordinator, Head – Masters and Doctoral Programs in Physical Therapy, University of Sao Paulo, via electronic mail media with his consent and is attached in the APPENDIX 3 unaltered.

Total 12 sessions (each half an hour) of intervention is received by both groups. In 8 weeks period, first 4 weeks participants received 2 sessions per week and then in advanced stage, participants received 1 session per week, followed by1 hour of home exercises instructed by the responsible physiotherapist.

At the first session, participants were comprehensively assessed by the physical therapist, who prescribed exercises that were individualized based on the participant's presentation. The exercises were designed to improve function of specific muscles of the low back region and control of posture and movement.

The motor control exercise program involved 2 stages. Each participant was progressed through the stages according to specific criteria that should be met in each stage. The 2 stages and their main objectives were:

• Stage 1. Train coordinated activity of the trunk muscles, including independent activation of the deeper muscles (including transversus abdominis and multifidus) and reduce over activity of specific superficial muscles in an individualized manner.

• Stage 2. Implement precision of the desired coordination and train these skills in static tasks and incorporate them into dynamic tasks and functional positions.

Stage 1 of the exercise program involved retraining of the multifidus and transversus abdominis muscles. These exercises were supplemented with exercises for the pelvic-floor muscles, breathing control, and control of spinal posture and movement. The specific muscles that were trained depended on the initial assessment. Participants were

taught how to contract these muscles independently from the superficial trunk muscles (Richardson et al., 2004). The exercises were progressed until the patient was able to maintain isolated contractions of the target muscles for 10 repetitions of 10 seconds each while maintaining normal respiration (Richardson et al., 2004). When this level of competence was achieved, patients were considered ready to progress to stage 2.

Stage 2 of the exercise program involved increasing the complexity of the exercise by progressing through a range of functional tasks and exercises targeting coordination of trunk and limb movement, maintenance of optimal trunk stability, and improvement of posture and movement patterns. Participants required the ongoing support of a trained physical therapist to ensure correct performance of the exercises. The participants were instructed to perform a daily set of home exercises. These exercises were performed at the same level and in the same position as those demonstrated during the treatment session. Session 8 was a discharge session in which the patient's progress was reviewed and exercises were prescribed to be continued at home. Then the post test data have been collected from the participants and patients will be prescribed exercises to continue at home.

The conventional physiotherapy is delivered to the control group according to the patient's best interest. Each conventional treatment session will last 30 minutes in duration to match the experiment group treatment sessions.

The conventional physiotherapy protocol used in the study is developed by the Physiotherapy Department, CRP, Savar, Dhaka and the approved, signed scanned copy of the original protocol 'Conventional Physiotherapy Protocol Followed by Physiotherapy Department For Chronic Low Back Pain (CLBP)' is attached in the APPENDIX 3.

3.9 Methods of data collection

3.9.1 Data collection tools

In this particular study, a written questionnaire, pen, paper and a Numeric Pain Rating Scale (NPRS) and the Roland Morris Disability Questionnaire (RMDQ) were used as a data collection tools.

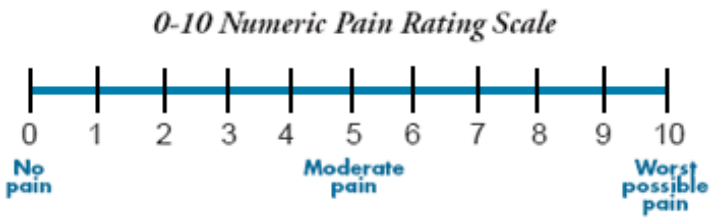
3.9.2 Questionnaire-

The questionnaire for this study was carefully developed under the constant observations, advice and permission of the supervisor following certain guidelines. There were close ended questions with Numeric Pain Rating Scale (NPRS) and the Roland Morris Disability Questionnaire (RMDQ) with some objective questions which were measured by the examiner and each question was formulated to identify the effect of motor control exercise along with the conventional physiotherapy for the treatment of chronic non-specific low back pain.

3.10 Measurement tools

3.10.1 Numeric Pain Rating Scale (NPRS)

The Numeric Pain Rating Scale (NPRS) is a segmented numeric version of the visual analog scale (VAS) in which a respondent selects a whole number (0–10 integers) that best reflects the intensity of the individual's pain .According to McCaffery et al. (1989) and later on Stevens et al., (2016) the Numeric Pain Rating Scale (NPRS -11) is an 11-point scale for the patient self-reporting of pain. It is for adults and children of 10years old or older.



High test–retest reliability has been observed in both literate and illiterate patients (r = 0.96 and 0.95, respectively) before and after medical consultation. Sensitivity of NRS for 'unbearable' pain in older patients was 72% with a specificity of 97·2%. With a cut-off point NRS, sensitivity increased to 83%, while specificity was 96·7%. With a cut-off point NRS, sensitivity was 94%, while specificity was 85% (Chen et al., 2015).

3.10.2 The Roland Morris Disability Questionnaire (RMDQ)

The Roland Morris Disability Questionnaire (RMDQ) is a 24-item questionnaire related to normal activities of daily living. Patients are asked to tick the items that they perceive as difficult to perform due to low back pain. Each answer is scaled either 0 (no difficulty) or 1 (difficulty), thus leaving a range of scores from 0 to 24, with a higher score indicating higher levels of activity limitation. This well-known questionnaire has proven to be reliable (Brouwer et al., 2004) valid, (Costa et al., 2009) and responsive (Pengel et al., 2004) in patients with low back pain.

The 24-item Roland-Morrison Disability Questionnaire (RMDQ) was used to assess self-rated physical disability through a series of Yes/No questions regarding aspects of disability, with 24 points representing maximum disability. The RMDQ has been recommended as a valid questionnaire to measure disability for interventions regarding LBP (Dworkin et al., 2005).

Stevens et al. (2016) stated that the RMDQ includes items on physical ability/ activity, sleep/rest, psychosocial, household management, eating and pain frequency. It is designed to take approximately 5 minutes to complete, without any assistance from the administrator.

Instructions and scoring: The Roland Morris Disability Questionnaire can be administered face-to-face, electronically or over the phone. The score can range from 0 (no disability) to 24 (maximal disability). A slight modification of the scoring method

is to have yes/no boxes to be ticked. In this way it is possible to distinguish a missing value from a deliberate 'no' response. If this method is used, the 0 to 24 score should be converted to a percentage score, dropping unanswered questions from the total when more than a single question is left unanswered (Kent & Lauridsen, 2011).

Expected associations with pain and spinal movement confirm external construct validity. The Sensitivity and Specificity at cut off point of 0.5 was 80% and 84% with respectively positive predictive value (PPV) of 83.33% and negative predictive value (NPV) of 80.76% (Nambi, 2013).

3.11 Data Collection procedure

The data collection procedure was carried away by an examiner who has no connection with this research. This procedure conducted through assessing the patient on the basis of inclusion and exclusion criteria, randomization through using Microsoft Office 2013 plus Excel, pretest data collection, 8 weeks treatment sessions.

After screening the patient at department and randomization, the patients were assessed and treated by the physiotherapists. Trail group received conventional physiotherapy along with motor control exercise (Stage 1 and stage 2) and the control group participants only received conventional physiotherapy according to their condition.

A pilot study was carried out prior to the main data collection procedure to determine the responsiveness and side effect of the exercise as it is applied to the chronic non-specific low back pain patients (Costa et al., 2009).

Data was gathered through a randomisation, pretest, and intervention and post-test procedure and by using a written questionnaire form which was formatted and prepared by the researcher under the supervision of the supervisor which also includes the Numeric Pain Rating Scale (NPRS) to measure pain intensity level and the Roland

Morris Disability Questionnaire (RMDQ) to measure the disability level, stated in the APPENDIX.

Pretest was performed before the intervention and the same procedure was performed to collect the posttest data. The researcher gave vague instruction to the data collector how to proceed with the questionnaire and the scales used in that.

A Bangla questionnaire was used as the participants are native Bangla speaker and the Bangla translation of Roland Morris Disability Questionnaire (RMDQ) was used with the permission from the Developers of the questionnaire. The linguistic validation is performed due to the difference of language and to better communication purpose as the participants are Bangla native speakers.

The data collector collected the data both in trail and control group in presence of the physiotherapist in order to reduce the biasness. The patient was totally blind about the procedure and the researcher has no connection with the data collection procedure. The data collector only gave her the participants filled up questionnaires.

At the end of the trail specific test were performed for statistical analysis.

3.12 Ethical Considerations

The research proposal was submitted for approval to the Institutional Review Board (IRB) of BHPI and to the administrative bodies for of the ethical committee of CRP. Again before beginning the data collection, researcher has obtained the permission the concerned authorities ensuring the safety of participants. In order to avoid ethical claims, the participants were set free to receive treatment for other purposes as usual. Each participants were informed about the study at the beginning of the trail and given a full proof written consent.

3.13 Informed Consent

A signed informed consent was ensured from every participants prior to the beginning of the trial and the data collector. The researcher obtained consent to participate from every subject. All participants are informed that they have full authority over the decision if they want to meet the outdoor doctor for consultation or if the condition become worse. Participants were informed that they were completely free to decline answering any questions during the study and were free to withdraw their consent and terminate participation at any time. Withdrawal of the participation from the study, it would not affect their treatment in the Physiotherapy Department and they would still get the same facilities and treatment according to their condition.

Every subject had the opportunity to discuss their problem with the senior authority or administration of CRP and have any questioned answer to their satisfaction. Any query or questions related to the study or participation would be welcomed by the researcher herself.

3.14 Data analysis

The collected data is analyzed through interferential statistics using "Mann Whitney U test" for pain and disability. All participants were coded according to group to maintain participant's confidentiality and both the experiment and control group participants score their pain intensity on the Numeric Pain Rating Scale (NPRS) and disability level through Roland Morris Disability scale (RMDS) was used prior to the trial and after the intervention sessions. Reduction of pain intensity and disability level for both groups and improvement of functional activities are the differences between pretest and posttest score and it should be analyzed with the help of U test. The Mann-Whitney U test and Wilcoxon Signed Rank test are used for the analysis after eight session of treatment both trial and the control group.

The Mann–Whitney U test is often viewed as the nonparametric equivalent of Student's t-Test for Independent Samples, but this comparison may be somewhat too convenient. However, the Mann–Whitney U-Test is used with nonparametric data (typically, ordinal data). Even so, the Mann–Whitney U-Test has many appropriate uses and it should be considered when using ranked data, data that deviate from acceptable distribution patterns, or for when there are noticeable differences in the number of subjects in the two comparative groups (MacFarland & Yates, 2016).

The study is an experimental study and has unmatched groups of different participants, who was randomly assigned by computer generated random allocation using Excel to conventional physiotherapy along with motor control exercise and only conventional physiotherapy group and the measurement of the outcome came from considering ordinal, interval or ration data.

3.15 Significant level

To find out the significant level of the study, it is undoubtedly important to calculate the "P" (Probability) value. This experimental study hypothesis was one tailed because it was producing a specific direction of the result.

A "P" values refer the probability of the results for the experimental study. The word probability refers to the accuracy of the findings. A 'p' value is called the level of significance for an experiment and If P value is < 0.05 which will be accepted by the researcher to show the significant result of the study to prove or support the hypothesis and reject the null hypothesis. 'The statistical approach to determining sample size is the power calculation. Statistical power is a measure of how likely the result is to produce a statistically significant result for a difference between groups of a given magnitude'. Statistical test of significant apply probability theory to work out the changes of obtaining the observer result the significance levels of 0.05, 0.01, 0.001 are

commonly used an indicated of statistically significant difference between variables (Curtis et al., 2015).

3.16 Elimination of confounding variables

A confounding variable is a distraction, it can allow correlation even though there isn't any and they can introduce biasness which can lead to false interpretation of the study. There were also some confounding variables in this study that needed to be controlled such as, patients therapy session date, home advised exercise performances, psychological myths, steroid injection or other treatment which could interfere with the trail outcome.

Researcher has found no significant difference between the ages of the two groups, so there is no influence of age in the result. To control the confounding variables and biasness the researcher has given strict instruction to the data collector to maintain inclusion criteria as to include only those who has no history of ongoing physiotherapy intervention, steroid injections or other treatments.

CHAPTER- IV RESULTS

20 patients were enrolled in the study. 10 in the Motor Control Exercise (MCE) along with conventional treatment group (experimental group) and 10 in the only conventional treatment group (control group). Every participants of both experimental and control group scored their pain on Numerical Pain Rating Scale (NPRS) and Disability on Roland Morris Disability Questionnaire (RMDQ) before and after completion of the treatment.

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

4.1. A Participants Socio-Demographic baseline

Table 1: Demographic variables of the participants.

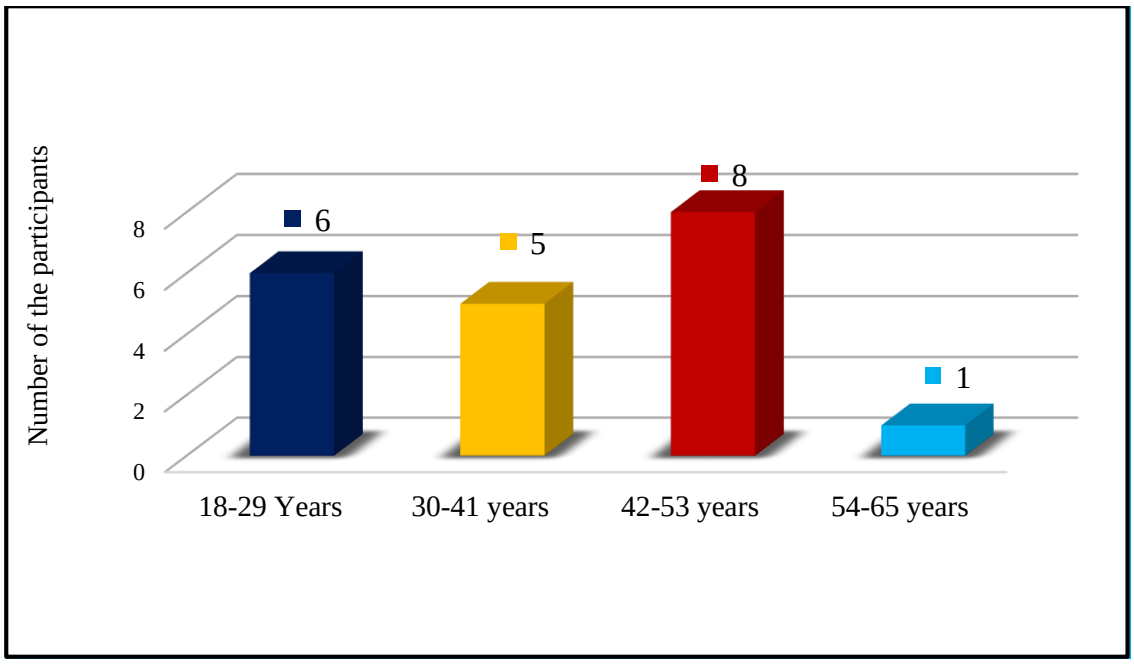
Variables	Group (Mean ± SD)				P
	Control Group	N	Experiment Group	N	
Age of the participants (y)	37.70 ± 11.982	10	39.10±12.485	10	0.526
Occupation of the participants	3.20 ± 1.619	10	3.30 ± 2.627	10	0.660
Duration of pain of the participants (months)	3.40 ± 1.838	10	3.50 ± 2.121	10	0.434
Pretest NPRS score	7.00±0.943	10	7.40 ± 0.966	10	0.243
Pretest RMDQ score	17.70 ± 2.452		12.00 ± 2.936	10	0.500

The above mentioned table 1 shows the variables, their mean with standard deviations and significance levels in this study. Age, occupation of the participants, duration of pain of the participants (months), pretest pain score in NPRS and pretest RMDQ score show not significant p value (<0.05) indicates this variables don't have significant influence on this study.

