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Effectiveness of Upper Limb Stretching Technique for Patients with Cervical Radiculopathy

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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 "**Effectiveness of Upper Limb Stretching Technique for Patients with Cervical Radiculopathy: A Randomized Control Trial"** Submitted by **Ahsan Habib Bulbul,** for the partial fulfillment of the requirement for the degree of Bachelor of Science in Physiotherapy.

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DECLARATION

This work has not previously been accepted in substance for any degree and isn't concurrently submitted in candidature for any degree. This dissertation is being submitted in partial fulfillment of the requirements for the degree of B.Sc. in Physiotherapy.

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

In case of dissemination the finding of this project for future publication, research supervisor will highly concern, it will be duly acknowledged as graduate thesis and consent will take from the physiotherapy department of Saic College of Medical Science and Technology (SCMST).

Signature: **Date:** August, 2024

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CONTENTS

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LIST OF TABLES

Table Description **Page No.**

LIST OF FIGURE

ACRONYMS

AROM	Active Range of Motion
CCJ	Craniocervical Junction
CR	Cervical Radiculopathy
DM	Diabetes Mellitus
DNF	Deep Neck Flexor
HTN	Hypertension
IRM	Incomplete Rest Method
MRI	Magnetic Resonance Imaging
MST	Myokinetic Stretching Technique
NDI	Neck Disability Index
NPRS	Numeric Pain Rating Scale
ROM	Range of Motion
SCMST	Saic College of Medical Science and Technology.
SMWAM	Spinal Movement Combined With Arm Mobilization
ULNTT	Upper Limb Neural Tension Test
UST	Ultrasound Therapy

ABSTRACT

Introduction: Cervical radiculopathy is a common neurological condition caused by nerve root compression in the cervical spine, resulting in pain, numbness, and functional limitations. Conservative treatments, including physical therapy, have shown promise in managing symptoms. **Purpose:** This study investigates the effectiveness of upper limb stretching exercises in combination with conventional physiotherapy for cervical radiculopathy patients. **Objective**: The objective was to determine the effectiveness of this combined approach in reducing pain, improving range of motion (ROM), alleviating disability and analyzing sociodemographic factors and pain-related characteristics among participants. **Methodology:** A randomized controlled trial (RCT) was conducted involving 28 participants diagnosed with cervical radiculopathy. Participants were divided into two groups: one receiving upper limb stretching with physiotherapy and the other receiving only conventional physiotherapy. Interventions were administered over 14 sessions. Pain disability and range of motion were measured using the Numeric Pain Rating Scale (NPRS) Neck Disability Index (NDI) and goniometer. **Analysis of Data:** Data were analyzed using SPSS version 25, with Mann Whitney U test and Wilcoxon Signed Rank tests comparing pre and post-intervention scores within and between groups. **Result:** Both groups showed significant reductions in pain, disability and improved range of motion with the experimental group demonstrating slightly greater improvements. Post-treatment NPRS scores were lower in the experimental group (mean 2.64) compared to the control group (mean 3.43). **Conclusion:** Upper limb stretching exercises, combined with conventional physiotherapy, enhance outcomes in cervical radiculopathy patients, offering a promising adjunct to standard care. Future studies should explore long-term effects and refine intervention protocols.

Key Words: *Cervical radiculopathy, Upper limb stretching, Pain, Disability, Range of motion.*

CHAPTER- I	INTRODUCTION

1.1 Background

Research shows that nerve root dysfunction from mechanical compression leads to cervical radiculopathy even though inflammatory cytokines generated from injured intervertebral discs could possibly cause symptoms (Woods and Hilibrand 2015, p. 251). When first seeking medical care patients who suffer from radiculopathy commonly present symptoms involving their arm area and neck or a combination of both. The research discusses cervical radiculopathy diagnosis and demonstrates its epidemiological trends. Results from patient history with physical examination play an essential role in this section. The authors present essential clinical indicators of shoulder pathology and peripheral nerve entrapment syndromes among the diagnostic considerations. The research presents available treatment procedures for cervical radiculopathy and explains its expected course (Iyer and Kim 2016, p. 272).

Radiculopathy exists as a neurological problem that restricts or inhibits conduction in spinal nerves with their branching structures whereas radicular discomfort stands as an individual entity. The pattern of numbness emerges along dermatomal regions because sensory blockages affect those areas whereas weakness shows through myotomal distribution because motor blockages happen first. The identification of radiculopathy happens through neurophysiological measurements since it displays objective clinical signs instead of pain symptoms. The correlation is frequent but radiculopathy can manifest alone without pain symptoms and radicular pain may exist independently from radiculopathy. A cervical disc herniation or degenerative spondylotic condition usually creates nerve root compression but the symptoms can appear without clear compression when nerves inflammatory state develops (Rhajib et al. 2022, p. 54).

Upper extremity pain triggered by cervical radiculopathy affects one or both arms while additional pain in the neck region might also present. A nerve root compression that occurs due to spinal cord irritation or nerve root compression in the cervical spine region leads to this condition. People aged 50 to 54 experience this condition most frequently while also presenting symptoms of motor failure in combination with sensory dysfunction and impaired reflexes.

Degenerative cervical spine degeneration serves as the main reason behind cervical radiculopathy development. The most common evaluation results include painful motions alongside muscle spasms of the neck. A diminished reflex response is the most common neural test finding particularly affecting deep tendon reflexes in the triceps. The diagnosis becomes clear when Spurling test results match those of upper limb tension test and shoulder abduction test. Medical imaging tests are unnecessary when people do not have trauma history and their symptoms persist nor show alarming signals (Childress and Becker 2016, p. 1619).

Many individuals experience neck discomfort since studies indicate that between 30 to 50 percent of people will suffer from this condition annually while general practitioners deal with seven neck and upper extremity cases weekly. Studies show abnormal neurology through cervical radiculopathy affects approximately sixty females out of one hundred thousand people and one hundred males out of one hundred thousand people (McCartney et al. 2018, p. 44). The annual average occurrence of cervical radiculopathy stands at 85 cases per 100,000 people in the population though it reaches 203 cases per 100,000 individuals at the fifth decade of life (Priya Vishnu et al. 2015, p. 199). Studies show cervical roots number 6 (C6) and 7 (C7) experience the highest number of developments among patients with conditions such as C5-C6 or C6-C7 spondylosis or disc herniation. Studies show that 50% of all individuals experience upper body discomfort at some point during their lifetime (Sambyal and Kumar 2013, p. 442).

The symptoms' position and arrangement depend on how much the nerve roots become exaggerated. When dorsal and ventral nerve roots become complicated then the human body can show simultaneous sensory and motor changes. Medical attention becomes common for individuals with radiating neck pain because they want relief from their arm symptoms. During treatment patients experience upper limb symptoms as well as pins and needles sensation along with numbness and muscle weakness that results in serious disability and restricted ability to function. Physical therapy programs enable individuals with cervical spine disorders to control their symptoms along with reducing their intensity. The conservative treatment for radiating neck pain consists of soft cervical collar use for short-time and traction and medication options. Special care is needed to regulate physical therapy interventions with their three components of manipulation therapy and physical therapy and steroid injections. Patient outcomes benefit significantly from physical therapy interventions which include manual cervical traction and manipulation techniques together with therapeutic exercise and modality application for managing cervical radiculopathy conditions. Available literature does not provide direct research which compares the different treatment approaches for nerve mobilization and traditional physical therapy methods nor evaluates the efficacy of nerve mobilization versus standard physical therapy treatments (Sambyal and Kumar 2013, p. 442).

Today, neural mobilization and upper limb neural tension testing (ULNTT) used by physical and occupational therapists in therapeutic setting. The biomechanical data show enough peripheral nerve under tension strain and glide through the interacting tissue that can be observed. Although we know evidence of ULNTT causing peripheral nerve strain, we also know that ULNTT strains other multisegmental tissues. Clinically, the interrater reliability of the scan has been scanned, and the conditions of a positive test have begun to be defined although there is not much randomized controlled research. Data does not exist demonstrating positive results when applying neural mobilization in various patient group while there are not right dose parameters (duration, frequency and amplitude). Thus, these methods can be used in clinical settings pragmatically that derives from recurring clinical rationale (Walsh 2015, p. 241).

Patients with cervical radiculopathy benefit from stretching exercises of the upper limbs. Symptoms of cervical radiculopathy include pain, numbness and muscular weakness that radiates down the arm, as nerve roots in the cervical spine become compressed. Treatment for spasticity usually includes a variety of physical therapy techniques to decrease symptoms and improve quality of life. Although there were many different stretching exercises for the upper limbs done as part of a protocol, only one, namely the pelvic stretcher (which requires that the subject lie across a bed while raising and lowering her upper limbs), has been shown to reduce pain and improve functional results of people with cervical radiculopathy. Exercises of stretching, intended to reduce musculoskeletal imbalances, improve range of motion, and ease neural tension were thought to ease symptoms (Kim et al. 2020, p. 64).

Several research have been conducted to find out what further benefits there are, like for example, cervical radiculopathy, to extending the upper limbs. One clinical example showed an organized stretching program to have a dramatic positive effect on pain and functional capability. Likewise, study also showed that patients who took in upper limb stretching exercises in their routine had less episodes of discomfort and greater arm powering and durability than people who did basically exercise (Bodes et al. 2019, p. 215). A systematic review research also highlights the benefits of this as a stretching exercise as it suggests that increasing soft tissue flexibility around the affected cervical nerves may help ease nerve compression (Kumar et al. 2021, p. 552). But these are not exercises that can be performed as they are, these need to be customized to each persons needs as straight poor form can make the symptoms even worse. However, upper limb stretching exercises are a useful, low risk supplement to conservative management measures of cervical radiculopathy that, although they cannot fully replace more comprehensive therapy approaches (Chung et al. 2019, p. 142).

The stretching exercises of the upper limbs are an important part of physical fitness and rehabilitation, because stretching exercises for the arms, shoulders and upper back reduce general functional range of motion, increase flexibility and decrease muscle tension. The exercises presented in this manuscript include the deltoids, biceps, triceps, and forearm muscles all as they are susceptible to injury and stiffness from repeated motions and extended postures (Johnson et al. 2018, p. 112). Stretching these muscles is particularly important for those who work at desk or continuously do arm motion, in order to relieve tension, improve the circulation and delays the onset of musculoskeletal difficulties (Smith and Lee 2020, p. 315).

There has been a linkage of central and peripheral processes related to neuromuscular system to stretching of the upper limbs. These performance (force and power) decreases may be caused by neurophysiological (skin mechanoreceptors, muscle and joint proprioception), hormonal, cellular (structural alterations such as titin), or mechanical (stiffness, torque – length properties) variables. These studies are primarily focusing on how a certain stretching program impacts on the muscles pursuing. Nonetheless, prior investigations have already revealed that the trained limb may have a cross-over influence on the ipsilateral untrained limb. To date only a limited number of studies have been conducted to determine the transfer effects of SS routine when tested 10 week stretching program (3 times 30s with 30s rest, 3 day in week). For example, tiredness and force/power, many studies have shown that there is a cross over effect too. We found increased ROM and strength (1RM) with both hands (extended and non stretched limb), and the findings collected by Marchetti et al. (2014, p. 945) also show increased ROM and strength (1RM) of both hands (Eng et al. 1980, p. 212). Upper limb stretching along with conventional physiotherapy or only conventional physiotherapy was studied to assess the effect on reducing the pain in the neck, impairments in ROM, radicular symptoms and the disability in the neck among patients with cervical radiculopathy. The hypothesis is that conventional physiotherapy along with upper limb stretchig or conventional physiotherapy only have a significant improvement on neck pain, ROM, radicular symptoms and neck disability in subjects with unilateral cervical radiculopathy (Smith and Lee 2020, p. 315).

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1.2 Rationale:

Upper limb stretching can be highly effective for patients with cervical radiculopathy due to its multifaceted benefits. This condition often involves nerve root compression, leading to pain, weakness, and sensory changes in the upper extremities. Stretching exercises improve flexibility and reduce muscle tension, which can alleviate pressure on the cervical spine and surrounding nerves. Additionally, stretching promotes blood flow to the affected areas, aiding in healing and reducing inflammation. It also facilitates nerve mobilization, potentially relieving symptoms and enhancing functional movement. Furthermore, regular stretching can improve posture, an essential aspect since poor posture may worsen radiculopathy symptoms.

Thus, the purpose of the researcher is to determine the effectiveness of upper limb stretching to decrease cervical radiculopathy in patients. In fact, studying the effectiveness of upper limb stretching usage in physiotherapy treatment as an intervention to decrease cervical radiculopathy patients would be the reason for the study. The investigator was interested to know the effectiveness of upper limb stretching in physiotherapy treatment of cervical radiculopathy in this condition. In addition, this study will also be useful for the physiotherapy profession. Therefore it will be beneficial to deliver treatment to patients with neck pain.

So researcher think if the cause of cervical radiculopathy is mechanical then the correction method of cervical radiculopathy will be mechanical way because drugs or medicine can not correct or reduce cervical radiculopathy. There is so many gaps I found from previous study about "Effectiveness of upper limb stretching technique for patients with cervical radiculopathy". So I think these study can fill these gaps & establish the new things. Then the patients with cervical radiculopathy will be get better treatment & better result of cervical radiculopathy. It can helps to know patients and common people about the stretching effectiveness & physiotherapist or medical practitioners can provide better treatment to the patients with cervical radiculopathy.

1.3 Research question:

Is upper limb stretching technique effective for patients with cervical radiculopathy?

1.4 Aim of the study:

The aim of the study was to investigate the effectiveness of upper limb stretching techniques in alleviating symptoms in patients suffering from cervical radiculopathy.

1.5 Objectives:

- **General objective:**

  To compare the effectiveness of upper limb stretching versus conventional physiotherapy treatment on patients with cervical radiculopathy at Mirpur Dhaka.

- **Specific objectives:**

1. To assess the level of pain of the patients of experimental group by using NPRS before and after upper limb stretching along with conventional physiotherapy.
2. To investigate the range of motion of the patients of experimental group by using goniometer before and after upper limb stretching along with conventional physiotherapy.
3. To assess the neck disability of the patients of experimental group by using NDI before and after upper limb stretching along with conventional physiotherapy.
4. To assess the level of pain of the patients of control group by using NPRS before and after conventional physiotherapy.
5. To investigate the range of motion of the control group by using goniometer before and after conventional physiotherapy.
6. To assess the neck disability of the patients of control group by using NDI before and after conventional physiotherapy.
7. To determine socio-demographic characteristics and pain related information of experimental and control group.

1.6 Research Hypothesis

Null hypothesis (Ho):

Upper limb stretching is not effective among patients with cervical radiculopathy.

$$\mu_1 - \mu_2 \neq 0 \text{ or } \mu_1 \neq \mu_2$$

Alternative hypothesis (Ha):

Upper limb stretching is effective among patients with cervical radiculopathy.

$$\mu_1 - \mu_2 = 0 \text{ or } \mu_1 \geq \mu_1$$

Here,

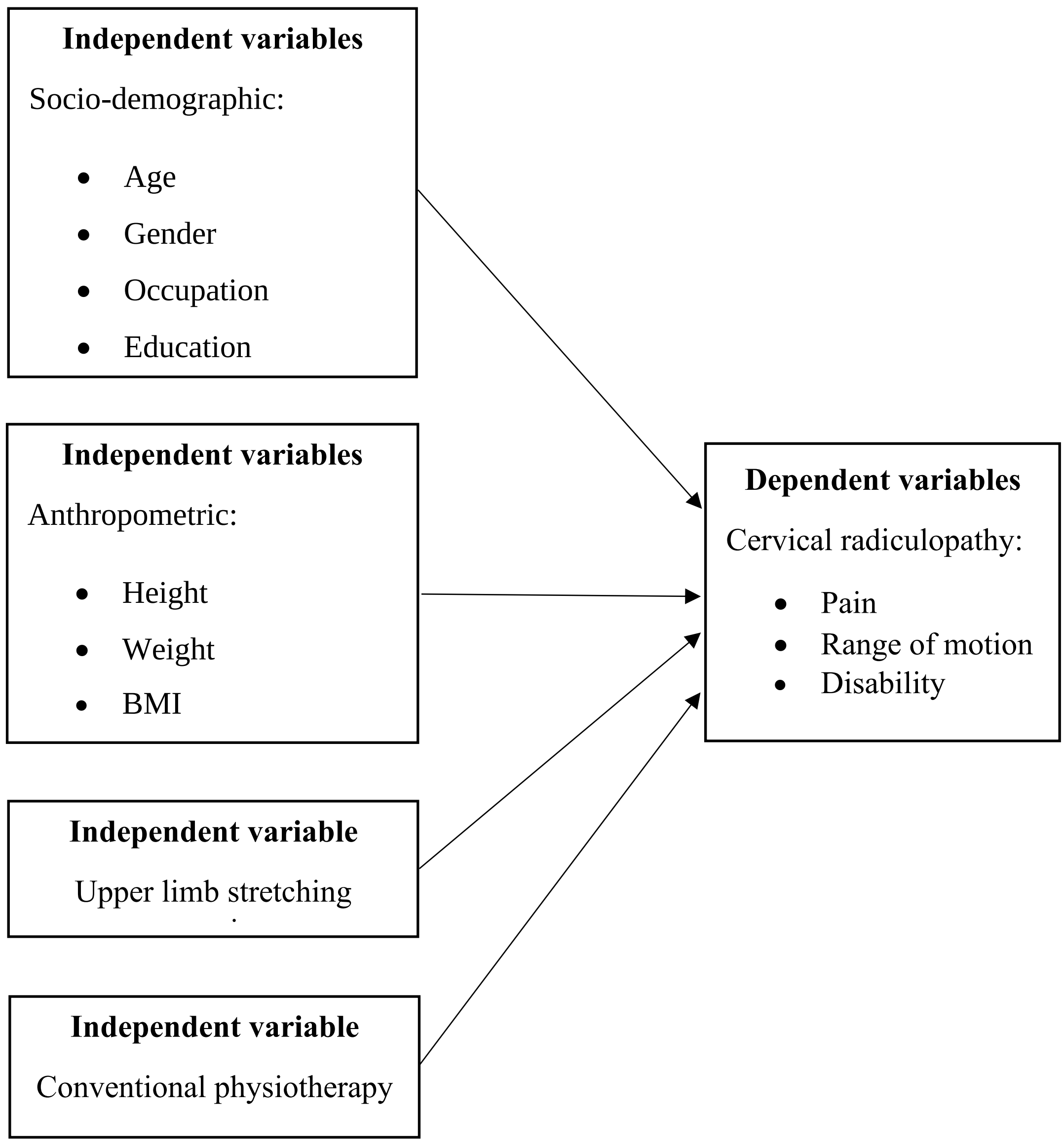
Ho = Null hypothesis

Ha = Alternative hypothesis

μ_1 = Mean of population 1

μ_2 = Mean of population 2

1.7 List of variables :



1.8 Operational definition of variables:

Radiculopathy: Radiculopathy is a variety of symptoms due to the pinching of a spinal column nerve root. The pinched nerve can occur in the cervical area of back up to the thoracic or lumbar areas of the spine. Unlike radiculopathy symptoms, radiculitis' symptoms usually include tingling, discomfort, weakness, numbness, etc., which can occur in any region of the body.

Cervical radiculopathy: This is an illness process called cervical radiculopathy, what gets characterized by arthritic spine spur bone or herniated disk debris compressing the nerves. This impingement leads usually to sensory deficiencies, wrist dysfunction in the neck and upper extremities to segmental radiating arm discomfort or numbness. Cervical radiculopathy are known as the diseases that generate symptoms on the nerve roots. A herniated disc, foraminal constriction or degenerative spondylotic change (Osteoarthritic altered or degeneration) may lead to the intervertebral foramen stenosis causing compression, irritation, traction, and a lesion of nerve root.

Stretching: As a physical workout, stretching involves placing a body component in a certain posture that will help the muscle or muscle group lengthen and elongate, increasing its suppleness and flexibility.

Upper limb: The arm, forearm, wrist, and hand are all considered to be part of the upper limb, also referred to as the upper extremity. Stretching from the shoulder joint to the fingertips, it is a functional unit of the upper body. Together, the bones, muscles, nerves, blood vessels, and connective tissues that make up the upper limb enable a variety of functions, including gripping and object manipulation.

Upper limb stretching: Upper limb stretching is an important practice that involves lengthening the muscles, tendons, and ligaments in the arms, shoulders, and neck. This form of exercise offers numerous benefits, including increased flexibility, improved range of motion, and enhanced overall physical performance. Regular stretching helps prevent injuries by preparing muscles for activity and promoting proper alignment, which is crucial for athletes and individuals engaging in repetitive tasks.

Pain: Pain is defined as an unpleasant sensory and emotional experience, associated with, or presumably due to, actual or potential tissue damage (IASP) is working.

Disability: Any condition which makes a person's life more or less difficult in accomplishing some or all of the activities of daily living falls under the category of disability. Cognitive, developmental, intellectual, mental, physical, sensory, or any combination of several factor, could be considered a disability.

Neck Disability Index (NDI): It is a self report questionnaire to assess how neck pain affects a patient in his daily life, and the self rated disability of patients with neck pain; neck disorders are the major source 9 of pain and activity limitation in workers and patients involved in motor vehicle collisions. The Neck Disability index is a Neck specific disability index. Ten items pertaining to pain and activities of daily living, including personal care, lifting, reading, headaches, concentration, work status, driving, sleeping and recreation were addressed in the questionnaire. This was a measure that was designed to be given to the patient and potentially be valuable information when the patient has neck pain for management and prognosis.

CHAPTER- II LITERATURE REVIEW

The backbone consists of both 33 bones and related soft tissues which belong to the subcranial part of the axial skeleton segments. The spine covers five regions distinguished by their shape and curve patterns beginning with the cervical then progressing to the thoracic followed by the lumbar and sacral before ending with the coccygeal region. The cervical region consists of seven moving vertebral elements whereas the thoracic area has twelve and the lumbar region shows five (Fornalski et al. 2013, p. 1). Each spinal region has matching skeletal framework although each presents different freedom of motion as well as joint interaction which results in an S-shaped spine structure. The fused caudal vertebrae have two components that lack movement ability because this includes the sacrum and the coccyx. The human sacrum consists of five fused vertebrae which are joined with four pieces of the coccyx (Eschweiler et al. 2022, p. 188). Two main cervical segments comprise of seven vertebrae (C1–C7). The two most cephalad vertebrae of the CCJ (axis (C2); atlas (C1) together with the occiput). From C3 down to the most caudal cervical vertebrae together with C3 through C7 make up subaxial vertebrae. The cervical spine maintains both the mobility functions of the head and neck and takes weight burden from the skull (Kaiser and Luco-Pico 2019, p. 58).