4.1. B Age Range of the participants

There are five age range groups starting from 18 years to end at 65 years.

Figure 2: Age range of the participants.

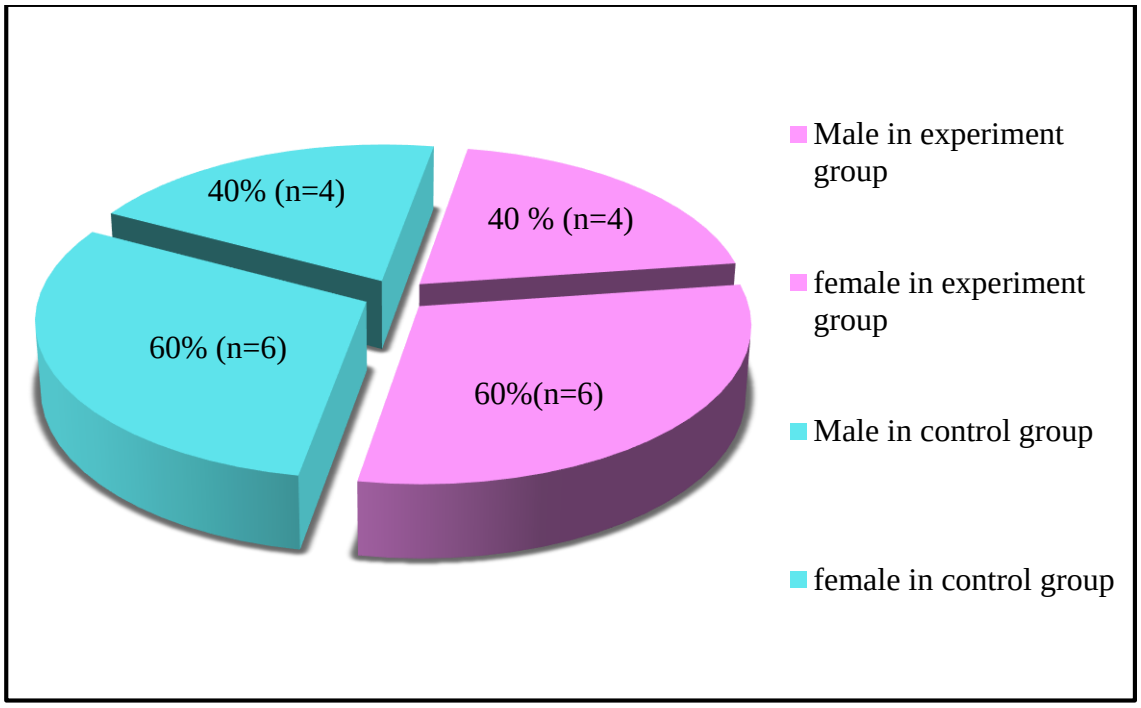


This bar presentation shows that 42-53 years age group contains most participants (8= 40%).It is obvious that age has an effect even though it is not that significant but middle aged to older people suffer much by chronic low back pain but young patients (18 to 29 years) also has a high prevalence (6=30%) in this study. 5 (25%) participants in the 30 to 41 years group and only 1(5%) patient in the 54 to 65 age group.

4.1. C Sex of the participants

20 Patients with Chronic non-specific low back pain were included as sample of the study, among them almost 50% (n=10) were male and about 50% (n=10) were female

Figure 3: Male female ratio in the study.

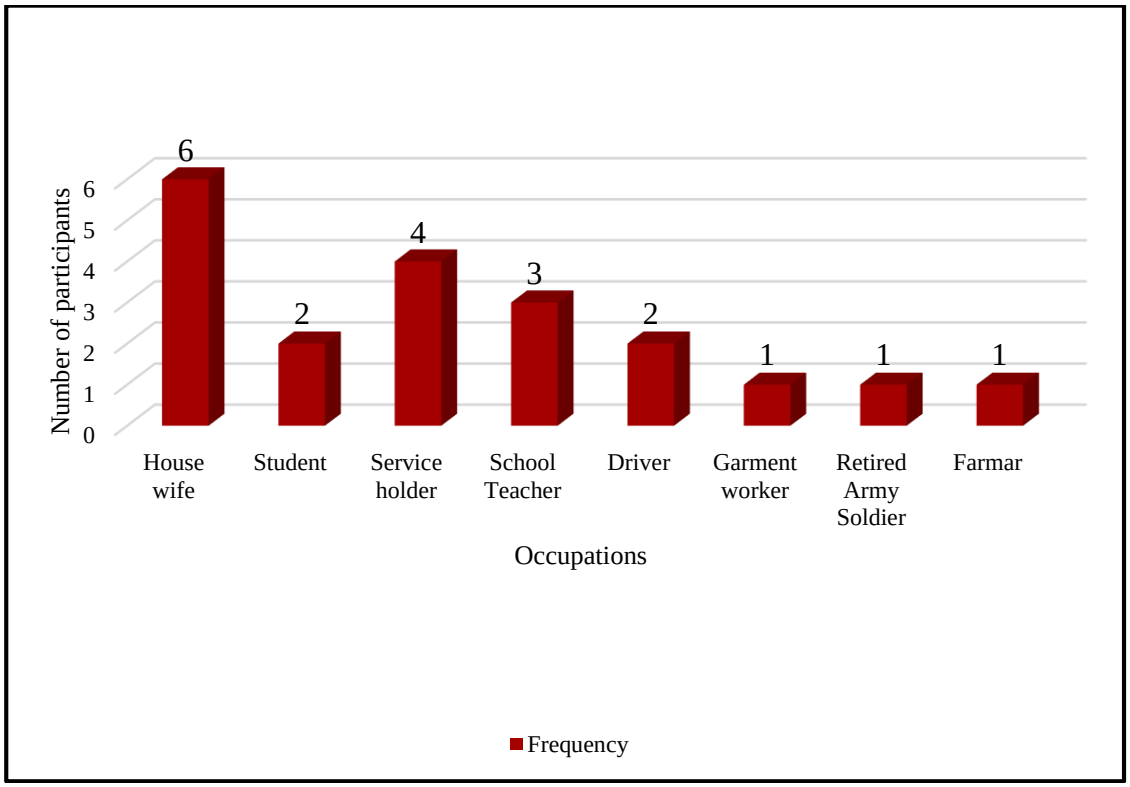


Among them, In Control Group 40% (n=4) were Male and 60% (n=6) were Female and in trail Group 60% (n=6) female and 40% (n=4) were male.

4.1. D Occupation of the participants

In total 20 participants there were 8 types of occupations.

Figure 4: Occupation of the participants.

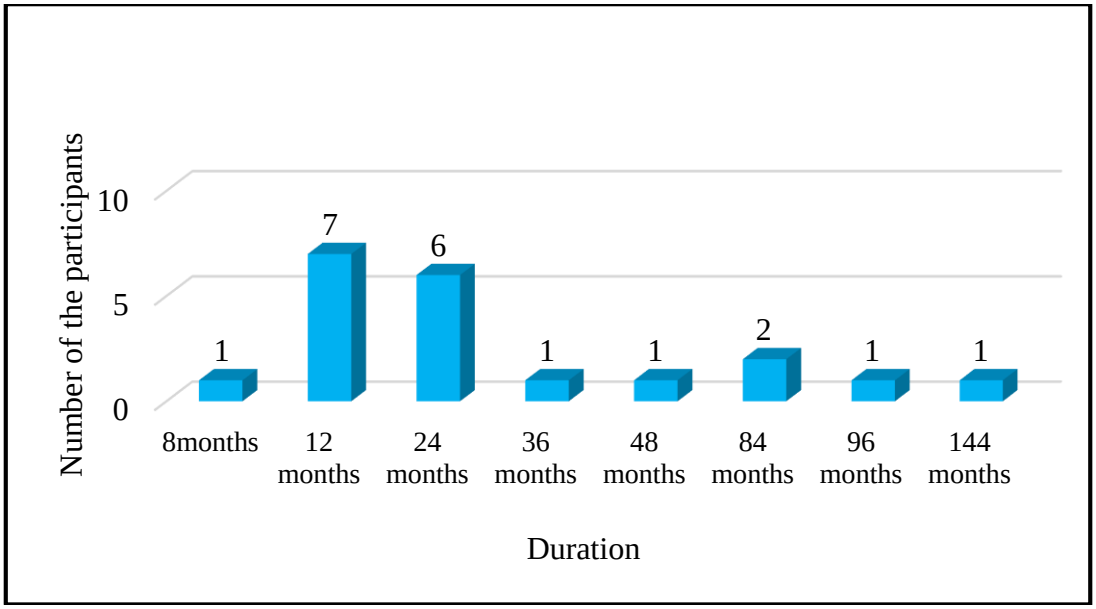


The house wife is most occurred occupation among the participants (6=30%), then service holders (4=20%), school teacher (3=15%), students (2=10%), driver (2=10%), garment workers (1=5%), retired army officer (1=5%) and one farmer(5%). As the P value shows no significance of the occupation on the pain occurrence or the disability level but chronic pain affects their daily activities scarcely.

4.1. E Duration of pain in the participants

Only chronic low back pain patients were selected for the study. Non-specific low back Pain may be defined as pain and discomfort localized below the costal margin and above the inferior gluteal folds, with or without referred leg pain of at least 3 months duration. Low back pain is considered to be chronic if it has been present for longer than three months. So all the participants were patients of chronic non-specific low back pain and the duration must exceed 3 months at least. Among them mostly, 35% (n=7) and 30 %(n=6) patients were suffering for consecutively 1years and 2 years.

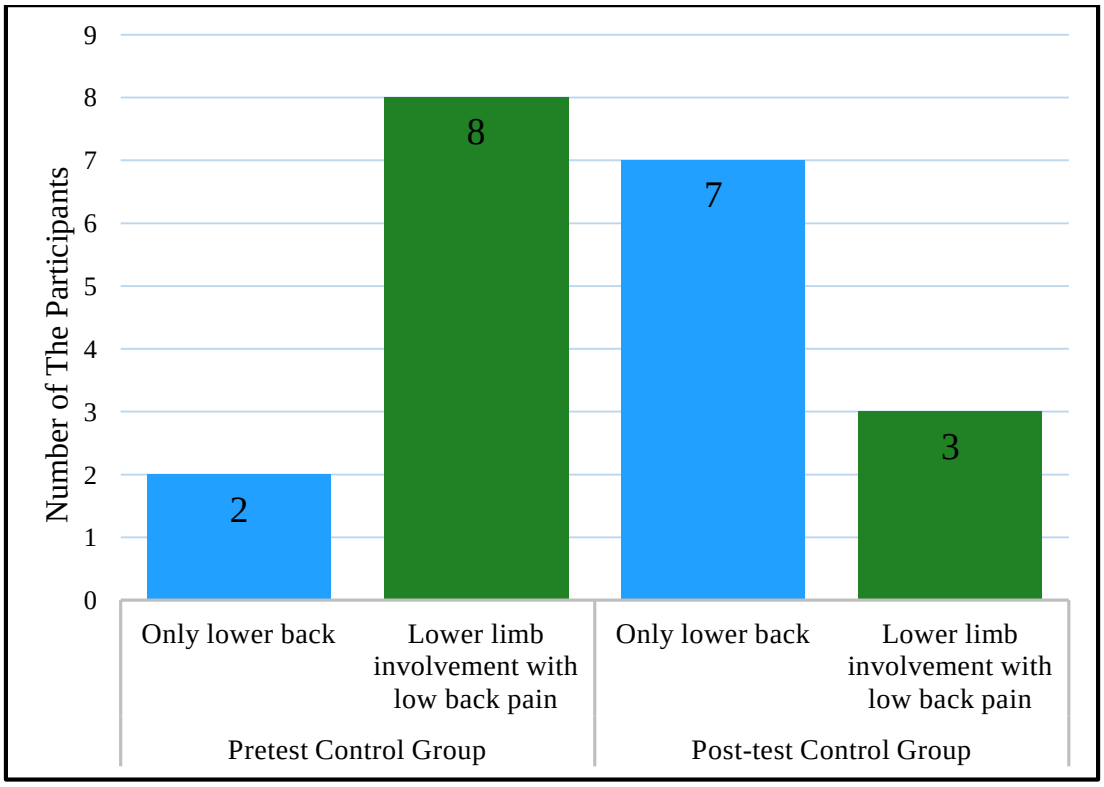
Figure 5: Duration of pain in the participants.



Most prevalent duration is 12 months= 1year (7 participants), then 24 months=2 years (6 participants) then 8 months (1 participants), 36 months (1), 48 months (1), 34 months(2), 96 months (1) and 1 patients is suffering for 12 years (144 months).

4.1. F Site of the pain among Control Group participants in pretest and post test

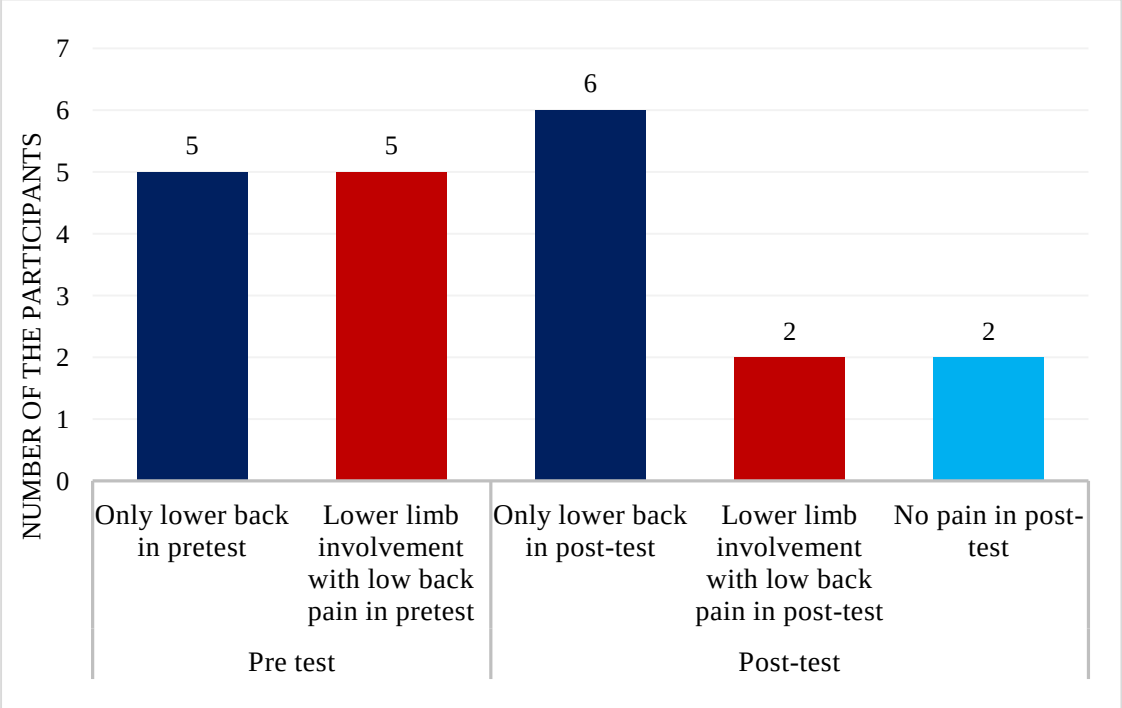
Figure 6: In control group, site of pain.



This bar chart presents site of pain in control group. In pretest there are 2 participants complained pain only in lower back and 8 participants confirmed lower limb involvement. But after application of only physiotherapy, post-test data shows, there is reduction of pain perception.7 participants expressed pain only lower back and 3 participants with lower limb involvement.

4.1. G Site of the pain among Experiment Group participants in pretest and post-test:

Figure 7: Site of the pain among Experiment Group participants.



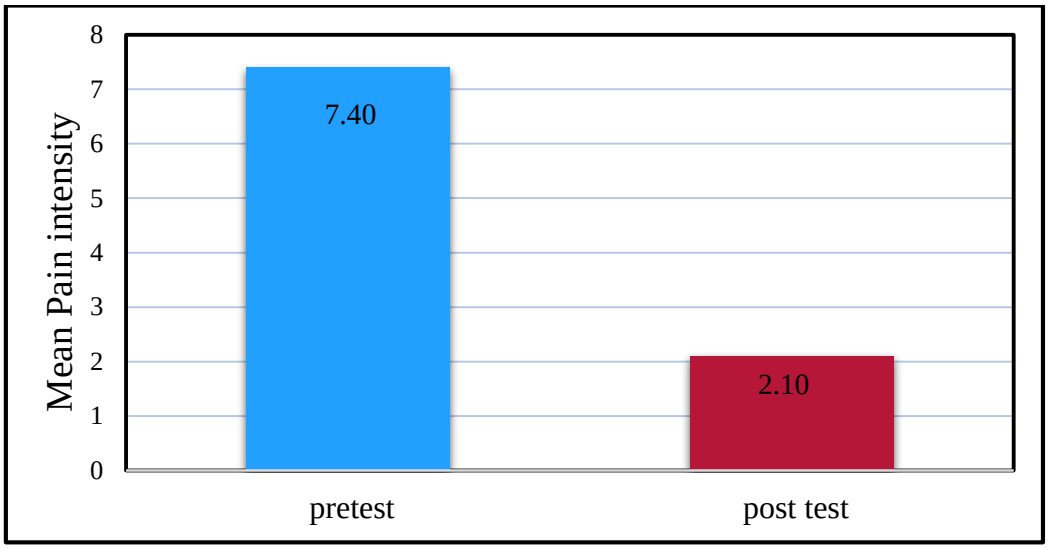
This bar chart shows site of pain in trail group. In pretest there are 5 participants complained pain only in lower back and 5 participants confirmed lower limb involvement. But after application of Motor control exercise (MCE) along with conventional physiotherapy, post-test data shows, there is reduction of pain perception.6 participants expressed pain only lower back and 2 participants with lower limb involvement and 2 patients expressed they were not feeling any pain at that moment.

4.2. A Effects on pain and disability

In trail group pain level,

Mean reduction of pain intensity rated in score means in Numerical Pain Rating Scale (NPRS).

Figure 8: Mean reduction of pain intensity in trail group on NPRS scale.

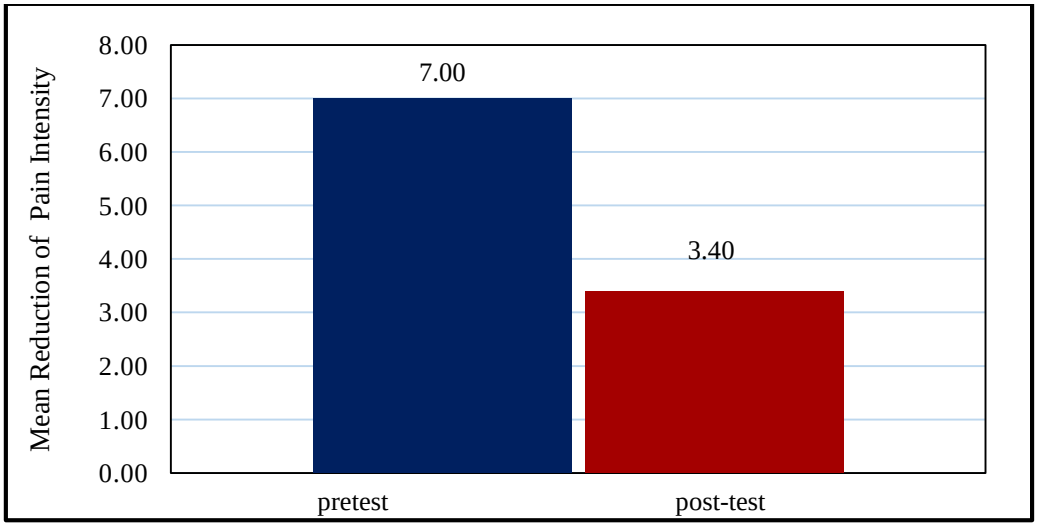


In trail group 10 participants pretest mean pain ration score on NPRS was 7.40 and post-test pain ration scores mean was 2.10. That indicate that Motor control exercise along with conventional physiotherapy is effective in reduction of pain among the patients with chronic non-specific low back pain.

In Control Group pain level,

Mean reduction of pain intensity rated in score means in Numerical Pain Rating Scale (NPRS).The pretest pain mean was 7.00 and the post test was 3.40.

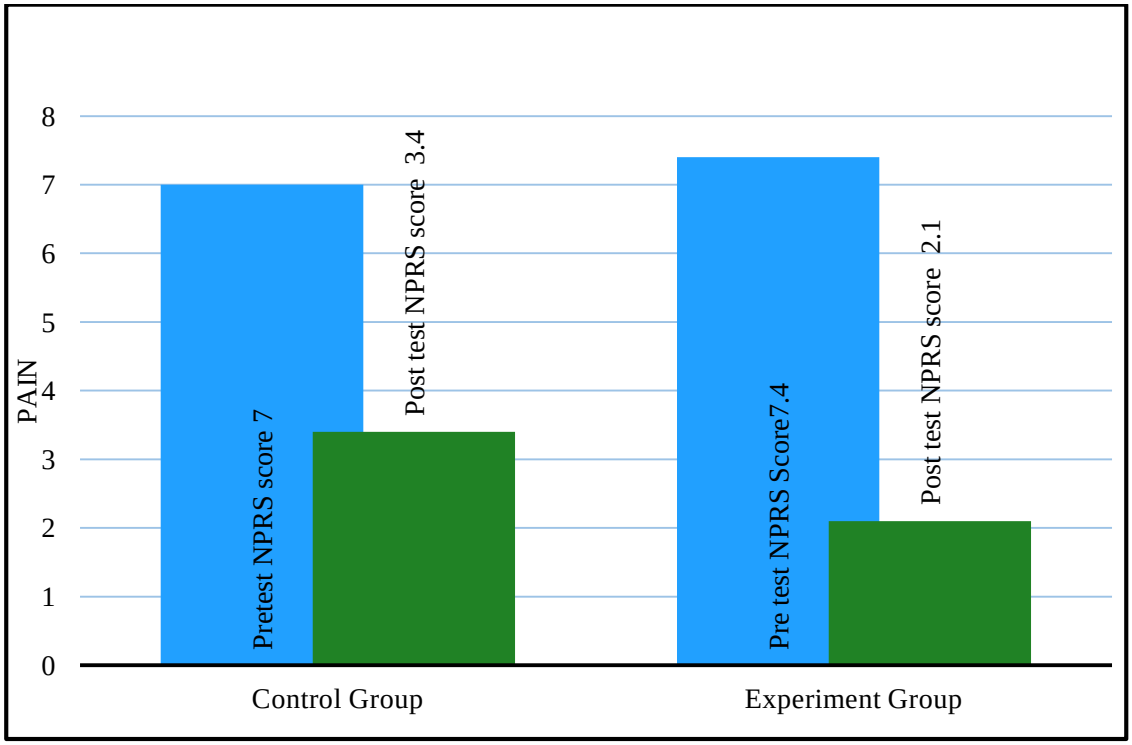
Figure 9: Mean reduction of pain intensity in control group on NPRS scale.



In control group 10 participants pretest mean pain ration score on NPRS was 7.00 and post-test pain ration scores mean was 3.40. That indicate that only physiotherapy is also effective in reduction of pain but not as efficient as trail group among the patients with chronic non-specific low back pain.

4.2. B Mean reduction of pain:

Figure 10: Mean reduction of pain intensity in NPRS scale.



Variables in this study statistically significant at the $p<0.05$ level of significance. In this study it was found that the reduction of chronic low back pain was statistically significant.

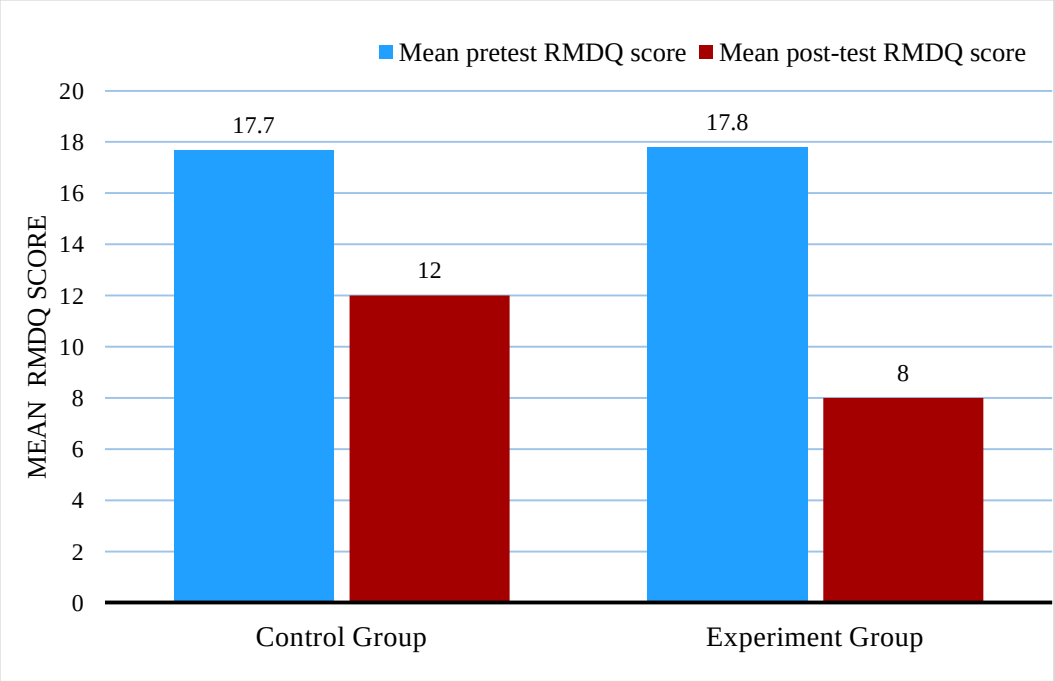
In control group, the mean NPRS score in pretest was 7.00 and in post-test was 3.40.In trail group the mean score in pretest 7.4 and post-test was 2.1. In both groups pain reduced but in trail group the reduction is more marinated and vivid. So it can be stated that, Motor Control Exercise (MCE) along with conventional physiotherapy has an effective influence in reduction of pain level among the patient with chronic non-specific low back pain.

4.2. C Mean difference of RMDQ score

After pretest and post-test the mean difference of RMDQ score was in experimental group and in control group. In pretest of both group,

Mean Reduction of RMDQ score

Figure 11: Mean difference of RMDQ score.



In this study it was found that the reduction of disability level occurred due to chronic low back pain was statistically significant. Variables in this study statistically significant at the $p<0.05$ level of significance.

In control group, the mean RMDQ score in pretest was 17.70 and in post-test was 12.00.In trail group the mean score in pretest 17.8 and post-test was 3.712.In both groups disability reduced but in trail group the reduction is more marinated and vivid. So it can be stated that, Motor Control Exercise (MCE) along with conventional physiotherapy has an effective influence in reduction of disability level among the patient with chronic non-specific low back pain.

4.3.1 Patient pain on Mann-Whitney test in between groups

Table II: Pain on Mann-Whitney U test score between group

Category of the participants	N	Mean of post-test pain ± SD	Mean Ranks	Mann-Whitney U test score	P
Trial group	**10**	**2.10 ± 1.370**	**7.75**	**22.500**	**0.018**
Control group	**10**	**3.40 ± 0.966**	**13.25**		
Total	**20**				

From this data, it can be concluded that pain reduction score on the Numerical Pain Rating Scale (NPRS) in trail group was statistically significantly higher than the control group (U = 22.500, p = .018).

An examination of the findings in Table III shows that the results of the Mann Whitney U test applied to the posttest pain score of the participants in the experimental and control groups revealed a statistically significant difference at the level of $p<0.05$(Z=-2.163;p=.018). The rank average of the posttest disability scores of the experimental group participants was 7.75, while participants in the control group had a posttest pain score rank average of 13.25.This result indicates that the experimental group participants who have received Motor Control Exercise (MCE) along with conventional physiotherapy attained higher success at the pain reduction score when compared to the participants of the control group who have received only conventional physiotherapy.

4.3.2 Pain comparison using Wilcoxon Signed Rank test within the control group.

Table III: Rank and test statistics of patient rated pain within the control group.

Pain at resting position (cm) Post-test - Pain at resting position (cm) pretest	N	Mean Rank	Sum of Ranks	Test Statistics (Wilcoxon Signed-Rank Test)	
				Based on positive ranks Z	P
Positive rank	0	.00	.00		
Negative rank	10	5.50	55.00	-2.842	0.001
Ties	0				
Total	10				

Table III described the comparison of the participants before (pretest) and after (post-test) pain score. The table's legend displayed that in the control group none of the participant's experienced increased pain after only physiotherapeutic intervention (conventional physiotherapy) is given to them.10 participants of control group had higher score before the intervention and the pain score reduced after the application of the conventional physiotherapy. In addition, no participant has experienced increase of pain after the treatment session in control group so the positive rank numbers zero. The point 'ties' indicate that no patient's pain score remained same as the pretest score. P value is 0.001 which that there is less than a 1% chance that the results are due to random error and it is significant. Therefore it is can be said that, the null hypothesis is accepted and the hypothesis is rejected.