The spinal cord originates its cervical nerves in the area known as the cervical part. The nervous system communicates motor and sensory information from the central nervous system through efferent and afferent fibers such nerves contain. The motor cell body exists in the anterior horn of the spinal cord because it is located in a peripheral position (Woods et al. 2015, p. 251). All eight pairs of cervical nerves (C1 through C8) emerge superior to their matching vertebrae except for the C8 where exit occurs below the C7 vertebra facing down toward C8. These plexuses send their nervese to form major motor peripheral nerves which control functions in the head and neck as well as upper limbs and diaphragm region. These nerves provide dermatomal sensitivity to the regions of the head and neck together with the shoulder and upper limb (Waxenbaum, Reddi and Bordoni 2019, p. 169).

The largest human body joint exists in the glenohumeral or shoulder joint. According to Bakhsh and Nicandr (2018, p. 10) the shoulder muscles have the ability to perform simultaneously through the diverse maneuvers that include internal rotation and external rotation along with flexion and extension and abduction and adduction. Each shoulder muscle functions with the scapula to make up the primary bone structure of this joint. A glenoid cavity which serves as the glenohumeral joint articulation surface exists on the lateral side of the scapula. Protection of the glenoid cavity comes from glenoid labrum and shoulder joint capsule together with supportive ligaments and peripherally located myotendinous attachments of rotator cuff muscles. Muscle contractions of the shoulder create most of the stability present in the shoulder joint. The main rotator cuff muscles form the largest portion of muscles supporting the shoulder joint. Rotator cuff muscles consist of four muscles which include the supraspinatus and infraspinatus together with the teres minor and subscapularis muscles (Epperson et al. 2023, p. 56).

The sternoclavicular joint connects the upper limbs to the skeleton center. The pectoral girdle consists of three joint connections including the acromioclavicular joint together with the coracoclavicular joint and the sternoclavicular joint. The three components of the pectoral girdle include the humerus and scapula as well as the clavicle. In its correct position the clavicle sits right above the upper rim of the first rib (Morris and Ozer 2017, p. 63). The distal clavicle segments articulate with acromial processes through the acromioclavicular joint yet it connects with coracoid processes by means of the coracoclavicular joint. The structural shoulder joint ligaments include coracoacromial ligament which stands alongside glenohumeral ligament (Card and Lowe 2018, p. 112).

The scapula is a flat bone with several muscle attachments. The glenoid fossa performs the articulating function with the humeral head at the lateral angle of the scapula. The glenohumeral joint is an articulation between the (scapula, humerus, thoracic cavity) and the scapulothoracic articulation is the articulation between the latter two (Epperson et al. 2023, p. 56). The scapula is joined to the clavicle through the acromioclavicular and coracoclavicular joints. The coracoclavicular (CC) joint consists of the underside of the clavicle being held together strongly by the coracoclavicular ligament to the underside of the scapula's coracoid process. The acromioclavicular joint, which has no structural support of the shoulder joint, is found at the lateral side of the clavicle. The shoulder joint gets a little bit of peripheral reinforcement on the shoulder joint from the muscles in the shoulder, the coracoid process, the acromion process and the coracoacromial ligament. The muscles and auxiliary structures of the shoulder have the purpose to strengthen the shoulder joint structural integrity (Holt et al. 2012, p. 5).

In the upper mechanical link extremity, beyond the wrist, through the shoulder and up to the hand, the elbow joint has a very complex anatomy which plays an important role as the higher mechanical link extremity. It is a pivot for the forearm and puts the hand where it should be for fine motions and strong grasp. A loss in elbow function can impact day to day operations negatively. It is essential to understand the architecture of the elbow, which consists of its soft tissue components as well as its articulation and bone geometry. The three categories into which the biomechanics of the elbow joint can be separated are kinematics, elbow stability stabilizing structures and force transmission through the elbow joint. The passive and active stabilizers stabilize the elbow joint biomechanically (Fornalski et al. 2013, p. 1).

The wrist without doubt is the most differentiated region of the musculoskeletal system. The severity of wrist injuries could be from minor wounds to complicated traumas that involve many mutilations of functions at once, all which can end up with a huge financial impact (Bajuri et al. 2012, p. 510). Biomechanics is crucial for deciding both the anatomy and the appropriate therapy (either conservative or surgical) for the wrist, just as elsewhere. A synopsis of hard and soft tissue structure of the wrist, followed by details on the kinematics, the biomechanical behavior of the wrist is provided here. Eight carpal bones and the two bones of the forearm, (ulna and radius), make up the wrist joint. The wrist is strong and short ligaments are to keep the wrist stiff and the forearm muscles start the wrist joint moving. Since the delivery of functionality to the wrist joint requires all these elements, each of these structures allow wrist movement and sustainability (Eschweiler et al. 2022, p. 188).

Cervical radiculopathy is a growing worldwide problem that is defined by the compression of the nerve roots to the neck (Rodine and Vernon 2012, p. 18). Chronic pain, weakness and changes in sensation that last longer than the expected three to six month recovery are caused by it (Treede et al. 2019, p. 19). In fact, neck discomfort is the fourth most common cause of disability in over one-third of people. It is surprising that as many as 20% to 70% will experience neck pain which interferes with their daily living activities. In general, the European Journal of Pain reported on recent statistics indicating that globally there were about 352.0 occurrences of cervical radiculopathy per 100,000 people for the past three decades forth create impairment (Childs et al. 2011, p. 57). The incidence of cervical radiculopathy is also notable; specifically, there are 83.2 occurrences in 100,000 persons, and the greatest number is between age 40 and 50.5 6. The incidence translates to 63.5 cases per 100,000 women and 107.3 cases per 100,000 males per year (Safiri et al. 2020, p. 364).

In the final, comprehensive and meticulous review, there were nine studies over the whole spectrum from low quality to high quality research thus guaranteeing the full representation of data. Using this research as a basis, the incidence rates showed a range between 0.832 and 1.79 occurrences per 1000 person years, two studies of high quality, one study of lower quality (Woods et al. 2015, p. 251). The research results showed a range of 1.21 to 5.8 per 1000 people, relative to prevalence values, as found in four studies which were moderately or strongly graded, meaning that these results are confirmed. Furthermore, one quality of study, this data showed that male prevalence rates were 1.14 percent with (95 percent confidence interval = 0.45 -- 1.82 percent) and female rates were 1.31 percent with (95 percent confidence interval = 0.66 -- 1.96 percent), which demonstrated gender specific prevalence times. Further, an unadjusted prevalence of 6.3% was found by another medium quality investigation to include both the male and the female participants in it (the study), adding to the overall results of the study (Mansfield et al. 2020, p. 555).

More often, cervical radiculopathy is recognized as a clinical manifestation that occurs after the injury or compression of a nerve root of the cervical spine and hence leads to a painful and uncomfortable state of the patient in question (Carette and Fehlings 2015, p. 392). The disease was first described by the distinguished physician James Parkinson in 1817, when he asserted that this was a rheumatic ailment characterising the deltoid muscle (Parkinson 2012, p. 223). In terms of calculation for the annual incidence rate of cervical radiculopathy, it has been found to be approximately 83.2 cases per 100,000 people hence a notable difference in prevalence of this condition between genders was observed as men have a statistically higher ratio of approximately 107.3 per 100,000 compared to women who have a lower incidence rate of 63.5 per 100,000. This condition has been shown to be the most common among individuals with ages between

50 and 60 years, and based on earlier studies, the incidence has been recorded at a rate of 3.5 cases per 1,000 persons (Khedr et al. 2016, p. 1056). In addition, the surgical interventions performed per 1,000 cases of cervical radiculopathy in Sweden in 2004 also offered statistical data which indicates how significant the clinical implication and how medical intervention is required for the management of this condition (Khedr et al. 2016, p. 1056).

In 80% of cases mostly involving C6 or C7 nerve roots, herniated cervical discs cause cervical radiculopathy. The symptoms include radiating neck pain, pain or discomfort in arms or shoulders, tingling or numbness, weakness of arms, arms or shoulders, altered reflexes (Radhakrishnan et al. 2014, p. 325). The diagnosis is made on the basis of clinical evaluation, MRI, and manual Spurling's test (Lam et al. 2022, p. 1025). When significant nerve root compression leads to radiculopathy, the functioning of a particular muscle supplied by the affected nerve root will be muscular weakened. Decreased neck muscle function and increased muscular fatigue in cervical radiculopathy patients has been demonstrated (Bellew 2016, p. 1311). The rising incidence and seriousness of cervical radiculopathy are indicated by these figures and hence, the need for effective treatments and preventative measures increases. Examples of these types of activities that are useful (albeit only) for reducing this side effect and accelerating recovery in such chronic neck pain and nerve pain: Muscle strengthening, stretching, etc. (I am useless at coming up at encouraging ones!).

Physical therapy is a common nonsurgical treatment for patients with cervical radiculopathy that is quite safe and efficient. Treatments included in physical treatments are manual therapy, exercise therapy, electrotherapy (Costello 2018, p. 37).

Physical therapy has recognized muscle stretching as one of the most widely utilized modality for the management of spasticity and for the improvement of viscoelastic characteristics within the muscle tendon units, which help to contribute to functional improvement in the people having such conditions (Harvey et al. 2017, p. 67). The main form of stretching practiced by the players is a static stretching, which is highly popular and widely implemented stretching process and, may be carried by different ways, specially, by hands of physiotherapist or by means of a range of adjunctive devices such as splints, orthoses, plaster casts etc. (Jung et al. 2011, p. 53). The efficacy of stretching therapy alone or together with other therapeutic strategies has been numerous studies to manage spasticity (Jang et al. 2016, 65) and to enhance mobility through increasing the range of motion (ROM) after events like stroke or cervical radiculopathy, among other well known conditions, that cause severe loss in physical function (Jong et al. 2013, p. 331). Although it has been widely applied, the best parameters of the frequency, intensity, velocity, and duration of stretching therapy have never been universally agreed upon by the scientific community, leaving professionals with no definite guidelines on how to practice (Platz et al. 2015, p. 404). In addition, there is a large deficit in research related to stretching programs and their effectiveness in reducing spasticity and or improving joint range of motion following a stroke event (Bovend'Eerdt et al. 2018, 1395).

Hypertonia is characterized by excessive muscle tone and has both a neural component derived from the central nervous system as well as a biomechanical component deriving from the physical properties of muscle and connective tissue and both components can lead to detrimentally affect the quality of life experienced by patients affected by this disorder and that of caregivers who supply patients with assistance and support required to them. It was carefuly designed and executed this systematic review to rigorously study the effects of static stretching therapy either alone or in combination with other therapies on the effects of upper limb spasticity and overall mobility among adults who have suffered from a cerebrovascular accident (CVA) or stroke. In this detailed research, the authors aim to explore and evaluate the differential effects of two particular methodologies static stretching with simple positioning techniques and static stretching utilizing positioning orthoses to determine the impact that that has had on the clinical parameters mentioned above (Barnes 2014, p. 1).