4.3.3 Pain comparison using Wilcoxon Signed Rank test within the trail group.

Table IV: Rank and test statistics of patient's disability level within the trail group.

Pain at resting position (cm) post-test - Pain at resting position (cm) pre test	N	Mean Rank	Sum of Ranks	Test Statistics (Wilcoxon Signed-Rank Test)	
				Based on positive ranks Z	P
Positive rank	0	0.00	0.00		
Negative rank	10	5.50	55.00	-2.829	0.001
Ties	0				
Total	10				

Table IV described the comparison of the participants before (pretest) and after (post-test) pain score. The table's legend displayed that in the trail group no increase of pain after Motor Control Exercise (MCE) along with physiotherapeutic intervention (conventional physiotherapy) is given to them.10 participants of trial group had higher score before the intervention and the pain score reduced after the application of the Motor Control Exercise (MCE) along with physiotherapeutic intervention (conventional physiotherapy). In addition, no participant has experienced increase of pain after the treatment session in trial group so the positive rank numbers zero. The point 'ties' indicate that no patient's pain score remained same as the pretest score. P value is 0.001 which that there is less than a 1% chance that the results are due to random error and it is significant. Therefore it is can be said that, the null hypothesis is accepted and the hypothesis is rejected.

4.3.4 Patient Disability on Mann-Whitney test in between groups

Table V: Disability on Mann-Whitney U test score between groups.

Category of the participants	N	Mean of post-test disability score on RMDQ	Mean Ranks	Mann-Whitney U test score	P
Trial group	**10**	**8.00 ± 3.712**	**7.90**		
Control group	**10**	**12.00 ± 2.936**	**13.10**	**24.000**	**0.023**
Total	**20**				

The above table mentioned tabulated data, it can be concluded that disability reduction score on the Roland Morris Disability Questionnaire (RMDQ) in trail group was statistically significantly higher than the control group (U = 24.000, p = 0.023).

An examination of the findings in Table shows that the results of the Mann Whitney U test applied to the post-test disability score in RMDQ of the participants in the experimental and control groups revealed a statistically significant difference at the level of $p<0.05$ (Z= -2.000; p=0.023). The rank average of the posttest disability scores of the experimental group participants was 7.90, while participants in the control group had a posttest pain score rank average of 13.10. This result indicates that the experimental group participants who have received Motor Control Exercise (MCE) along with conventional physiotherapy attained higher success at the disability reduction score when compared to the participants of the control group who have received only conventional physiotherapy.

4.3.5 Disability level comparison using Wilcoxon Signed Rank test within the control group.

Table VI: Rank and test statistics of patient's disability within the control group.

Disability score in RMDQ at post-test - Disability score in RMDQ at pre test	N	Mean Rank	Sum of Ranks	Test Statistics (Wilcoxon Signed-Rank Test)	
				Based on positive ranks Z	P
Positive rank	0	0.00	0.00		
Negative rank	10	5.50	55.00	-2.829	0.001
Ties	0				
Total	10				

Table VI described the comparison of the participants before (pretest) and after (post-test) disability score in RMDQ. The table's legend displayed that in the control group none of the participant's experienced increased disability level or score after only physiotherapeutic intervention is given to them.10 participants of control group had higher score in RMDQ before the intervention and the disability score reduced after the application of the only conventional physiotherapy. In addition, no participant has experienced increase of disability level after the treatment session in control group so the positive rank numbers zero. The point 'ties' indicate that no patient's disability score in RMDQ remained same as the pretest score. P value is <0.001 which that there is less than a 1% chance that the results are due to random error and it is significant. Therefore it is can be said that, the null hypothesis is accepted and the hypothesis is rejected.

4.3.6 Disability level comparison using Wilcoxon Signed Rank test within the trail group.

Table VII: Rank and test statistics of patient's disability level within the trail group.

Disability score in RMDQ at post-test - Disability score in RMDQ at pre test	N	Mean Rank	Sum of Ranks	Test Statistics (Wilcoxon Signed-Rank Test)	
				Based on positive ranks Z	P
Positive rank	0	0.00	0.00		
Negative rank	10	5.50	55.00	-2.814	0.001
Ties	0				
Total	10				

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

CHAPTER-V DISCUSSION

This is the first randomized control trial of motor control exercise for chronic low back pain in Bangladesh. By considering motor control exercise treatment, outlining the likely outcomes, and assisting them to decide whether they want to pursue the treatment.

Costa et al., (2009).The exact biological basis for the efficacy of motor control exercise in patients with low back pain is still unclear, but if subjects can be taught to control their trunk muscles while performing functional activities, (Hodges, 2008) then this may explain the improvements seen in activity, activity limitation, and disability level caused by the chronic low back pain. There is some evidence that this training can change trunk muscle behavior during functional tasks (Tsao and Hodges, 2007). A range of mechanisms have been proposed to explain the effect of motor control training on pain. These mechanisms include reduced load and improved quality of movement as a result of improved coordination of trunk muscles.

Such changes in control may be mediated by plastic changes at the motor cortex or elsewhere in the motor system. This study demonstrated that motor control exercise produced a reduction in the risk for persistent pain. This finding is supported by earlier works suggesting that patients who have continuing impairment of the deep trunk muscles experience more recurrent low back pain episodes.

The analysis of significance was carried out by using non parametric Mann-Whitney U test to compare the effectiveness of Motor Control Exercise (MCE) along with conventional physiotherapy compared to the only conventional physiotherapy for the management of chronic non-specific low back pain.

By using a non-parametric Mann-Whitney U test on the data the results were found to be significant ($p < 0.005$ for a one tailed hypothesis). The null hypothesis therefore can

be rejected. That actually means that the Motor Control Exercise (MCE) along with conventional physiotherapy is more effective than only conventional physiotherapy technique reducing pain and disability in the patients with chronic non-specific low back pain.

The researcher found significance improvement of pain. .Pain numerical rating scale was used in the study to measure pain level in participants in pretest and afer intervention , so was used by Morone et al. (2016); Costa et al. (2009) in his placebo control trail of motor control exercise, used by Macedo et al. (2012) in their randomised control trail. In experimental group, Mean difference of reduction of pain was 5.3 and Mean difference of reduction of disability was 9.8 and in case of the pain reduction was statistically significant in all cases, in all groups pain was reduced.

In this study Roland Morris Disability Scale was used in case of chronic low back pain (CLBP) generated disability. In here, subjects sored in between 0-24 in the RMDQ score. The mean difference of the RMDQ scale was 5.7 in control group and 9.8 in experimental group. In this research, the researcher found that the low back pain, that were referred to the lower limb, their reference reduced and pain stayed at centrally, pain during movement reduced in both groups after 8 session of treatment. The functional level of the patient was increased and the disability caused by the chronic non-specific low back pain was significantly reduced. The disability scored reduced in both groups but the experimental group shows promising result and their dependency reduced and their activity level improved.

Roland Morris disability questionnaire is a well-accepted measurement tool for low back pain and is frequently used by the researcher worldwide. Stevens et al. (2016); Costa et al. (2009); Ferreira et al. (2007) used RMDQ in their studies, even systemic

reviews, meta analyses such as Chiarotto et al. (2016) are performed widely with this measurement tool.

One area of high priority in future research is the development of clinical methods to assess deficits in motor control. Such methods would allow sub classification of patients and the identification of those in need of MCE. According to Ferreira et al., (2009) the treatment effects of MCE are greater in those with poorer ability to activate TrA, implying one subgroup of patients experiencing LBP. It has been debated whether MCE should focus on isolated contraction of local musculature or if exercises should aim at engaging all abdominal and back extensor musculature to ensure spinal stability and robustness (Bystrom et al., 2013).

Dropout in randomised controlled trials is common and threatens the validity of results, as completers may differ from people who drop out. Differing dropout rates between treatment arms is sometimes called differential dropout or attrition. Although differential dropout can bias results, it does not always do so. Similarly, equal dropout may or may not lead to biased results. Depending on the type of missingness and the analysis used, one can get a biased estimate of the treatment effect with equal dropout rates and an unbiased estimate with unequal dropout rates. Unequal dropout rates do not imply that estimates are biased (Bell et al., 2013).

Dropout percentage of the study is 30% (6 participants among 20 patients). Two of them were male and 4 of them females. From control group the percentage were 80% (4 participants) and from the trail group the percentage were 20% (2 participants).

Also researcher must aware about the correct method of adjusting the dropout rate while estimating the sample size. Thus, a well-planned and well-designed clinical trial would give better results.

Limitation of the study

The main limitation of this study was its short duration. This study was used 20 patients with chronic non-specific low back pain. This was a very small number of samples in both groups which was not sufficient for the study to generalize to wider population of low back pain. Physiotherapists could not be blinded to the interventions. The other main limitation of the study was that the trial therapists were not blinded to the treatment allocation. The researcher are unaware of a method to blind therapists in trials of exercise. The researcher tried to minimize the effect of unbinding by training the trial therapists.

This research carried out in CRP, Savar such a small environment; it was very difficult to keep confidential the aims of the study for blinding procedure. The samples were selected between the age group of 18-65year, but the researcher couldn't find out which age group patients were more effective. If the most effective age group were found then the result will be more specific.

There was no available researches representing effectiveness of this intervention before this one in Bangladesh. So timeline comparison of the particular exercise's effectiveness couldn't be possible.

CHAPTER-VI CONCLUSION AND RECOMMENDATION

In conclusion, the results of this trial suggest that in patients with chronic or recurring LBP, MCE is superior to only conventional physiotherapy intervention with regard to disability and pain. More studies are, however, needed to investigate what subgroups of patients experiencing CLBP respond best to MCE. The study concluded that the effectiveness of conventional physiotherapy with along with Motor Control Exercise (MCE) was better than the only conventional physiotherapy for chronic non-specific low back pain patients at different functional position which was a Randomised Control Trail (RCT).

The optimal implementation of Motor Control Exercise at present is unclear and the effect of such exercises on various condition remains yet questionable. Future trials evaluating issues such as dosage parameters, feedback approaches, and effects in defined subgroups are a high priority.

The researcher recommend that in clinical practice therapists identify their area of expertise and treat their patients accordingly.

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APPENDIX 1 : CONSENT FORM IN ENGLISH

I am Tasnuva Alam, a final year student of the Bachelor of Science in Physiotherapy course of Bangladesh Health Professions Institute (BHPI), the academic institute of Centre for the Rehabilitation of the Paralysed (CRP). In regards to partial fulfillment of requirements for the Bachelor Degree, it is obligatory to conduct a research project in 4th year. So, I would like to invite you to take part in my study. The research title is "**Effectiveness of Motor Control Exercise along with Conventional Physiotherapy among the Patients with Chronic Non-specific Low Back Pain"** and the aim is to find out the effectiveness of motor control exercise along with conventional physiotherapy among the patients with chronic non-specific low back pain.

You have to answer a few question before and after the completion of six treatment sessions regarding pain and disability caused by your chronic low back pain. Your participation in this study is voluntary. If you want to withdraw yourself from the study, you may do so at any time without any hesitation. You will not be paid for the participation.

The researcher will maintain confidentiality of all proceedings. Without your permission, the data provided by you will never be used and this research and will not cause you any harm in anyways. Only your personal details and answers of the questionnaire will be documented and used for the study purpose.

Considering all that, I want to participate in this study. ☐ Yes ☐ No

Signature of the participant and Date ……

Singnature of data collector and date ……

Signature of the researcher and Date ……

সম্মতিপত্র (বাংলা)

আমি তাসনুভা আলম, পক্ষাঘাতগ্রস্থদের পুনর্বাসন কেন্দ্র (সি আর পি)-র একটি শিক্ষা প্রতিষ্ঠান, বাংলাদেশ হেলথ প্রফেশন্স ইন্সটিটিউট (বি এইচ পি এই), এর ফিজিওথেরাপি বিভাগের ৪র্থ বর্ষের একজন ছাত্রী। আমার বি এস সি ইন ফিজিওথেরাপি ডিগ্রির আংশিক পূর্ণতার প্রয়োজনে ৪র্থ বর্ষে একটি গবেষণা কর্ম পরিচালনা করা বাধ্যতামূলক। আমার গবেষণাটিতে অংশগ্রহণের জন্য আপনাকে আমন্ত্রণ জানাচ্ছি। আমার গবেষণাটি "নির্দিষ্ট কোন কারণ ছাড়া ক্রনিক কোমরব্যথা রোগীদের ক্ষেত্রে প্রচলিত ফিজিওথেরাপি এর সাথে মোটর কন্ট্রোল এক্সারসাইজের কার্যকারিতা " নিয়ে এবং গবেষণাটির মূল লক্ষ্য হল নির্দিষ্ট কোন কারণ ব্যতীত ক্রনিক কোমরব্যথা রোগীদের ক্ষেত্রে প্রচলিত ফিজিওথেরাপি এর সাথে মোটর কন্ট্রোল এক্সারসাইজের প্রভাব এবং কার্যকারিতা মূল্যায়ন করা।

আপনাকে গবেষণাটি শুরুর পূর্বে এবং ছয় সেশন চিকিৎসা পর্ব সম্পন্ন হওয়ার পরে আপনার ক্রনিক কোমর ব্যথা এবং ব্যথাজনিত অক্ষমতা বিষয়ক কিছু প্রশ্নের উত্তর দিতে হবে। গবেষণাটিতে অংশগ্রহণ করা সম্পূর্ণ ঐচ্ছিক। আপনি চাইলে, যে কোন সময় কোন দ্বিধা ছাড়াই নিজেকে এই গবেষণা থেকে প্রত্যাহার করতে পারবেন। অংশগ্রহণের জন্য আপনাকে কোন আর্থিক সুবিধা প্রদান করা হবে না।

আপনাকে আশ্বস্থ করা হচ্ছে যে, গবেষণার প্রতিটি ধাপে গবেষক গোপনীয়তা বজায় রাখবেন। আপনার অনুমতি ছাড়া, আপনি যে তথ্য দিয়েছেন তা কখনোই ব্যবহার করা হবে না এবং এই গবেষণাটি কোন ক্রমেই আপনার কোনোরকম ক্ষতির কারণ হবে না। শুধুমাত্র গবেষণার উদ্দেশ্যে আপনার ব্যক্তিগত বিবরণ এবং প্রশ্নপত্রের উত্তরগুলো লিপিবদ্ধ করা হবে।

আলোচিত বিষয় সাপেক্ষে আমি গবেষণাটিতে অংশগ্রহণ করতে চাই। ☐ হ্যাঁ ☐ না

অংশগ্রহণকারীর স্বাক্ষর এবং তারিখ .....