Upper limb myokinetic stretching technique (MST) is a type of myofascial release defined as procedures involving muscular energy methods, passive or active stretching to the point when the taut band is release the desired (Dictionary 2018). When the therapy of newborns with congenital muscular torticollis was reduced using MST, the thicknesses of the muscles and the range of motion (ROM) were improved (Chon et al. 2010, p. 63). Published research has shown a spinal movement coupled with arm mobilization (SMWAM) is beneficial in treating cervical radiculopathy treatment. Yet there are little data available on MST and contrasting MST with SMWAM. This is why just as the goal of this study is to test to see how MST and SMWAM affect functional impairment, grip strength, range of motion, and discomfort in persons with cervical radiculopathy (Mathur et al. 2017, p. 75).

The stretching procedure is done by increasing the space between the ends of the nerve bed by using the elongation. Stretching methods also biomechanically affect the nervous system by tensioning procedures. Research indicates that there is not sufficient proof that stretching is effective in treating a particular upper-quarter problem (Coppieters et al. 2012, p. 746). In addition, such impacts of tensioning stretching on CR patients' mechanosensitivity have not been well enough studied. The aim of this study was to find out if the addition of tensioning upper limb stretching to a standard physical therapy schedule might help chronic unilateral CR patients in terms of pain intensity and mechanosensitivity (Ellis and Hing 2018, p. 8).

It is clinically assumed that these stretchings which lead to the extension in more longitudinal direction while applying less tension over the tensed or impinged nerve. The gliding/tensioning may reduce intraneural edema and circulatory impairment through different effects on intraneural pressure. Inappropriate dynamically changing intraneural pressure gives rise to a 'pumping action' or a 'milking effect' which increases nerve hydration by an evacuation of intraneural oedema and symptom reduction. It is possible that each of these strategies has been tested in numerous RCTs and systematic reviews separately. In a single case study (Sawa and Giakas 2012, p. 443), it was demonstrated that cervical traction and neural mobilization provide excellent benefit for reducing both pain and impairment in a patient with cervical radiculopathy.

Most studies have considered the benefits of upper limb extension with respect to cervical radiculopathy. For instance, in a clinical investigation a structured stretching exercise was shown to reduce discomfort and improve functional capacities. It also showed that the patients who extended their activity with stretching of the upper limbs were more capable in terms of arm strength and endurance and less painful than the one who only pursued general activity (Bodes et al. 2019, p. 215). Apart from that, a systematic review study also explores the advantages of stretching activities, which is that they can reduce nerve compression by enhancing discussion of soft tissue around the affected cervical nerves. Unfortunately, bad form can make the situation worse so each of these exercises have to be modified to someone's specific needs. Although they cannot completely replace more obtrusive therapeutic techniques, the upper limb stretching exercises may be useful and low risk additive to conservative care strategies in cervical radiculopathy (Chung et al. 2019, p. 142).

In the current study of statistical analysis, it was found that no difference between stretching technique and SMWAM effects on pain reduction and functional impairment and range of motion of cervical radiculopathy patients. When we gathered the demographic information of the two groups, they were homogenous at baseline. Since research indicates that cervical radiculopathy is most commonly seen in the age range of 30 to 50 years, the exclusion was only made for those less than 30 years of age. As per a study concerning the incidence of cervical spondylotic radiculopathy, the incidence of the condition from 50 to 59 years of age is determined by degenerative changes in the spine. Overall, the current research found more than 53.1% more men than women (46.9%). The current investigation confirms epidemiologic study Hungund et al. (2020, p. 134) in Rochester, Minnesota reporting incidence rate of cervical radiculopathy of 63.5 per 100,000 population of females and of 107.3 per 100,000 females and 107.3 per 100,000 males.

It was found in the literature study that combinations of the stretching technique and SMWAM trained well in some conditions. Thus, the current investigation found efficacy of stretching technique and SMWAM in functional impairment, range of motion, and discomfort. The relief of discomfort was due to the prolonged pressure or stretch on the tight band of the trapezius muscle fibers that allowed for limited hypercontraction or shortening (Chon et al. 2010, p. 63). In a related research, a sample of patients with cervical radiculopathy were treated by myofascial release of the upper trapezius, and indicated clinically reduced pain and impairment (Sambyal et al. 2016, p. 442).

CHAPTER- III	METHODOLOGY

3.1 Study design:

The study design was a Randomized Controlled Trial (RCT). This design was best for comparing the effectiveness between upper limb stretching technique and conventional physiotherapy among the patients with cervical radiculopathy.

3.2 Study area:

The areas of study were Unique Pain and Paralysis Centre (UPPC), Mirpur and Elite Physiotherapy and Rehab Zone, Mirpur.

3.3 Study place:

This study was performed in Saic College of Medical Science and Technology (SCMST) at Mirpur Dhaka.

3.4 Study period:

The study period was one year (September 2023 to August 2024).

3.5 Study population:

The population of this study was patients with cervical radiculopathy of the Unique Pain and Paralysis Centre (UPPC) and Elite Physiotherapy and Rehab Zone.

3.6 Sample size:

k = $\frac{n_2}{n_2}$ = 1

$$n_1 = \frac{\left(\sigma_1^2 + \sigma_2^2/K\right)\left(Z_1 - \frac{a}{2} + Z_1 - \beta\right)^2}{\Delta^2}$$

$$n_1 = \frac{(1.48^2 + 1.48^2/1)\ (1.96+1.04)^2}{1.39^2}$$

$n_1 = 20$

$n_2 = K \times n_1 = 20$

Here,

$\Delta = \mu_2 - \mu_1$ = absolute difference between two means

σ_1 , σ_1 = variance of mean 1 and 2

n_1 = sample size for group 1

n_2 = sample size for group 2

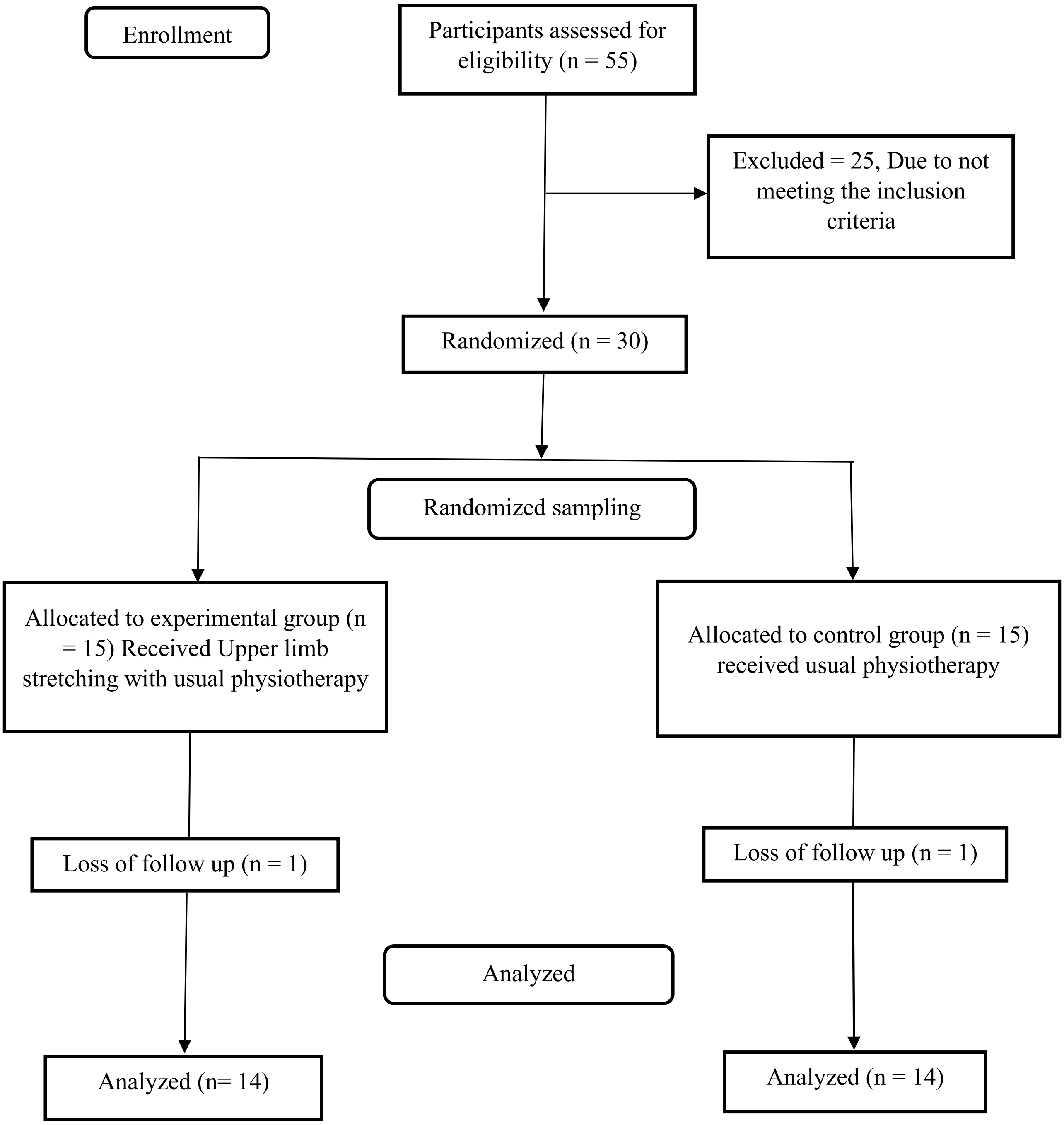
α = probability of type I error (usually 0.05)

β = probability of type II error (usually 0.2)

z = critical Z value for a given α or β

k = ratio of sample size for group 2 to group 1

3.7 CONSORT (Consolidated Standards of Reporting Trials) flow chart:



3.8 Sampling technique:

Convenience sampling technique was adopted to select the patients with cervical radiculopathy from Unique Pain and Paralysis Centre and Elite Physiotherapy and Rehab Zone at Mirpur, Dhaka. Then screening of the patients was done on basis of inclusion criteria. The patients were included who met the inclusion criteria. Thereafter, Simple random sampling technique was used to allocate the participants into experimental and control group.

3.9 Eligibility criteria:

3.9.1 Inclusion criteria:

- ✓ Patient with confirmed diagnosed cervical radiculopathy.
- ✓ Age range 18-70 years (Suvarnnato et al. 2019, p. 915).
- ✓ Both gender of male and female.

3.9.2 Exclusion criteria:

- ✓ Patients with recent surgery.
- ✓ Mental unstable patients.
- ✓ Patients who are not interested.
- ✓ Patients with severe pathological condition.

3.10 Methods of data collection:

3.10.1 Technique of data collection:

Face to face formal interview technique was used to collect data from the selected patients with cervical radiculopathy.

For determination range of motion was used by a goniometer to collect data from the selected patients with cervical radiculopathy.