উপাত্ত সংগ্রহকারীর সাক্ষর এবং তারিখ .....

গবেষকের সাক্ষর এবং তারিখ .....

APPENDIX 2 : QUESTIONNAIRE (ENGLISH)

This set of questionnaire is aimed to measure pain and disability among patient suffering from chronic nonspecific low back pain using numerical pain rating scale (NRS) and Roland Morris Disability (RMDQ). Please only answer the question which describes your condition best. After completion of the treatment sessions, please answer the questions to evaluate the effect of the treatment.

I. Pretest Data :

- Part : 1 Patient's information

Patient's name: Patient's ID:

Patient's Address:

Date of data collection: Contact Number:

- Part-2 : Socio demographic Information

Question		Response
6.	Age :	
7.	Sex :	❑ Male ❑ Female
8.	Marital Status :	❑ Single ❑ Married
9.	Occupation :	

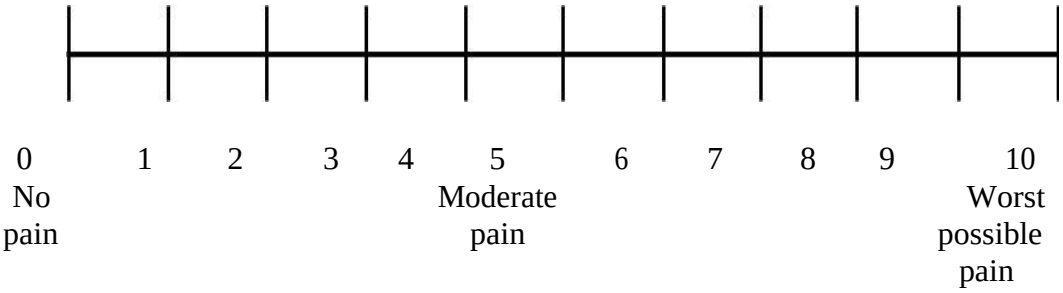
- Part -3: Medical Information:

Question	Response
• Low back pain duration	
• Where are you feeling pain right now?	
• Bowl bladder Involvement ?	
• Do you feel pain during movement?	
• Do you feel any problem in lower limb along with the low back pain ?	
• Does your pain radiate to the below knee, leg ?	
• Do you have assoaciated problem with low back pain ?	

- **Part 4 – Pain measurement**

(B) Pain measurement rating scale (Numerical pain rating scale) :
Instruction of Numerical Pain Rating Scale : • The patient is asked to make three pain ratings, corresponding to current, best and worst pain experienced over the past 24 hours. • The average of the 3 ratings was used to represent the patient's level of pain over the previous 24 hours.

"Please indicate the intensity of current pain level on a scale of 0 (no pain) to 10 (worst pain imaginable)"



- **Part 5 - Disability measurement :**

The Roland-Morris Disability Questionnaire

When your back hurts, you may find it difficult to do some of the things you normally do.

This list contains sentences that people have used to describe themselves when they have back pain. When you read them, you may find that some stand out because they describe you today.

As you read the list, think of yourself today. When you read a sentence that describes you today, put a tick against it. If the sentence does not describe you, then leave the space blank and go on to the next one. Remember, only tick the sentence if you are sure it describes you today.

The score of the RDQ is the total number of items checked – i.e. from a minimum of 0 to a maximum of 24.It is acceptable to add boxes to indicate where patients should tick each item.

❑	I stay at home most of the time because of my back.
❑	I change position frequently to try and get my back comfortable.
❑	I walk more slowly than usual because of my back.
❑	Because of my back I am not doing any of the jobs that I usually do around the house.
❑	Because of my back, I use a handrail to get upstairs.

❑	Because of my back, I lie down to rest more often.
❑	Because of my back, I have to hold on to something to get out of an easy chair.
❑	Because of my back, I try to get other people to do things for me.
❑	I get dressed more slowly than usual because of my back.
❑	I only stand for short periods of time because of my back.
❑	Because of my back, I try not to bend or kneel down.
❑	I find it difficult to get out of a chair because of my back.
❑	My back is painful almost all the time.
❑	I find it difficult to turn over in bed because of my back.
❑	My appetite is not very good because of my back pain.
❑	I have trouble putting on my socks (or stockings) because of the pain in my back.
❑	I only walk short distances because of my back.
❑	I sleep less well because of my back.
❑	Because of my back pain, I get dressed with help from someone else.
❑	I sit down for most of the day because of my back.
❑	I avoid heavy jobs around the house because of my back.
❑	Because of my back pain, I am more irritable and bad tempered with people than usual.
❑	Because of my back, I go upstairs more slowly than usual.
❑	I stay in bed most of the time because of my back.
Disability score on Roland Morris Disability Questionnaire (0-24) :	

The series of pretest question ends here. Thank you for your cooperation.

Name and sign of the Data collector :	
Date of data collection :	Time of data collection :

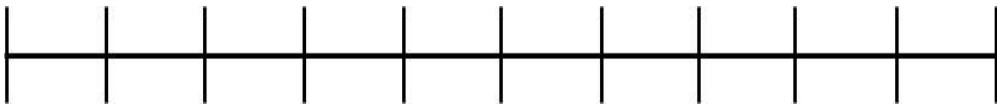
II. Post test data:

Question	Response
• Where are you feeling pain right now?	
• Bowl bladder Involvement ?	
• Do you feel pain during movement?	
• Do you feel any problem in lower limb along with the low back pain ?	
• Does your pain radiate to the below knee, leg ?	
• Do you have assoaciated problem with low back pain ?	

- **Part 4 – Pain measurement**

(B) Pain measurement rating scale (Numerical pain rating scale) :
Instruction of Numerical Pain Rating Scale : • The patient is asked to make three pain ratings, corresponding to current, best and worst pain experienced over the past 24 hours. • The average of the 3 ratings was used to represent the patient's level of pain over the previous 24 hours.

"Please indicate the intensity of current pain level on a scale of 0 (no pain) to 10 (worst pain imaginable)"



0 1 2 3 4 5 6 7 8 9 10

No pain — Moderate pain — Worst possible pain

- Disability measurement :

The Roland-Morris Disability Questionnaire When your back hurts, you may find it difficult to do some of the things you normally do. This list contains sentences that people have used to describe themselves when they have back pain. When you read them, you may find that some stand out because they describe you today. As you read the list, think of yourself today. When you read a sentence that describes you today, put a tick against it. If the sentence does not describe you, then leave the space blank and go on to the next one. Remember, only tick the sentence if you are sure it describes you today. The score of the RDQ is the total number of items checked – i.e. from a minimum of 0 to a maximum of 24.It is acceptable to add boxes to indicate where patients should tick each item.	
❑	I stay at home most of the time because of my back.
❑	I change position frequently to try and get my back comfortable.
❑	I walk more slowly than usual because of my back.
❑	Because of my back I am not doing any of the jobs that I usually do around the house.
❑	Because of my back, I use a handrail to get upstairs.
❑	Because of my back, I lie down to rest more often.
❑	Because of my back, I have to hold on to something to get out of an easy chair.
❑	Because of my back, I try to get other people to do things for me.
❑	I get dressed more slowly than usual because of my back.
❑	I only stand for short periods of time because of my back.
❑	Because of my back, I try not to bend or kneel down.
❑	I find it difficult to get out of a chair because of my back.
❑	My back is painful almost all the time.
❑	I find it difficult to turn over in bed because of my back.
❑	My appetite is not very good because of my back pain.
❑	I have trouble putting on my socks (or stockings) because of the pain in my back.
❑	I only walk short distances because of my back.
❑	I sleep less well because of my back.
❑	Because of my back pain, I get dressed with help from someone else.
❑	I sit down for most of the day because of my back.

❑	I avoid heavy jobs around the house because of my back.
❑	Because of my back pain, I am more irritable and bad tempered with people than usual.
❑	Because of my back, I go upstairs more slowly than usual.
❑	I stay in bed most of the time because of my back.
Disability score on Roland Morris Disability Questionnaire (0-24) :	

The series of question ends here. Thank you for your participation.

Name and sign of the Data collector :	
Date of data collection :	Time of data collection :

প্রশ্নাবলী

এই প্রশ্নাবলীর সেটটি সংখ্যাগত ব্যথা পরিমাপের স্কেল এবং **রোল্যান্ড মরিস অক্ষমতাজনিত প্রশ্নপত্র** ব্যবহার করে নির্দিষ্ট কারণছাড়া কোমর ব্যথা এবং ব্যথাজনিত অক্ষমতা পরিমাপের উদ্দেশ্যে তৈরি করা হয়েছে। অনুগ্রহ করে সেই উত্তরটি দিন যেটি সঠিকভাবে আপনার অবস্থা উপস্থাপন করে। চিকিৎসার প্রভাব মূল্যায়নের জন্য চিকিৎসাপর্ব শেষ হওয়ার পরে অনুগ্রহ করে আবার প্রশ্নগুলোর উত্তর দিন।

- অংশ - ১ রোগীর তথ্য

রোগীর নাম : রোগীর আইডি:

রোগীর ঠিকানা: ফোন নাম্বার:

উপাত্ত সংগ্রহের তারিখ:

I. উপাত্ত পূর্ববর্তী তথ্য :

- অংশ - ২ সামাজিক ও বৈষয়িক তথ্যাবলী

প্রশ্ন		উত্তর
১।	রোগীর বয়স :	
২।	লিঙ্গ :	❑ পুরুষ ❑ মহিলা
৩।	বৈবাহিক অবস্থা :	❑ অবিবাহিত ❑ বিবাহিত
৪।	পেশা :	

- অংশ - ৩ মেডিক্যাল তথ্য :

প্রশ্ন	উত্তর
● কতদিন ধরে আপনার কোমরে ব্যথা ?	
● এখন আপনি কোথায় ব্যথা অনুভব করছেন ?	
● কোমরে ব্যথার জন্য কি আপনার প্রশ্রাব পায়খানায় কোন সমস্যা হয় ?	
● আপনি কি স্বাভাবিক নড়াচড়ার সময়ে ব্যথা অনুভব করেন ?	
● আপনি কোমরে ব্যথার সাথে নিম্নাংশের অন্যকোথাও কোন সমস্যা অনুভব করেন ?	
● আপনি কি কোমরে ব্যথার সাথে পায়ে ব্যথা অনুভব করেন ? (বাম/ ডান)	
● আপনার পায়ের ব্যথা কি হাঁটুর নিচে নামে ?	
● আপনার পায়ে কি ব্যথার সাথে অন্য কোন সমস্যা আছে ?	
● কতদিন ধরে আপনার কোমরে ব্যথা ?	

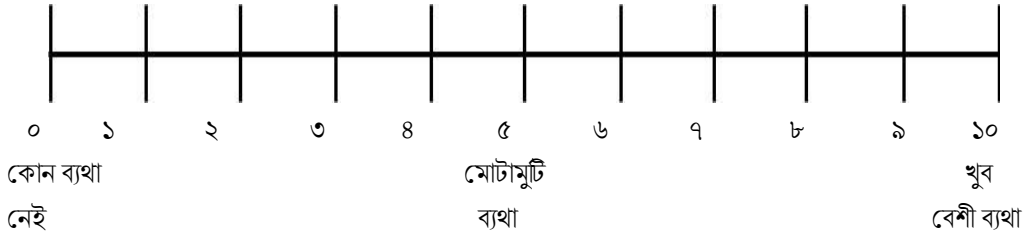
- অংশ ৪- কোমর ব্যথা পরিমাপ

(খ) ব্যথার পরিমাণ নির্ধারণ স্কেল (সংখ্যাগত ব্যথা পরিমাপের স্কেল) :

সংখ্যাগত ব্যথা পরিমাপের স্কেল ব্যবহারের নির্দেশনা :

- গত ২৪ ঘন্টায় রোগী বর্তমান, ভালো এবং খারাপ ব্যথার তিনটি অবস্থা স্কেলে (১-১০) বলবেন।
- ব্যথার তিনটি অবস্থার গড় মান রোগীর গত ২৪ ঘন্টায় ব্যথার অবস্থা নির্দেশ করে।

"অনুগ্রহ করে আপনার ব্যথার বর্তমান অবস্থা ০ (কোন ব্যথা নেই) এবং ১০ (খুব বেশি ব্যথা) এর স্কেলে নির্দেশ করুন"



- অংশ ৫- কোমর ব্যথাজনিত অক্ষমতা পরিমাপ

রোল্যান্ড মরিস অক্ষমতাজনিত প্রশ্নপত্র

কোমরে ব্যথা হলে স্বাভাবিক কাজগুলো করতে কি আপনার অসুবিধা হয় ?

কোমরে ব্যথা হলে যে সমস্যাগুলো হয় সেগুলোকে নিয়ে এই তালিকাটি তৈরি করা হয়েছে । আপনি যখন এটা পড়বেন তখন বুঝবেন যে, কতগুলো লক্ষণ আপনার আজকের পরিস্থিতি বর্ণনা করে।আপনি যখন তালিকাটি পড়বেন আপনার আজকের পরিস্থিতির ব্যাপারে ভাবুন।যে বাক্যটির সাথে আপনার অবস্থার মিল খুঁজে পাবেন সেটিতে একটি টিক চিহ্ন দিন। যদি বাক্যটির সাথে আপনার অবস্থার মিলে খুঁজে না পান তাহলে জায়গাটি ফাঁকা রেখে পরের প্রশ্নে চলে যান। **মনে রাখতে হবে,আপনি নিশ্চিত যে আপনি শুধু সেই বাক্যটিতেই টিক দিয়েছেন যেটি আপনার আজকের অবস্থা বর্ণনা করে।**

রোল্যান্ড মরিস অক্ষমতাজনিত প্রশ্নপত্র **(RMDQ) থেকে প্রাপ্ত নাম্বার হল টিককৃত প্রশ্নগুলোর যোগফল। এটা হল সর্বনিম্ন ০ এবং সর্বোচ্চ ২৪।**

রোগীদের সুবিধার্থে কোথায় টিক চিহ্ন দিতে হবে বোঝার জন্য প্রত্যেকটি বাক্যের সামনে ছোটো বক্স দেয়া হল।

- ❑ কোমরে ব্যথার জন্য বেশির ভাগ সময় আমি বাড়িতে থাকি।
- ❑ কোমরে ব্যথার আরামের জন্য আমি সবসময় নিজের অবস্থান পরিবর্তন করি।
- ❑ আমি কোমরে ব্যথার জন্য স্বাভাবিকের চেয়ে অনেক আস্তে হাঁটি ।
- ❑ কোমরে ব্যথার জন্য আমি আগের মত ঘরের কোন কাজ করতে পারি না ।
- ❑ কোমরে ব্যথার জন্য আমাকে রেলিং ধরে সিঁড়ি বেয়ে উপরে উঠতে হয় ।
- ❑ কোমরে ব্যথার কারণে আমি ঘন ঘন শুয়ে বিশ্রাম করি।
- ❑ কোমরে ব্যথার জন্য ইজি চেয়ার থেকে উঠার সময় আমাকে কিছু একটা ধরে উঠতে হয়।
- ❑ কোমরে ব্যথার জন্য আমি অন্য মানুষকে দিয়ে কাজ করানোর চেষ্টা করি।