3.10.2 Instrument of data collection:

The pretested structured questionnaire was used as an instrument of data collection. The questionnaire had parts. The first part contained questions on patient identification. The second part included questions on sociodemographic information. The third part contained questions on assessment related variables. The fourth part contained questions on pain related variables. The fifth part contained questions on range of motion related variables. The sixth part contained neck disability index related variables.

3.11 Tools for data collection:

In this particular study, a written questionnaire, weight machine, goniometer, height measure tape were used.

3.12 Procedure of data collection:

Out of the 55 patients, 55 cases of cervical radiculopathy were selected from outpatient services of Unique Pain and Paralysis Centre Mirpur 11 and Elite Physiotherapy and Rehab Zone, Mirpur 11. Patients were screened and thus 25 patients were excluded on basis of exclusion criteria. The 30 patients were allocated by randomization to experimental and control groups thereafter. Upper limb stretching was done in the experimental group and usual physiotherapy was done in the control group. Fifteen patients were in the experimental group and 15 patients in the control group. Ten sessions of treatment were not completed by one patient in both groups. The number of experimental and control group participants eventually comes to 14. Pain and disability were collected. This information has been viewed as pretest data. For the present intervention both experimental groups were upper limb stretching and conventional physiotherapy. Conventional physiotherapy was given for control group only. Both groups received similar 10 sessions. NPRS was used for collecting information about pain, gonimeter for range of motion and NDI for disability after the completion of the intervention. Post test data of 28 cervical radiculopathy patients have been regarded as information after the intervention. The researcher thanked the participants after the interview.

3.13 Intervention:

<table>
<tr><th>Control group (Received 2 weeks and 10 sessions of conventional physiotherapy)</th><th>Experimental group (Received 2 weeks and 10 sessions of upper limb stretching with conventional physiotherapy)</th></tr>
<tr><td>• Education about posture and home exercise.</td><td rowspan="3">• Usual physiotherapy intervention.</td></tr>
<tr><td>• Lateral glide mobilization to the appropriate segmental level.</td></tr>
<tr><td>• Cervical spine mobilization (Maitland)- 30-60 oscillations per minute.</td></tr>
<tr><td>• Soft tissue technique- 10 minutes in each session.</td><td rowspan="5">• Cross-arm stretching exercise 3-6 repetitions (20-30 seconds hold).
• Finger up and down stretch 3-6 repetitions (20-30 seconds hold).
• Standing biceps stretch 3-6 repetitions (20-30 seconds hold).
• Triceps overhead stretching 3-6 repetitions (20-30 seconds hold). (Elvy 1986, p. 225).</td></tr>
<tr><td>• Cervical muscles release like trapezius, sternocleidomastoid, and scalene- 5 minutes in each session.</td></tr>
<tr><td>• Deep neck flexor (DNF) isometric strengthening- 6-10 repetitions (10-second hold).</td></tr>
<tr><td>• Heat and cold compression- 10 minutes.</td></tr>
<tr><td>• Ultrasound therapy (UST)- 5-10 minutes.</td></tr>
</table>

Figure no 1: Upper limb stretching exercises

3.14 Management of data:

At the end of each day, the collected questionnaires were checked for any errors or inconsistencies. The necessary corrections were made. The recorded data were coded accordingly into the SPSS-25 version of the program.

3.15 Data analysis:

The descriptive analysis was used to analyze the sociodemographic variables by the SPSS version 25. To determine pre test and post test intervention between groups, Mann Whitney U test was used and to assess pre test and post test intervention within the group Wilcoxon Signed Rank test was used. The bar diagram and chart use Microsoft Excel 2021.

3.16 Ethical consideration:

- The research proposal was submitted to the Ethical Review Board (EBR) of SAIC College of Medical Science and Technology (SCMST) and approval was obtained from the Board.
- Bangladesh Medical Research Council (BMRC) and World Health Organization (WHO) guideline also were followed to conduct the study.
- The aims and objectives of the research were explained to every participant before interview and asked for their response. The respondents who gave informed verbal consent included in the study.
- Some physical examination was applied to the participants for the present study. The participant was also informed of his/her right to discontinue at any point of interview.
- The name, address, and personal information of the participants were kept confidential by the investigator.

CHAPTER- IV RESULT

In this study the researcher used comparison of baseline characteristics, frequency and description of the variables to present the result of the study.

4.1 Comparison of baseline characteristics of the participants:

Variable		Control	Experimental	*P*
Age		46.21 ± 13.30	47.50 ± 10.86	0.908
Gender n (%):	Male	10 (71.4%)	10 (71.4%)	1.00
	Female	4 (28.6%)	4 (28.6%)	
Occupation n (%):	Housewife	4 (28.6%)	2 (14.3%)	0.218
	Service holder	6 (42.9%)	3 (21.4%)	
	Business	1 (7.1%)	4 (28.6%)	
	Worker	1 (7.1%)	0 (0%)	
	Others	2 (14.3%)	5 (35.7%)	
Education n (%):	Primary	0 (0%)	2 (14.3%)	0.387
	Secondary	4 (28.6%)	1 (7.1%)	
	Higher Secondary	1 (7.1%)	2 (14.3%)	
	Honors	4 (28.6%)	4 (28.6%)	
	Masters	5 (35.7%)	4 (28.6%)	
	Others	0 (0%)	1 (7.1%)	
Co-morbidities n (%):	Osteoporosis	1 (7.1%)	0 (0%)	0.788
	DM	1 (7.1%)	0 (0%)	
	HTN	2 (14.3%)	2 (14.3%)	
	Disc degeneration	1 (7.1%)	2 (14.3%)	
	Multiple	4 (28.6%)	4 (28.6%)	
	None	5 (35.7%)	6 (42.9%)	
BMI		24.72 ± 2.83	27.84 ± 3.77	0.017
NPRS pre-score		5.64 ± 0.929	5.43 ± 1.34	0.96
NDI pre-score		34.71 ± 10.09	45.71 ± 12.42	0.024

The baseline characteristics of participants showed no significant differences in age, gender, occupation, education, or co-morbidities, except for BMI ($p = 0.017$) and NDI scores (p = 0.024). Both groups were comparable in age (46.21 ± 13.30 vs. 47.50 ± 10.86 years, p = 0.908) and NPRS scores (5.64 ± 0.929 vs. 5.43 ± 1.34, p = 0.96). Gender distribution was identical, and co-morbidities were balanced. However, the experimental group had a significantly higher BMI and baseline disability, potentially influencing outcomes. These differences emphasize the importance of accounting for these variables when interpreting the intervention's effectiveness and post-treatment improvements.

4.2 Frequency distribution of participants:

4.2.1 Marital Status of Participants:

The marital status distribution in the sample is highly skewed, with the vast majority of participants being married (27 out of 28, or 96.4%). Only one participant (3.6%) is unmarried. This concentration of married individuals may influence the findings, as their perspectives and experiences could differ significantly from those of unmarried individuals. This skewed distribution suggests that the results may be more reflective of married individuals' viewpoints, and future studies may benefit from a more balanced sample in terms of marital status.

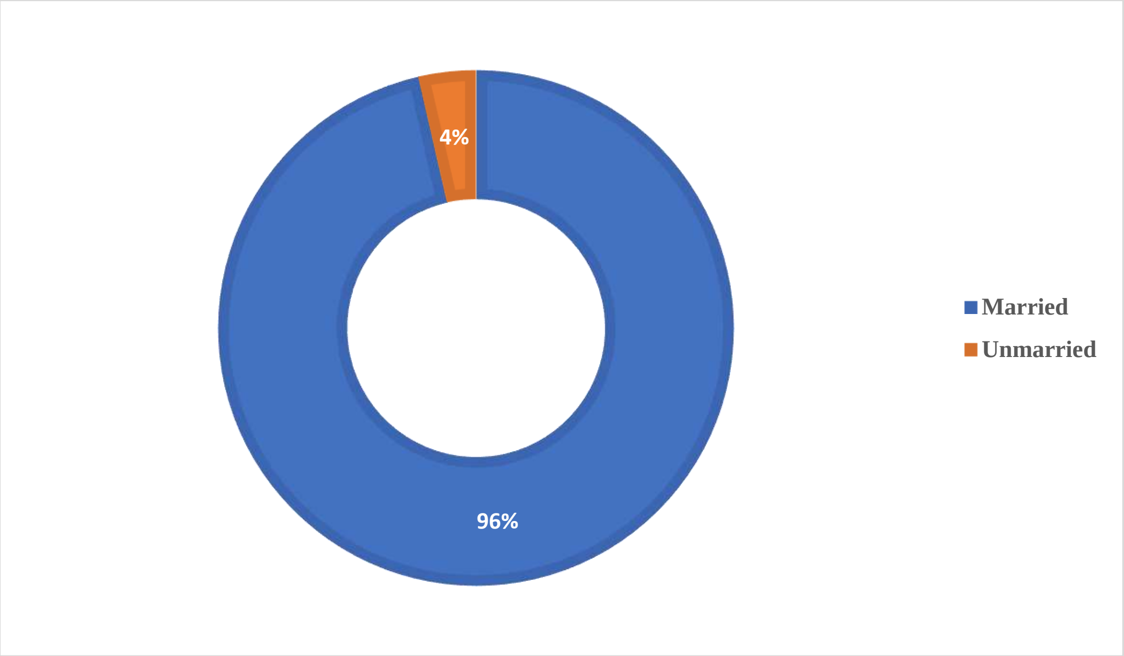


Figure no 2: Marital Status of the Participants

4.2.2 Family Type of Participants:

The sample consists of participants from both nuclear and joint family structures, with a slightly higher proportion of individuals from nuclear families (17 participants, or 60.7%) compared to joint families (11 participants, or 39.3%). This distribution indicates a balanced representation of family types, which may provide insights into how family structure impacts the study's outcomes. However, with a majority coming from nuclear families, findings may lean slightly toward perspectives more common in such family settings.

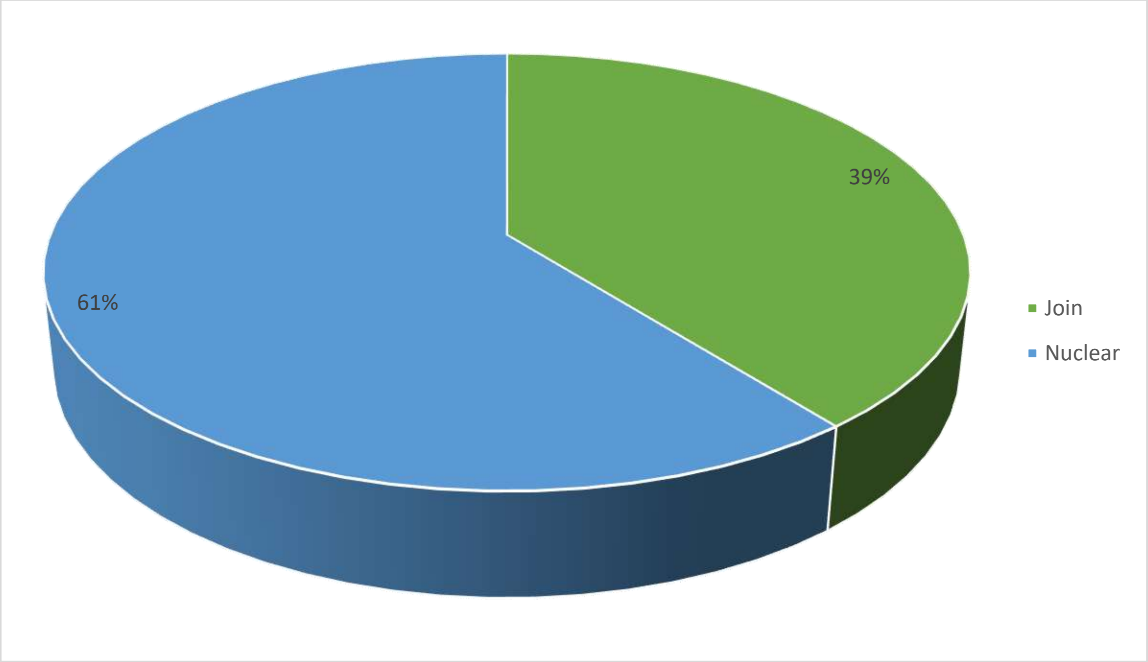


Figure no 3: Family Type of Participants

4.2.3 Living area of Participants:

Based on the data provided, a majority of participants in this study are from urban areas, with 26 individuals (93%) residing in urban settings, compared to only 2 participants (7%) from rural areas. This urban-dominant distribution suggests that the findings may be more reflective of urban populations' experiences or characteristics, potentially limiting the generalizability to rural settings. Future studies with a more balanced rural-urban sample could provide insights into any differences between these populations.

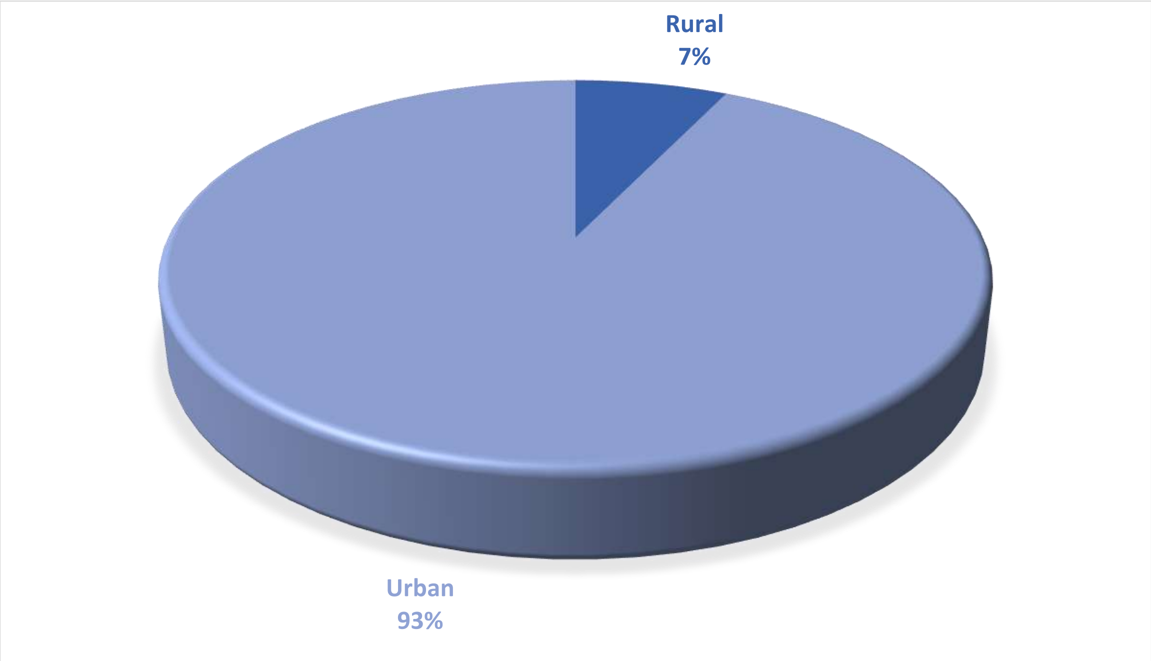


Figure no 4: Living area of Participants

4.2.4 Causes of Pain:

The data on causes of pain indicate that the majority of participants attribute their pain to bad working posture, with 20 individuals (71%) citing this as the main factor. This is followed by 4 participants (14%) identifying heavy weight lifting, and 3 participants (11%) pointing to bad sleeping posture. Trauma was reported by only 1 participant (4%) as the cause of pain.

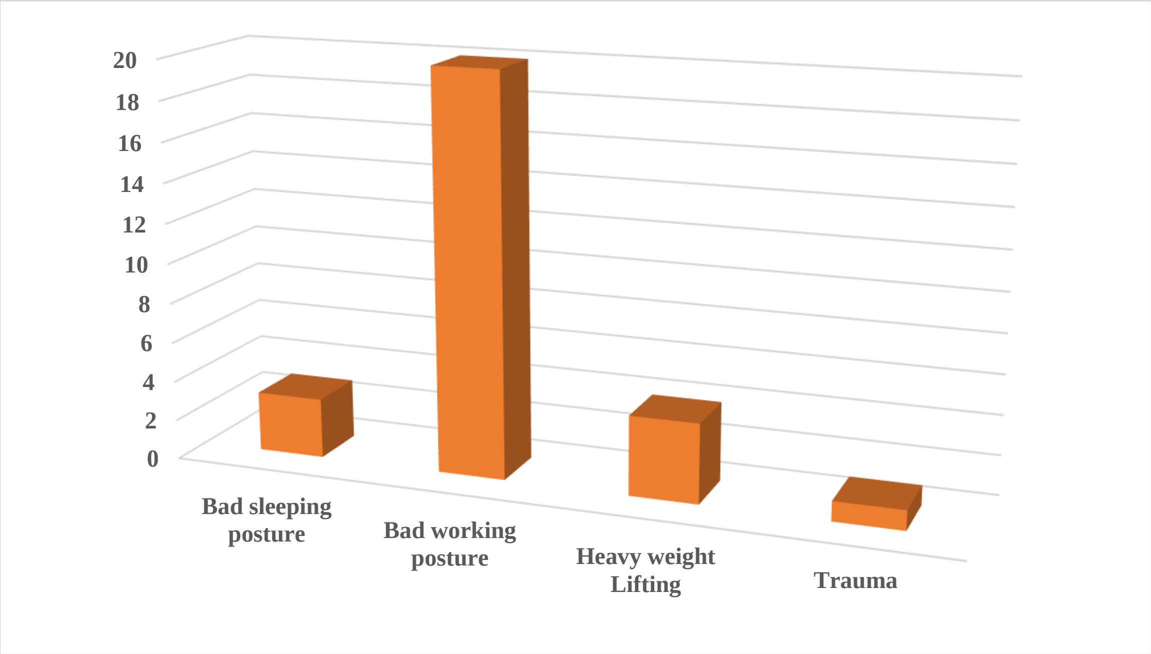


Figure no 5: Causes of Pain

4.2.5 Duration of Symptoms:

The data on symptom duration show that a majority of participants, 16 individuals (57%), experience constant symptoms, while 12 participants (43%) report intermittent symptoms. This indicates that persistent, ongoing pain is more common in this sample than fluctuating or episodic pain.

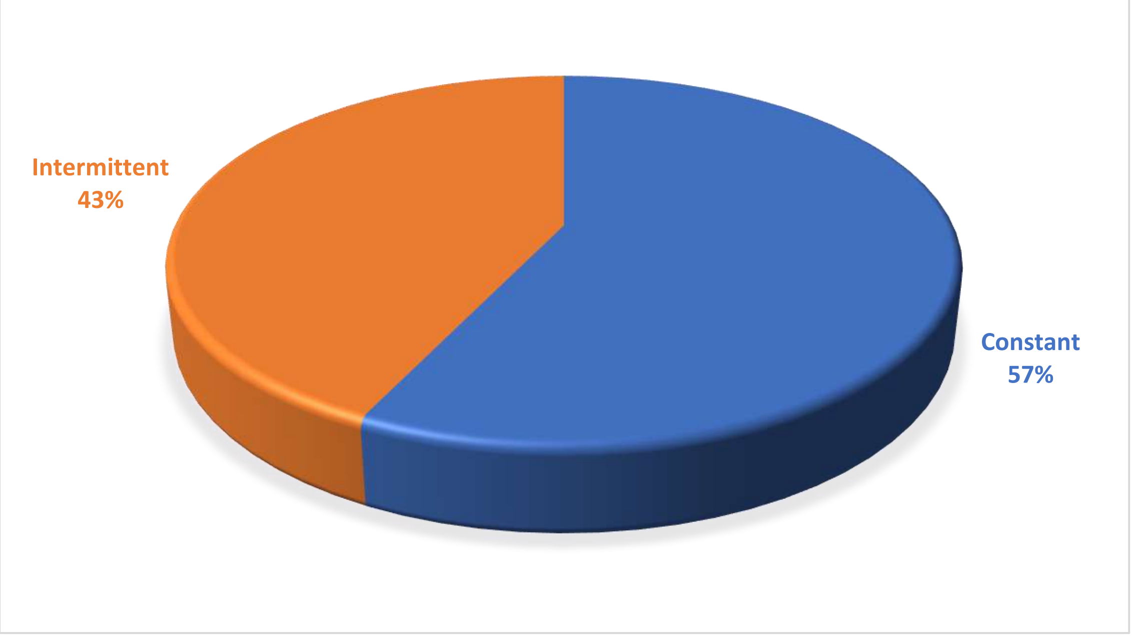


Figure no 6: Duration of Symptoms

4.2.6 Site of Pain Radiation:

The radiating pain data reveal that pain radiates to various upper limbs among participants, with 12 individuals (43%) experiencing pain in the left upper limb, 8 participants (29%) in the right upper limb, and another 8 participants (29%) reporting pain in both upper limbs.