- ❑ আমি কোমরে ব্যথার জন্য স্বাভাবিকের চেয়ে অনেক আস্তে পোশাক পরিধান করি।
- ❑ কোমরে ব্যথার জন্য আমি অনেকক্ষণ দাঁড়িয়ে থাকতে পারি না।
- ❑ কোমরে ব্যথার জন্য আমি সামনে ঝোঁকা অথবা হাঁটু ভাজ করে বসার চেষ্টা করি না |
- ❑ কোমরে ব্যথার কারণে আমার চেয়ার থেকে উঠতে কষ্ট হয় |
- ❑ সারাক্ষণই আমার কোমরে ব্যথা থাকে।
- ❑ কোমরে ব্যথার জন্য আমার বিছানায় পাশ ফিরতে অসুবিধা হয়।
- ❑ কোমরে ব্যথার জন্য আমার ক্ষুধা কমে গেছে।
- ❑ কোমরে ব্যথার জন্য আমার মোজা পরতে অসুবিধা হয়।
- ❑ কোমরে ব্যথার জন্য আমি হেঁটে বেশিদূর যেতে পারি না।
- ❑ কোমরে ব্যথার জন্য আমার ভালো ঘুম হয় না।
- ❑ কোমরে ব্যথার জন্য, আমি অপরের সাহায্য নিয়ে পোশাক পরিধান করি।
- ❑ কোমরে ব্যথার জন্য আমি দিনের বেশির ভাগ সময় বসে থাকি।
- ❑ কোমরে ব্যথার জন্য আমি ঘরের ভারী কাজ পরিহার করি।
- ❑ কোমরে ব্যথার জন্য স্বাভাবিকের তুলনায় আমার মেজাজ খিট খিটে থাকে এবং মানুষের সাথে বদরাগী আচরণ করি।
- ❑ কোমরে ব্যথার জন্য আমি স্বাভাবিকের তুলনায় ধীরে ধীরে সিঁড়ি বেয়ে উঠি।
- ❑ কোমরে ব্যথার জন্য আমি বেশির ভাগ সময় বিছানায় থাকি।

রোল্যান্ড মরিস অক্ষমতাজনিত প্রশ্নপত্র স্কোর (০ - ২৪) :

প্রশ্নাবলী এখানে শেষ হল। অংশগ্রহণ করার জন্য আপানাকে ধন্যবাদ।

উপাত্ত সংগ্রাহকের নাম ও সাক্ষর :	
উপাত্ত সংগ্রহের তারিখ :	উপাত্ত সংগ্রহের সময় :

II. উপাত্ত সংগ্রহ পরবর্তী তথ্য

প্রশ্ন	উত্তর
• কতদিন ধরে আপনার কোমরে ব্যথা ?	
• এখন আপনি কোথায় ব্যথা অনুভব করছেন ?	
• কোমরে ব্যথার জন্য কি আপনার প্রশ্রাব পায়খানায় কোন সমস্যা হয় ?	
• আপনি কি স্বাভাবিক নড়াচড়ার সময়ে ব্যথা অনুভব করেন ?	
• আপনি কোমরে ব্যথার সাথে নিম্নাংশের অন্যকোথাও কোন সমস্যা অনুভব করেন ?	
• আপনি কি কোমরে ব্যথার সাথে পায়ে ব্যথা অনুভব করেন ? (বাম/ ডান)	
• আপনার পায়ের ব্যথা কি হাঁটুর নিচে নামে ?	
• আপনার পায়ে কি ব্যথার সাথে অন্য কোন সমস্যা আছে ?	
• কতদিন ধরে আপনার কোমরে ব্যথা ?	

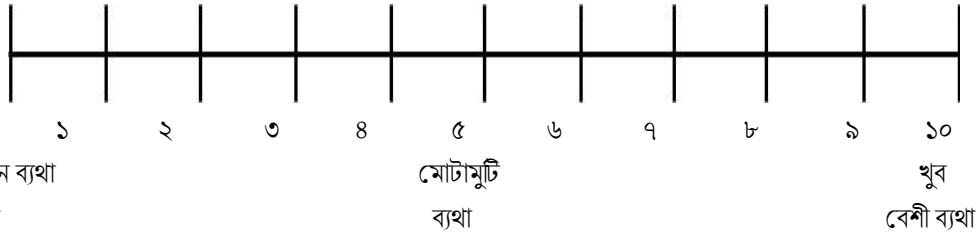
- অংশ ৪- কোমর ব্যথা পরিমাপ

(খ) ব্যথার পরিমাণ নির্ধারণ স্কেল (সংখ্যাগত ব্যথা পরিমাপের স্কেল) :

সংখ্যাগত ব্যথা পরিমাপের স্কেল ব্যবহারের নির্দেশনা :

- গত ২৪ ঘন্টায় রোগী বর্তমান, ভালো এবং খারাপ ব্যথার তিনটি অবস্থা স্কেলে (১-১০) বলবেন।
- ব্যথার তিনটি অবস্থার গড় মান রোগীর গত ২৪ ঘন্টায় ব্যথার অবস্থা নির্দেশ করে।

"অনুগ্রহ করে আপনার ব্যথার বর্তমান অবস্থা ০ (কোন ব্যথা নেই) এবং ১০ (খুব বেশি ব্যথা) এর স্কেলে নির্দেশ করুন"



- অংশ ৫- কোমর ব্যথাজনিত অক্ষমতা পরিমাপ

রোল্যান্ড মরিস অক্ষমতাজনিত প্রশ্নপত্র

কোমরে ব্যথা হলে স্বাভাবিক কাজগুলো করতে কি আপনার অসুবিধা হয় ?

কোমরে ব্যথা হলে যে সমস্যাগুলো হয় সেগুলোকে নিয়ে এই তালিকাটি তৈরি করা হয়েছে **|** আপনি যখন এটা পড়বেন তখন বুঝবেন যে, কতগুলো লক্ষণ আপনার আজকের পরিস্থিতি বর্ণনা করে।আপনি যখন তালিকাটি পড়বেন আপনার আজকের পরিস্থিতির ব্যাপারে ভাবুন।যে বাক্যটির সাথে আপনার অবস্থার মিল খুঁজে পাবেন সেটিতে একটি টিক চিহ্ন দিন। যদি বাক্যটির সাথে আপনার অবস্থার মিলে খুঁজে না পান তাহলে জায়গাটি ফাঁকা রেখে পরের প্রশ্নে চলে যান। **মনে রাখতে হবে,আপনি নিশ্চিত যে আপনি শুধু সেই বাক্যটিতেই টিক দিয়েছেন যেটি আপনার আজকের অবস্থা বর্ণনা করে।**

রোল্যান্ড মরিস অক্ষমতাজনিত প্রশ্নপত্র **(RMDQ) থেকে প্রাপ্ত নাম্বার হল টিককৃত প্রশ্নগুলোর যোগফল। এটা হল সর্বনিম্ন ০ এবং সর্বোচ্চ ২৪।**

রোগীদের সুবিধার্থে কোথায় টিক চিহ্ন দিতে হবে বোঝার জন্য প্রত্যেকটি বাক্যের সামনে ছোটো বক্স দেয়া হল।

- ❑ কোমরে ব্যথার জন্য বেশির ভাগ সময় আমি বাড়িতে থাকি।
- ❑ কোমরে ব্যথার আরামের জন্য আমি সবসময় নিজের অবস্থান পরিবর্তন করি।
- ❑ আমি কোমরে ব্যথার জন্য স্বাভাবিকের চেয়ে অনেক আস্তে হাঁটি ।
- ❑ কোমরে ব্যথার জন্য আমি আগের মত ঘরের কোন কাজ করতে পারি না ।
- ❑ কোমরে ব্যথার জন্য আমাকে রেলিং ধরে সিঁড়ি বেয়ে উপরে উঠতে হয় ।
- ❑ কোমরে ব্যথার কারণে আমি ঘন ঘন শুয়ে বিশ্রাম করি।
- ❑ কোমরে ব্যথার জন্য ইজি চেয়ার থেকে উঠার সময় আমাকে কিছু একটা ধরে উঠতে হয়।
- ❑ কোমরে ব্যথার জন্য আমি অন্য মানুষকে দিয়ে কাজ করানোর চেষ্টা করি।
- ❑ আমি কোমরে ব্যথার জন্য স্বাভাবিকের চেয়ে অনেক আস্তে পোশাক পরিধান করি।
- ❑ কোমরে ব্যথার জন্য আমি অনেকক্ষণ দাঁড়িয়ে থাকতে পারি না।
- ❑ কোমরে ব্যথার জন্য আমি সামনে ঝোঁকা অথবা হাঁটু ভাজ করে বসার চেষ্টা করি না ।
- ❑ কোমরে ব্যথার কারণে আমার চেয়ার থেকে উঠতে কষ্ট হয় ।
- ❑ সারাক্ষণই আমার কোমরে ব্যথা থাকে।
- ❑ কোমরে ব্যথার জন্য আমার বিছানায় পাশ ফিরতে অসুবিধা হয়।
- ❑ কোমরে ব্যথার জন্য আমার ক্ষুধা কমে গেছে।
- ❑ কোমরে ব্যথার জন্য আমার মোজা পরতে অসুবিধা হয়।
- ❑ কোমরে ব্যথার জন্য আমি হেঁটে বেশিদূর যেতে পারি না।
- ❑ কোমরে ব্যথার জন্য আমার ভালো ঘুম হয় না।
- ❑ কোমরে ব্যথার জন্য, আমি অপরের সাহায্য নিয়ে পোশাক পরিধান করি।
- ❑ কোমরে ব্যথার জন্য আমি দিনের বেশির ভাগ সময় বসে থাকি।
- ❑ কোমরে ব্যথার জন্য আমি ঘরের ভারী কাজ পরিহার করি।
- ❑ কোমরে ব্যথার জন্য স্বাভাবিকের তুলনায় আমার মেজাজ খিট খিটে থাকে এবং মানুষের সাথে বদরাগী আচরণ করি।
- ❑ কোমরে ব্যথার জন্য আমি স্বাভাবিকের তুলনায় ধীরে ধীরে সিঁড়ি বেয়ে উঠি।
- ❑ কোমরে ব্যথার জন্য আমি বেশির ভাগ সময় বিছানায় থাকি।

রোল্যান্ড মরিস অক্ষমতাজনিত প্রশ্নপত্র স্কোর (০ - ২৪) :

প্রশ্নাবলী এখানে শেষ হল। অংশগ্রহণ করার জন্য আপানাকে ধন্যবাদ।

উপাত্ত সংগ্রাহকের নাম ও সাক্ষর :	
উপাত্ত সংগ্রহের তারিখ :	উপাত্ত সংগ্রহের সময় :

APPENDIX-3

Date: February 22, 2016

The Chairman
Institutional Review Board (IRB)
Bangladesh Health Professions Institute (BHPI)
CRP-Savar, Dhaka-1343, Bangladesh

Subject: **Application for review and ethical approval.**

Sir,

With due respect I would like to draw your kind attention that I am a student of the Department of Physiotherapy at Bangladesh Health Professions Institute (BHPI)- an academic institute of CRP under Faculty of Medicine of University of Dhaka (DU). I have to conduct a thesis entitled, "**Efficacy of Motor Control Exercise along with Conventional Physiotherapy among Patients with Chronic Non-Specific Low Back Pain**" under honorable supervisor, Mohammad Habibur Rahman, Assistant Professor, Department of Physiotherapy, BHPI. The purpose of the study is to determine the effectiveness of Motor Control Exercise along with Conventional Physiotherapy among Patients with Chronic Non-Specific Low Back Pain.

The questionnaire that will be used will take about 15 to 20 minutes followed by measurements of pain and disability. Data collectors will receive informed consents from all participants. Any data collected will be kept confidential.

Therefore I look forward to having your kind approval for the thesis proposal and to start data collection. I can also assure you that I will maintain all the requirements for study.

Sincerely yours,

TASNUVA ALAM
.....

Tasnuva Alam
B.Sc. in Physiotherapy,
Department of Physiotherapy
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

Recommendation from the thesis supervisor:

Habib 22.02.2016
.....

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

Attachment: Thesis Proposal including measurement tools and process and procedure for maintaining confidentiality, Questionnaire (English and Bengali version), Information sheet & consent & any other paper.

বাংলাদেশ হেল্‌থ প্রফেশন্স ইনস্টিটিউট (বিএইচপিআই)
Bangladesh Health Professions Institute (BHPI)
(The Academic Institute of CRP)

Ref. CRP-BHPI/IRB/03/17/42

Date: 28/03/17

To
Tasnuva Alam
B.Sc. in Physiotherapy,
Department of Physiotherapy
Session: 2011-2012, DU Reg. No.: 1724
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

Subject: Approval of the thesis proposal – "Efficacy of Motor Control Exercise along with Conventional Physiotherapy among Patients with Chronic Non-Specific Low Back Pain" by ethics committee.

Dear Tasnuva Alam,

The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application on February 22, 2016 to conduct the above mentioned thesis, with yourself, as the Principal investigator. The Following documents have been reviewed and approved:

Sr. No.	Name of the Documents
1	Thesis Proposal
2	Questionnaire (English and Bengali version)
3	Information sheet & consent form.
4	The Motor Control Exercise (MCE) protocol and Conventional Physiotherapy protocol

Since the study involves answering a questionnaire) that takes 15 to 20 minutes measuring pain and disability with Numerical pain rating scale (NPRS) and Roland-Morris disability Questionnaire (RMDQ) and have no likelihood of any harm to the participants and have possibility of benefit patients in their treatment, management and rehabilitation from the information of certain behavior the members of the Ethics committee has approved the study to be conducted in the presented form at the meeting held at 08:30 AM on February 25, 2016 at BHPI.

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

Best regards,

Millat Hossain

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

August 16, 2016

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

Through: Head, Department of Physiotherapy, BHPI.

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

Dear Sir,

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

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

Forwarded Habib 16/8/2016.

Sincerely yours

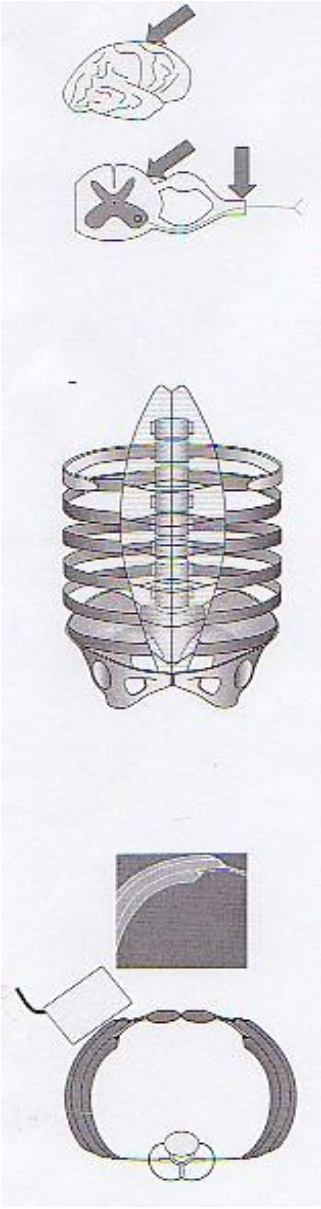
TASNUVA ALAM

Tasnuva Alam
Student of 4th Professional,
B. Sc. in Physiotherapy
Class roll: 20 Session: 2011-2012
Bangladesh Health Professions Institute (BHPI)
CRP, Chapain, Savar, Dhaka-1343.