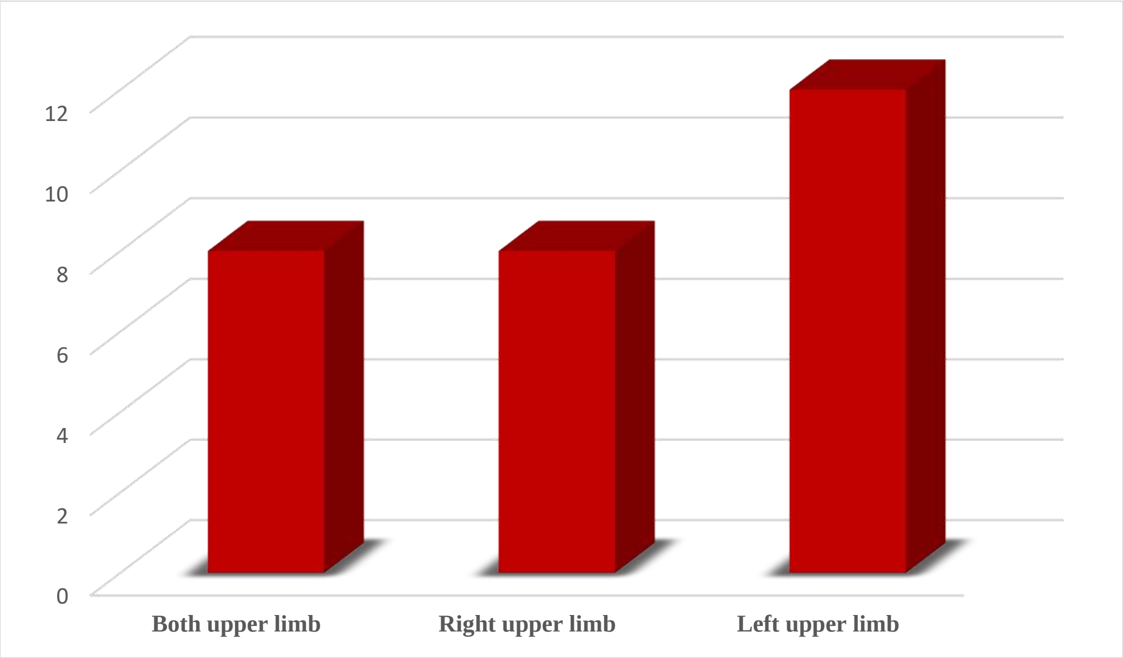


Figure no 7: Site of Pain Radiation

4.2.7 Site of pain Spread:

The nature of pain data shows that the pain varies in its reach, with 10 participants (36%) experiencing pain up to the elbow and another 10 participants (36%) experiencing pain that extends to the fingers. Pain reaching the wrist was reported by 5 participants (18%), while only 3 participants (11%) experience pain extending up to the shoulder.

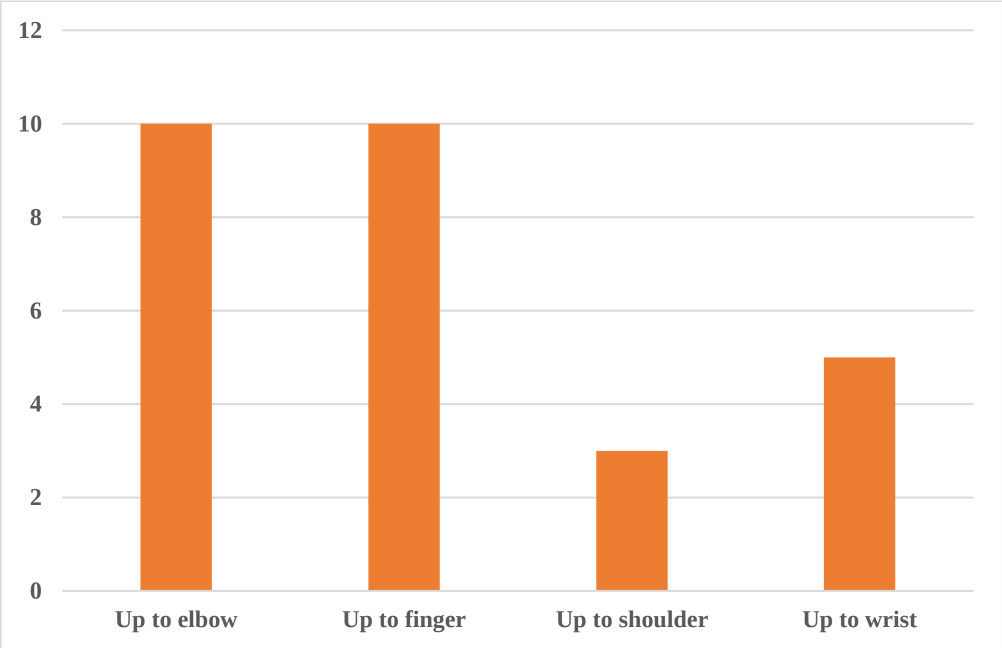


Figure no 8: Site of Pain Spread

4.2.8 Severity of Pain According to NPRS (Numeric Pain Rating Scale)- Post Test:

The NPRS post-test data indicate a notable shift in pain levels following the intervention. After treatment, 17 participants (61%) report experiencing mild pain, while 11 participants (39%) continue to experience moderate pain. Notably, no participants report severe pain in the post-test results.

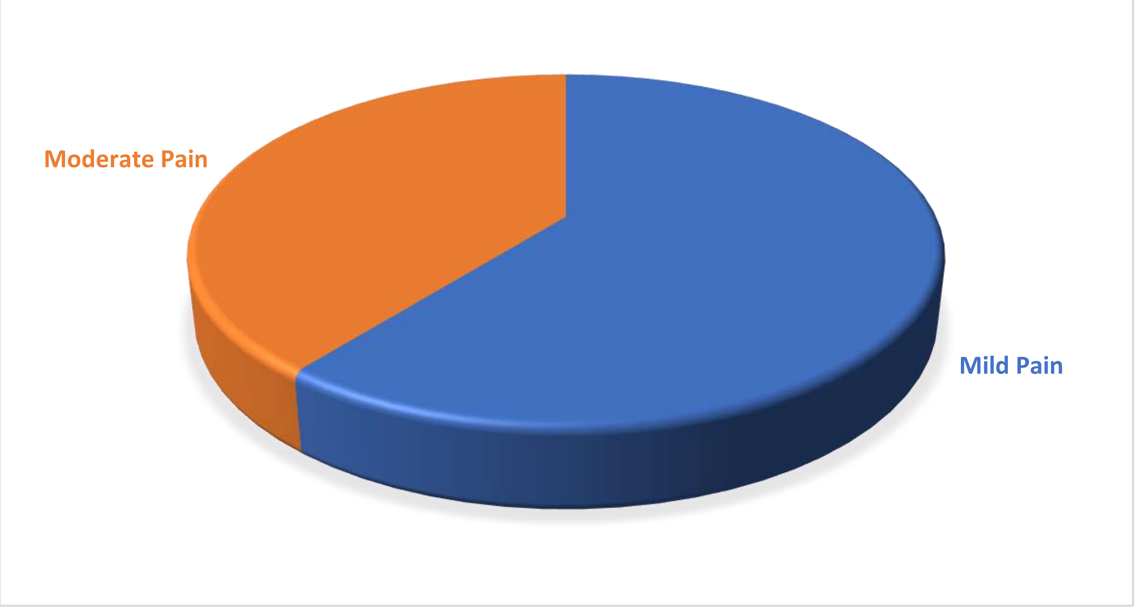


Figure no 9: Severity of Pain According to NPRS (Post Test)

4.2.9 Pain Severity in Sitting (Pre Test):

The pre-test data on pain severity during sitting reveal that most participants experience moderate pain, with 21 individuals (75%) reporting this level. Mild pain during sitting is reported by 5 participants (18%), while 2 participants (7%) experience severe pain.

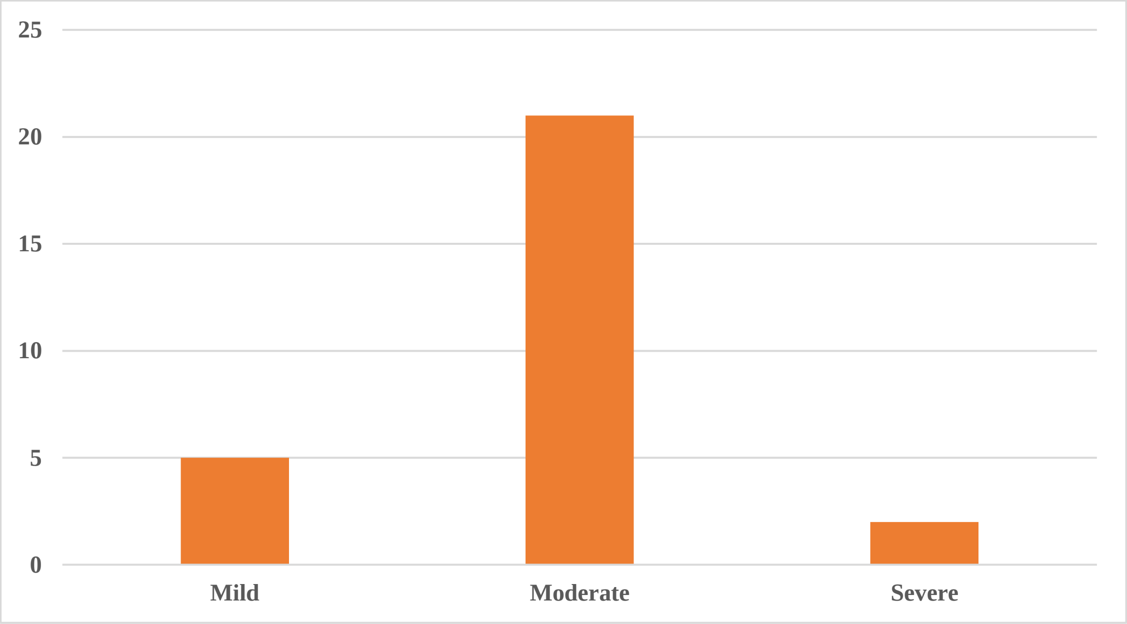


Figure no 10: Pain Severity in Sitting (Pre Test)

4.2.10 Pain Severity in Sitting (Post test):

The post-test data for pain severity during sitting show a significant improvement following the intervention. After treatment, 23 participants (82%) report only mild pain during sitting, while 2 participants (7%) still experience moderate pain. Notably, 3 participants (11%) report no pain at all in this position.

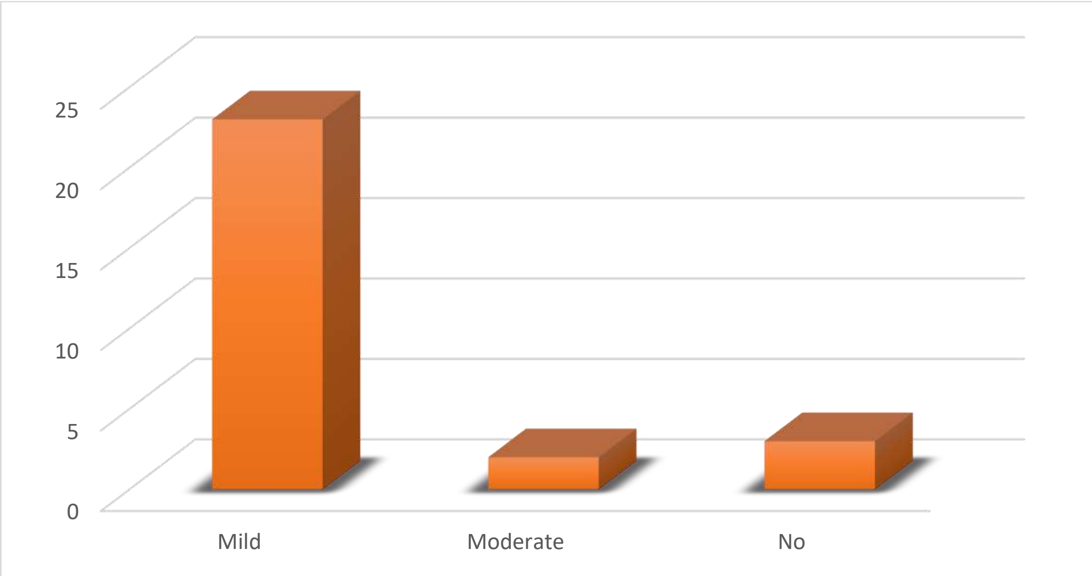


Figure no 11: Pain Severity in Sitting (Post test)

4.2.11 Pain Severity in Lying (Pre test):

The pre-test data on pain severity during lying down show that participants experience a range of discomfort levels. Eleven individuals (39%) report mild pain, 10 participants (36%) experience moderate pain, and 1 participant (4%) reports severe pain while lying down. Additionally, 6 participants (21%) do not experience any pain in this position.