Recommended & Forwarded
16.08.16
Md. Obaidul Haque
Associate Professor & Head of the Department
Department of Physiotherapy
Bangladesh Health Professions Institute (BHPI)
CRP, Chapain, Savar, Dhaka-1343

Approved
Contact with Md. Mostafa Kamal, (Sohel) as a counter part of the data collection process.

Md. Anwar Hossain
Professor &
Physiotherapy Dept.
CRP, Chapain, Savar, Dhaka-1343



Motor Control Exercise Intervention Manual

Taken from Paulo Ferreira PhD thesis 2004.

Revised with input from Matthew Jennings July 2005

Based on: Science of stability:
Clinical Application to Assessment and Treatment of Segmental Spinal Stabilisation for Low Back Pain. Paul Hodges, BPhty (Hons), PhD

Table of Contents **Page**

Introduction:

Format of the intervention

The motor control exercise program will involve 12 half hour sessions. The program will be applied during an 8-week period. During the first 4 weeks subjects will receive 2 sessions per week and during the last 4 weeks they will receive 1 session per week. All subjects in this group will be encouraged and instructed to perform daily home exercise for 1 hour according to specific instructions included in this manual. These exercises are to be continued at home even after the intervention is finished. The outcome measures will be taken at baseline, 8 weeks, 6 months and 12 months.

Aims of the Intervention

The main aim of the motor control exercises is to reverse the motor control deficits found in patients with chronic low back pain (CLBP). Specifically the program aims to:

1- Teach the subject to relearn the motor skills of the deep muscles of the spine, specifically transversus abdominus (TA) and multifidus (MF).
2- Promote early recruitment of the deep stabilising muscles.
3- Gradually develop isometric contraction of the deep stabilising muscles.
4- Teach co-contraction of the deep stabilising muscles.
5- Reduce unwanted over activity of the global muscles.
6- Encourage practice of the new motor skill.
7- Progress contraction and motor skills to functional tasks.

Phases of the program

The motor control exercise involves 3 phases. The patient is progressed through the phases according to specific criteria that should be met in each of these phases. The 3 phases and their main objectives are:

1- Promote independent activation of the deep stabilising muscles (TA and MF) and subsequently teach patient to co-activate these muscles.
2- Implement precision of the desired contraction and train these skills in static tasks.
3- Incorporate skills into dynamic tasks and functional positions.

These 3 phases form the basis of the program and should be followed strictly according to their parameters and criteria for progression to subsequent phases.

PHASE 1: PROMOTING INDEPENDENT ACTIVATION OF THE DEEP STABILISING MUSCLES AND TEACHING CO-CONTRACTION.

The main objective of this phase is to promote facilitation for the isolation of TA and MF contraction. **Therapists should initially teach subjects to contract TA in as much isolation as possible and after the patient has mastered this skill he/she can initiate the MF training**. TA provides a better visualisation for the patient than MF and therefore, should be initiated prior to MF. Therapists should initiate training offering maximal feedback to the subject and, as the subject learns the skill, the feedback should be reduced to a minimal level necessary for performing the task. Subjects should be encouraged to breathe normally as they learn and practise the desired manoeuvre. Synergist muscles might be used to achieve desired contraction if necessary (e.g. encourage patient to contract TA prior to / during contraction of MF). This is a clinical judgement and therapists should assess whether the subject responds positively or negatively to this strategy.

Feedback

The type of feedback that can be used for assessing and teaching TA/MF contractions are: observation; palpation; ultra-sound machine. Clinical signs to look for when offering feedback to the subject will be outlined for each desired muscle contraction and position. **Prior to teaching the desired muscle action, the subject will receive instructions / education in regards to the biomechanical action of the target muscles and objectives of the program**. These instructions could take up a large amount of time especially in the first session (around 20 minutes). Points that could be included in the program include:

1- The “corset action of TA” and its anatomical relationship with fascia and the spine.
2- The optimal anatomical position of MF to control inter-segmental movements of the spine.
3- The motor control deficits found in people with CLBP with regard to the deep stabilising muscles.
4- The unwanted activity of other global muscles such as external oblique and erector spinae.

Therapists should emphasise that patient compliance is extremely important for the success of treatment and without that the success rate is significantly reduced.

Assessing and teaching TA maneuver (supine or prone)

Initially the therapist might demonstrate this contraction in four point kneeling or ask the subject to assume this position since it provides better visualisation of the correct muscle action. The manoeuvre involves a gentle retraction of the lower abdomen while maintaining normal respiration. *The therapist should use instructions for the subjects and try to keep these instructions standard throughout the intervention period*. An example of instructions for the manoeuvre includes: "Slowly draw in your lower abdomen towards your back".

When teaching the subject the maneuver the whole procedure should include instructions for relaxation and quiet breathing in a sequence as follows:

1- Relaxed breath in and out.
2- Don't breathe in.
3- "Slowly draw in your lower abdomen towards your back".
4- Hold the contraction and breathe
5- Relax slowly.

Some people contract TA better as slowly breathing out and then continuing to breathe. Use what is best for correct contraction. Figure 1 shows the correct TA action.

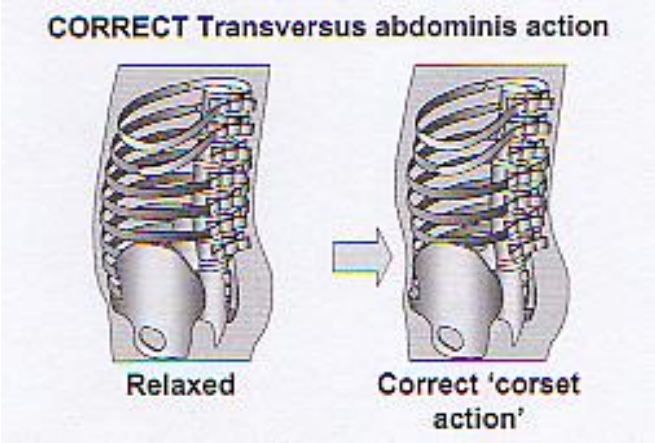


Figure 1- correct TA action

The therapist should monitor the breathing pattern and instruct subjects to breathe as normally as possible while holding the contraction. The manoeuvre should be performed in a controlled fashion and it should be interrupted if the subject shows any

sign of fatigue such as tremor. Any signs of unwanted global muscle activity (Figure 2) should be corrected and appropriate feedback / instructions should be given to correct this substitution. Signs of unwanted global muscle activity include:

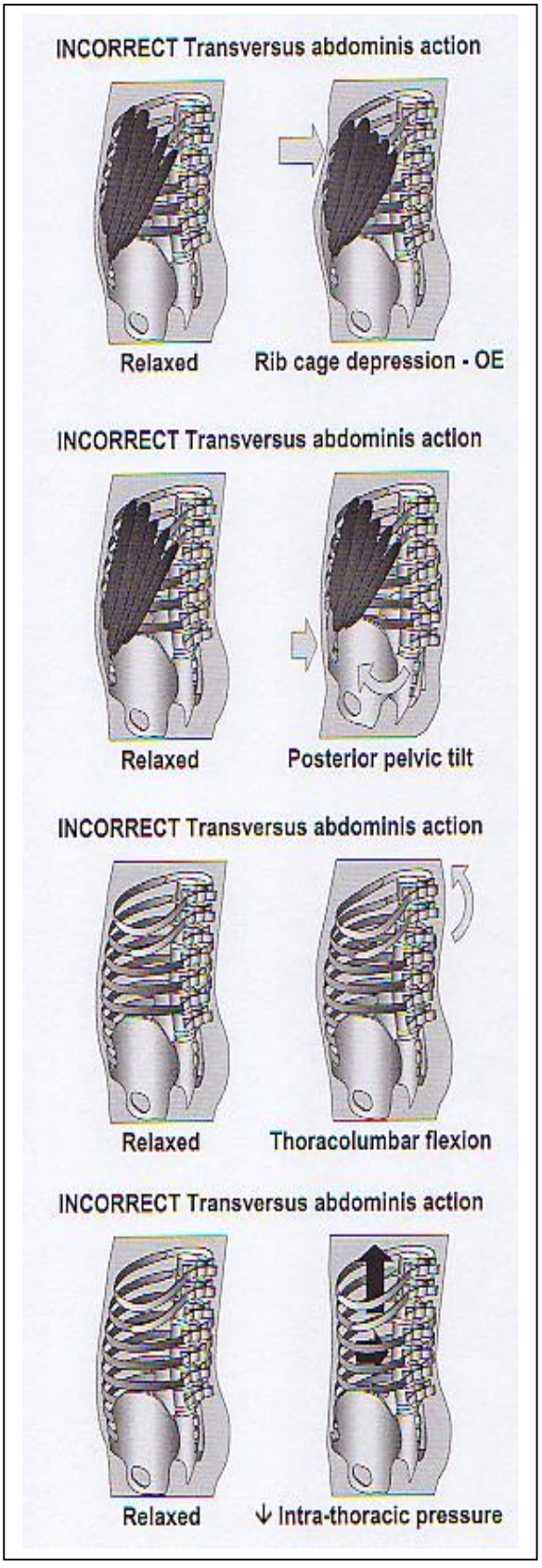
1- Posterior pelvic tilt
2- Flexion of the thoracolumbar junction
3- Rib cage depression
4- Inappropriate activation of external oblique (EO), internal oblique (IO) and rectus abdominus (RA).
5- Breath holding
6- Upper abdominal motion
7- Tremor

Feedback

The feedback provided by the therapist can be monitored via palpation, observation and the use of the ultra sound machine. Palpation of TA can be performed medially to the anterior superior iliac spine (ASIS). An appropriate contraction should involve a feeling of "deep tension" with no sign of "swelling of the muscles" or "sharp, rapid, superficial contraction" which could indicate contraction of IO (figure 3). Palpation of EO can be performed just inferior to the rib cage in the lateral aspect of the abdominal wall and a feeling of tension should be regarded as an undesired contraction of EO (Figure 4). Palpation of RA can be performed medially in the abdominal area close to the midline (Figure 5). Again, a feeling of tension is considered an inappropriate contraction and feedback to avoid that pattern should be provided by the therapist.

The therapist may also observe the patient for all signs of unwanted muscle activity described in Figure 2.

Figure 2- Signs of unwanted global muscle activity,



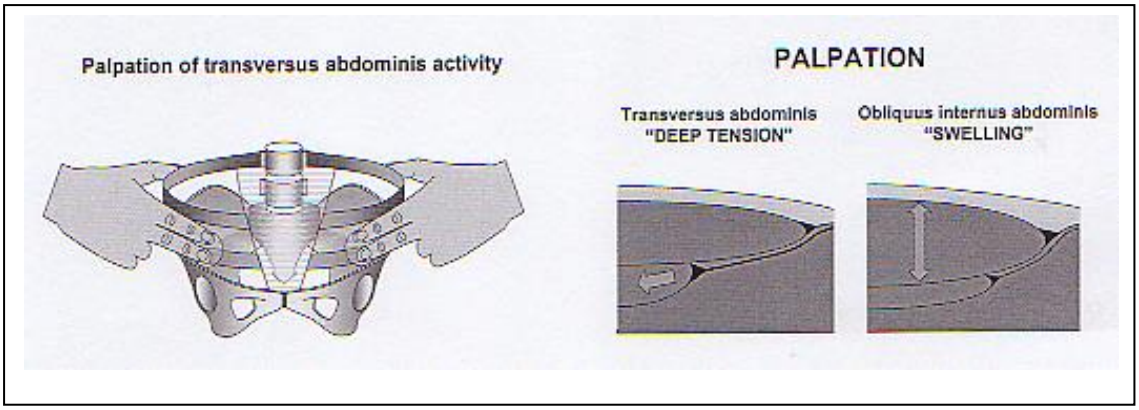
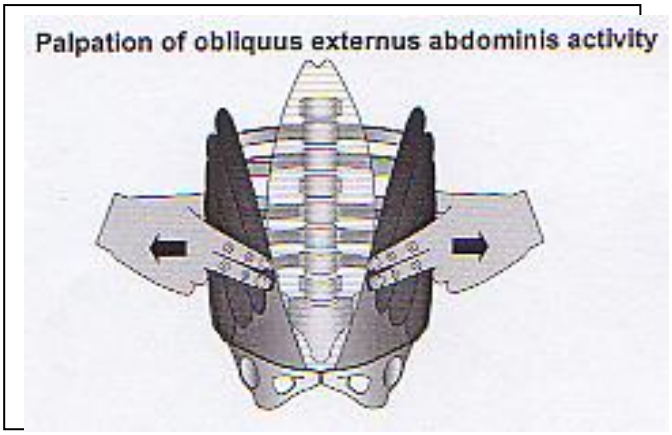


Figure 3- Palpation of TA and the "deep tension" produced by a desired contraction.

Figure 4- Palpation of EO



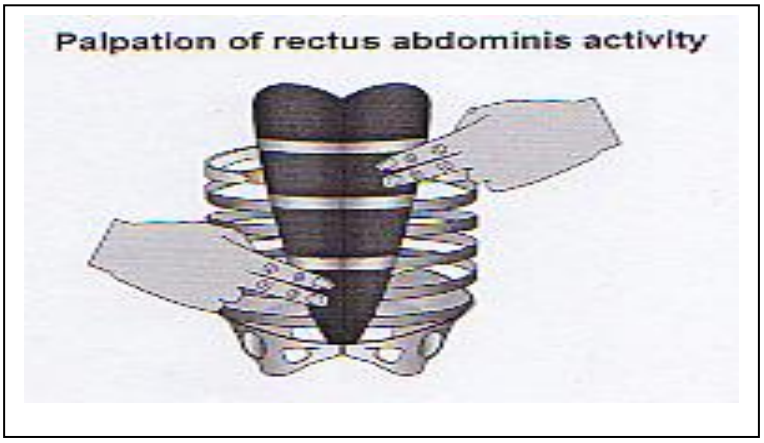


Figure 5- Palpation of RA

Using ultrasound for feedback

The ultrasound transducer can be used as a means of visualising the abdominal/ back muscles, assessing the appropriateness of muscle contractions and providing the subject with appropriate feedback. The linear transducer is positioned on the lateral aspect of the abdominal wall midway between the ribs and iliac crest. The therapist should position the transducer in such a way that a good visualisation of the three muscle layers (TA, EO, IO) is obtained on the screen. The parameters that are usually set in the machine for the feedback are:

1- Depth of 5-7 cm. The depth can be seen in the right hand corner of the monitor.
2- Multifocal points should be chosen.
3- The "gain" buttons should be controlled to achieve an optimal level of contrast.
4- The ATO key could be pressed to provide a dynamic control for the "gain" feature.

Once these parameters are set and the transducer is positioned according to the anatomical references, the therapist asks the subject to perform the muscle contraction. Only an increase in TA thickness should be seen in the monitor. Any sign of increased thickness in EO or IO is regarded as an inappropriate contraction and appropriate feedback is given to the patient.

Techniques to facilitate TA

The therapist might want to use techniques to facilitate the activation of TA. These techniques include:

1- Use of the pelvic floor muscles. The subject can be instructed to perform the muscle contraction as if stopping urine flow mid-stream.
2- Position the spine in neutral. This can be achieved with the subject in supine by putting a roll of towel underneath the subject's lumbar lordosis area.
3- Ask the patient to reduce the effort to perform the contraction.
4- Patient palpation. The therapist can guide the subject's fingers to feel the right muscle contraction on the medial aspect of the ASIS.

Once subjects achieve an appropriate contraction they can be trained during treatment to perform this task in the position in which they achieved the contraction. Subjects are trained with the facilitation technique and feedback that was necessary for performing the task. These contractions should be trained in repetitions of 10 sec until signs of

fatigue or unwanted muscle contraction is demonstrated. If a confident TA contraction is achieved, the therapist might initiate MF training although this will rarely be achieved in the first session.

Home daily exercises

The subject is always sent home with a set of exercises to be performed daily for one hour. These exercises should be performed at the same level, with the same facilitation technique, in the same position as those demonstrated during the treatment session. In the initial stages the subject might perform the exercises on the floor or bed with no use of aids such as gym balls. Emphasis should be given to avoid fatigue and undesired contractions. It is explained to the subject how important performance of the daily exercises is for the success of the treatment.

Assessing and teaching MF maneuver (prone)

Once a confident, independent contraction of TA has been achieved, the therapist might initiate MF training. The MF is usually trained with the patient in prone. The aim is to elicit an isolated contraction of MF from erector spinae (ES). This contraction is usually characterised by a gentle development of deep tension. When teaching the subject the manoeuvre the whole procedure should include the following instructions:

1- "Take a relaxed breath in and out".
2- "Without breathing in, gently swell out your muscle under my fingers without moving your spine or pelvis".
3- "Hold the contraction for 10 sec".
4- "Slowly relax".

The physical signs of unwanted global muscle activity include:

1- Rapid superficial contraction of ES.
2- Posterior pelvic tilt.
3- Anterior pelvic tilt.
4- Breath holding

Feedback

Feedback concerning correct muscle action can be provided either by palpation or with the aid of the ultrasound machine. When palpating MF, therapists apply the index finger and thumb on either side of spinous process (Figure 6).

The ultra sound transducer can be applied slightly laterally and parallel to the spinous processes of the lumbar spine. The parameters set on the machine are the same as for TA. The ultrasound monitor should show a slight depression of the facet joints if an appropriate contraction of MF is achieved.

Techniques to facilitate MF

The therapist might want to use techniques to facilitate the activation of MF. These techniques include:

1- Use of the pelvic floor muscles. Subjects can be instructed to perform the muscle contraction as with holding urine flow mid-stream.
2- Ask the patient to reduce the effort to perform the contraction.
3- Tactile feedback from therapist's fingers.

Home daily exercises

Subjects are always sent home with the set of exercises to be performed daily for one hour. These exercises should be performed in the same level, with the same facilitation technique, in the same prone position as those demonstrated in the session. Emphasis should be given to avoid fatigue and undesired contractions. Again, the importance of performing the exercises daily to produce successful results is explained to the subject. The exercises should incorporate TA training as learned previously.

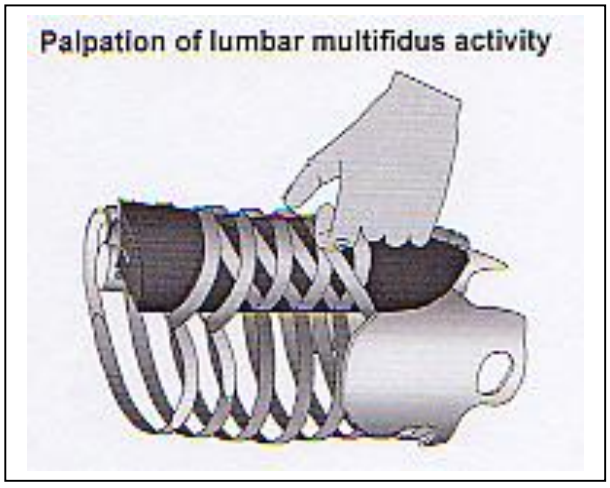


Figure 6- Palpation of MF

Improving precision (for both TA and MF)

Treatment progression is achieved by improving precision of both TA and MF contractions. This is accomplished by;

1- Increasing holding time of contraction.
2- Increasing number of contractions.
3- Reducing feedback such as minimising ultrasound visualisation and palpation. However, the therapist should determine if contraction is still being performed appropriately.

Precision is achieved when subjects are able to activate the muscles (both TA and MF) independently and can hold the contraction for 10 repetitions of 10 seconds. Once precision is achieved, co-activation of TA and MF is initiated. Co-activation of these muscles can also be combined with pelvic floor muscle contraction as previously described. Breathing can also be trained during this period by adding and mastering diaphragmatic breathing. This is achieved by asking subjects to pre-activate both TA and MF and start breathing by expanding the lateral inferior aspects of the thorax. The exercises are progressed by increasing the holding time of the breathing pattern associated with co-contraction of TA and MF.

Home daily exercises

Subjects are sent home with the set of exercises to be performed daily over one hour. Co-contraction should be emphasised as well as diaphragmatic breathing if a subject has learned this new pattern. Emphasis should be given to avoid fatigue and undesired contractions. Again, the importance of performing the exercises daily to produce successful results is explained to subjects.

PHASE 2: PROMOTING INDEPENDENT ACTIVATION OF THE DEEP STABILISING MUSCLES AND TEACHING CO-CONTRACTION.

The co-contraction of TA and MF is now trained in positions such as sitting, standing and 4 point kneeling. The timing of progression to these positions is decided by the clinician based on a sequence from the position where co- contraction was easily achieved to the position where it was barely achieved. Palpation of TA (just medial to the ASIS) and MF (just beside spinous processes) is continued to provide feedback to subject. The ultrasound machine can still be used provided it offers reasonable visualisation of the muscles. In these positions the global muscles will be automatically activated. The therapist does not need to avoid activation of global muscles, however, contraction of the deep muscles has to be ascertained.

Home daily exercises and instructions

Subjects are sent home with the set of exercises to be performed for one hour daily. Co-contraction is now performed in the position trained in the session. The patient is instructed to pre-activate the muscles during functional tasks such as walking, bending, and working.

When subjects are capable of holding the co-contractions in all the positions described above for 10 repetitions of 10 seconds they are progressed to the last stage.

PHASE 3: INCORPORATING SKILLS INTO DYNAMIC TASKS AND FUNCTIONAL POSITIONS.

The objective of this last phase is to incorporate the co-contraction of the deep muscles into dynamic tasks and functional positions. Before assuming any position/task subjects are instructed to pre-activate the deep muscles. Subjects can use self-palpation as feedback. The ultrasound machine can be used in those positions where it still provides a reasonable image such as when the patient is on the gym ball. A usual, but not fixed, progression of positions/tasks includes:

1- Leg loading in prone, supine, 4 point kneeling.
2- Use of the gym ball. Patient is positioned in sitting, prone, supine. Leg loading is applied as a progression.
3- Standing/sitting postures +/- lumbar or hip movement
4- Walking (with pre-activation of deep muscles).
5- Sideways, forward and backward stepping (with pre-activation of deep muscles).
6- The subject is progressed according to his/her ability to contract the muscles and maintain a normal lordosis and normal breathing. If a patient is demonstrating fatigue (e.g. tremor) the therapist should bring the patient back to a position/task where better control is accomplished. Progression is also achieved by adding speed during tasks.

Home daily exercises and instructions

Subjects are instructed to perform the exercises in the positions and with resources available at home. Exercises in set trained positions with leg slides, 4 point kneeling, and sideways, forward and backward stepping should be encouraged. Pre-activation of the deep muscles is encouraged before any functional task such as walking, bending

and carrying loads. If subjects are willing to engage or re-engage in social/sports activities they should be encouraged to do so.

Once the intervention is finished the therapist should instruct subjects to continue performing the exercises a minimum of three times a week. Instructions for maintaining the performance of the deep muscles and the risk of decreasing the stability of the spine if the exercises are not performed should be given.

Treatment Record Sheet – Manual Control Exercises

Name: Trial #:

Session	Date	Short descriptions of treatment and duration (eg: TA training in supine. Facilitation strategies: pelvic floor training).
1		
2		
3		
4		
5		
6		

Session	**Date**	**Short descriptions of treatment and duration (eg: TA training in supine. Facilitation strategies: pelvic floor training).**
7		
8		
9		
10		
11		
12		

Centre for the Rehabilitation of the Paralysed (CRP)
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Tel: 880-2-7745464-5, Fax: 880-2-7745069, E-mail: contact@crp-bangladesh.org, Website: www.crp-bangladesh.org

Ref :

Date :

CONVENTIONAL PHYSIOTHERAPY PROTOCOL FOLLOWED BY PHYSIOTHERAPY DEPARTMENT FOR CHRONIC LOW BACK PAIN (CLBP)

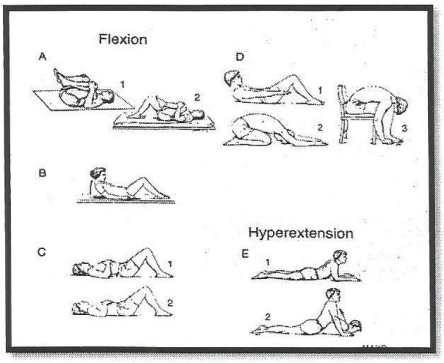
Conventional physiotherapy treatment for back pain followed by a broad assessment (McKenzie Institute) procedure along with home advices are practiced in the clinical Department of Physiotherapy. The management procedure vaguely depends on patient's condition and disease progress.

❑ **Manual therapy:**

- **McKenzie Method**

It is mainly applied to the spinal conditions mainly low back pain.. It is a standardized approach to both the assessment and treatment discovered by the Robin McKenzie. Directional Preference and Centralization of pain are the key points. Sub groups are Postural Syndrome, Dysfunction and Derangement (D1, D2 and D3).

- Prescribed every two hourly, starting with 10 repetitions.
- Correction of posture.



Branch Offices: CRP-Mirpur, Plot: A/5, Block-A, Section-14, Mirpur, Dhaka-1216, Tel: +880(0)2-8020178, 8053662, 8053663, 8053664, CRP-Gonokbari: P.O: Bolivadra Bazar, P.S. Ashulia, Savar, Dhaka, Tel: 880-2-7701281, CRP-Gobindapur: P.O. Kazoldhara, P.S. Kulaura, Dist. Moulvibazar, Mobile- 01711 446104

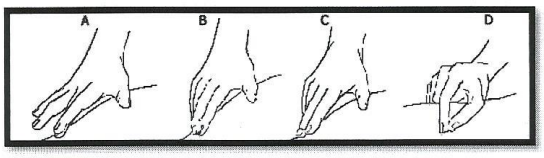
Ref :

Date :

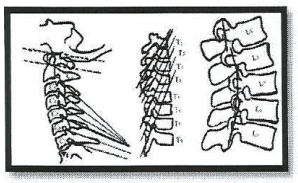
- **Cyriax Concept**

Dr.James Cyriax is called the Father of the Orthopedic Medicine. A good understanding of the term Referred Pain and examination by Selective Tissue Tension.

- Soft tissue mobilization 5-20 minutes according to patient's condition.



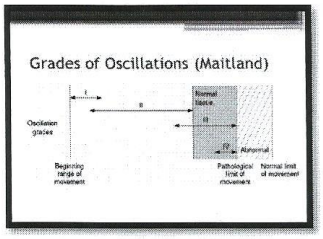
- Mulligan Concept



Movement with Mobilization (MWMS) techniques use for the low back pain.

- **Maitland Concept**

Manipulative physiotherapy approach depends on Grading Scale Mobilisation and Manipulation.



Ref : Date :

- Muscle
  - Soft tissue technique (Massage-Longitudinal stroking, transverse friction, transverse gliding, myofascial release, transverse mobilization) (10-15minutes)
  - Muscle energy technique
- Neuromeningeal –Neural stretching

❑ **Mechanical therapy:**

- Electrotherapy
  - Cryo therapy (15-20 minutes)
  - Infrared Radiation(IRR) (20-30 minutes)
  - Hot packs (10-15 minutes)
  - Ultrasound (15-20 minutes)
  - TENS(Transcutaneous electrical nerve stimulation) (10-15 minutes)
- Exercise therapy:
  - Back extension exercises
  - Back Strengthening exercises
  - Isometric Strengthening exercises
  - Isotonic Strengthening exercise(Concentric and eccentric)
  - Isokinetic exercises (Physiotherapy Gym-aerobic and anaerobic exercises)
- Specific muscle strengthening and relaxation exercises (Transversus abdominis, multifidus, erector spinae, internal and external oblique, gluteal maximus etc.)
- Spinal mobilization

25/9/17

Centre for the Rehabilitation of the Paralysed (CRP)
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Tel: 880-2-7745464-5, Fax: 880-2-7745069, E-mail: contact@crp-bangladesh.org, Website: www.crp-bangladesh.org

Ref :

Date :

- Passive segmental mobilization to the lumbar spine into end range
- Back mobilization exercise
- Abdominal stabilization exercise
- Stretching exercises
- Home based exercise therapy (patient education and awareness)
  - Back care advices proper posture
  - Lifting techniques
  - Ergometric modification (Lumber roll, special chair etc)

❑ **Traction (15-20 minutes)**

❑ **Lumber belt**

❑ **Cognitive & Behavioral therapy**

❑ **Surgery**

The choice of treatment was made by the physiotherapist based on the assessment findings.

.....25/02/17

Mohammad Anwar Hossain

Associate Professor & Head

Department of Physiotherapy

CRP, Savar, Dhaka

Branch Offices: CRP-Mirpur, Plot: A/5, Block-A, Section-14, Mirpur, Dhaka-1216, Tel: +880(0)2-8020178, 8053662, 8053663, 8053664, **CRP-Gonokbari:** P.O: Bolivadra Bazar, P.S. Ashulia, Savar, Dhaka, Tel: 880-2-7701281, **CRP-Gobindapur:** P.O. Kazoldhara, P.S. Kulaura, Dist. Moulvibazar, Mobile- 01711 446104