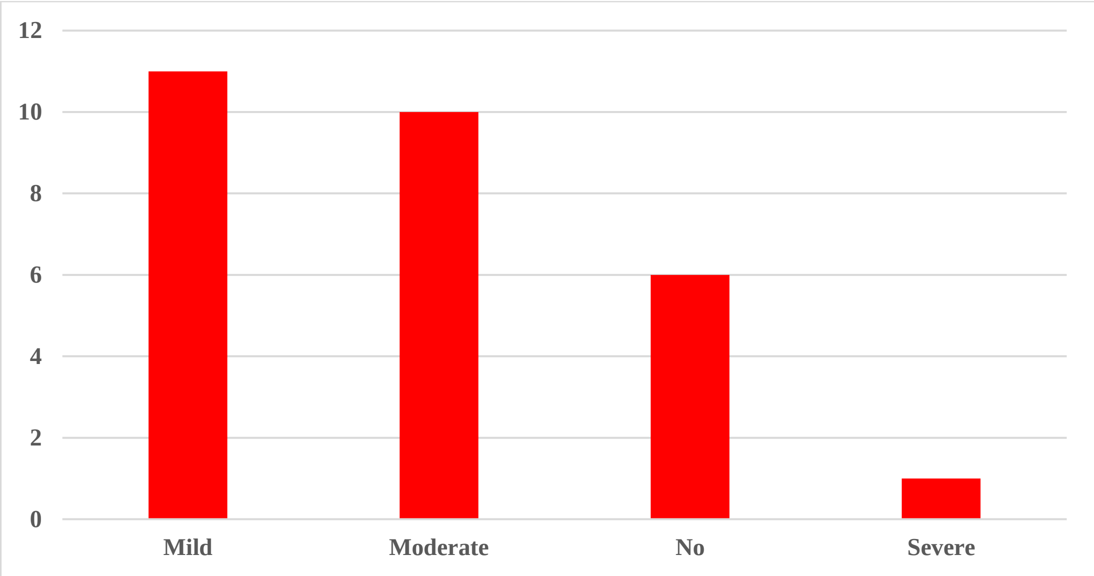


Figure no 12: Pain Severity in Lying (Pre test)

4.2.12 Pain Severity in Lying (Post Test):

The post-test data on pain severity during lying down demonstrate a marked improvement following the intervention. After treatment, 17 participants (61%) report no pain in this position, while 9 participants (32%) experience only mild pain, and just 2 participants (7%) continue to experience moderate pain. Notably, no participants report severe pain post-test.

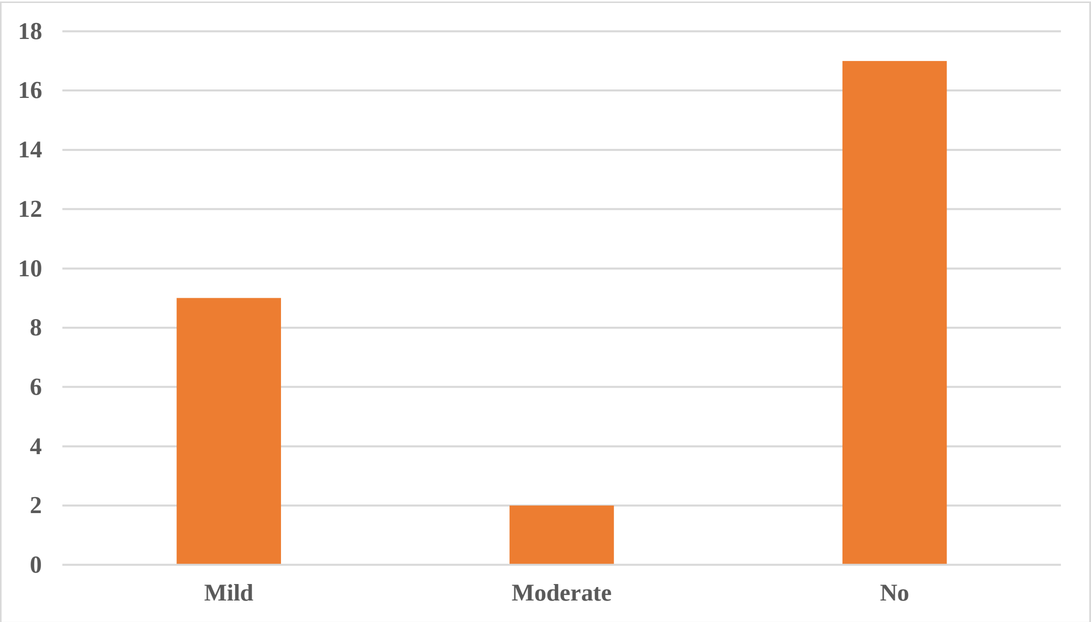


Figure no 13: Pain Severity in Lying (Post Test)

4.2.13 Pain Severity in Neck Flexion (Pre Test):

The pre-test data on pain radiation severity during flexion indicate that a significant portion of participants experience intense discomfort with this movement. Twelve individuals (43%) report severe pain radiation, and 10 participants (36%) experience moderate pain radiation. A smaller group reports mild pain (5 participants, 18%), while only 1 participant (4%) has no pain during flexion.

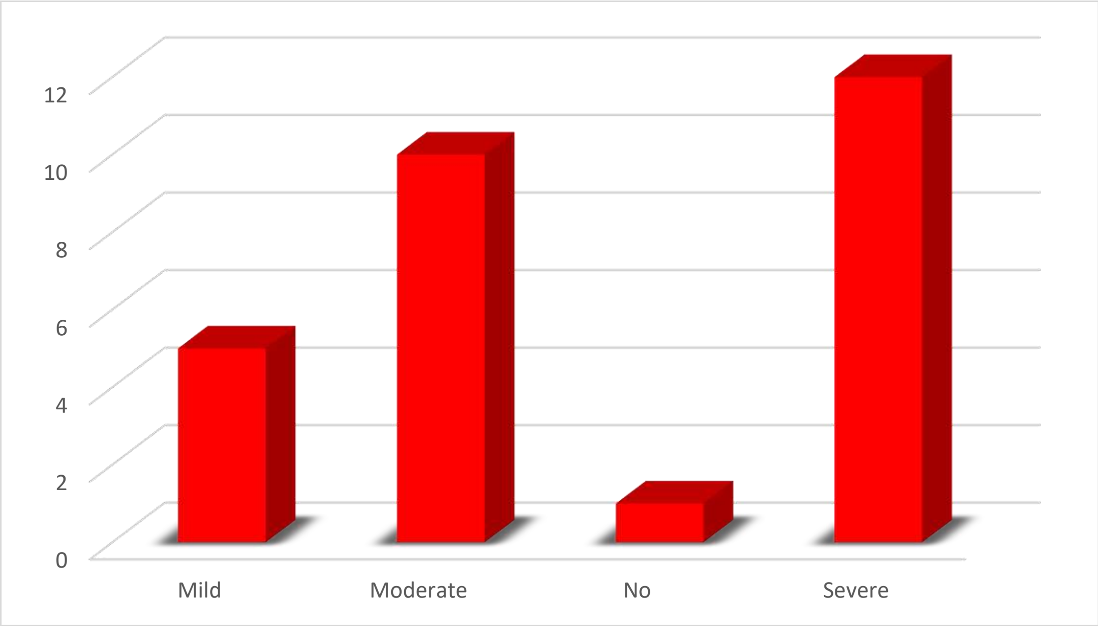


Figure no 14: Pain Severity in Neck Flexion (Pre Test)

4.2.14 Pain Severity in Neck Flexion (Post Test):

The post-test data on pain radiation severity during flexion show a significant reduction in pain following the intervention. After treatment, 18 participants (64%) report only mild pain radiation, 7 participants (25%) continue to experience moderate pain, and 3 participants (11%) report no pain at all during flexion.

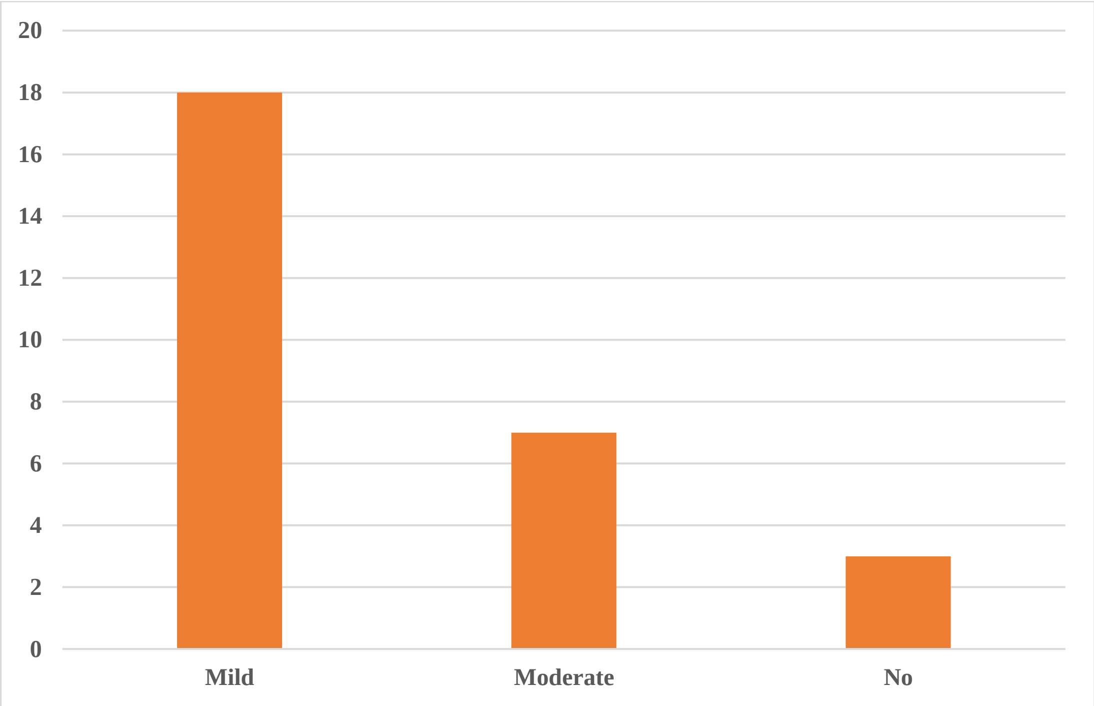


Figure no 15: Pain Severity in Neck Flexion (Post Test)

4.2.15 Pain Severity in Neck Extension (Pre Test):

The majority of participants reported mild pain radiation, comprising over half (57.7%) of the sample, followed by moderate pain radiation (38.5%). A small proportion of participants reported severe pain radiation (7.7%), while only 3.8% reported no radiation of pain. This indicates that most participants were experiencing some degree of pain radiation, with mild to moderate severity being the most common.

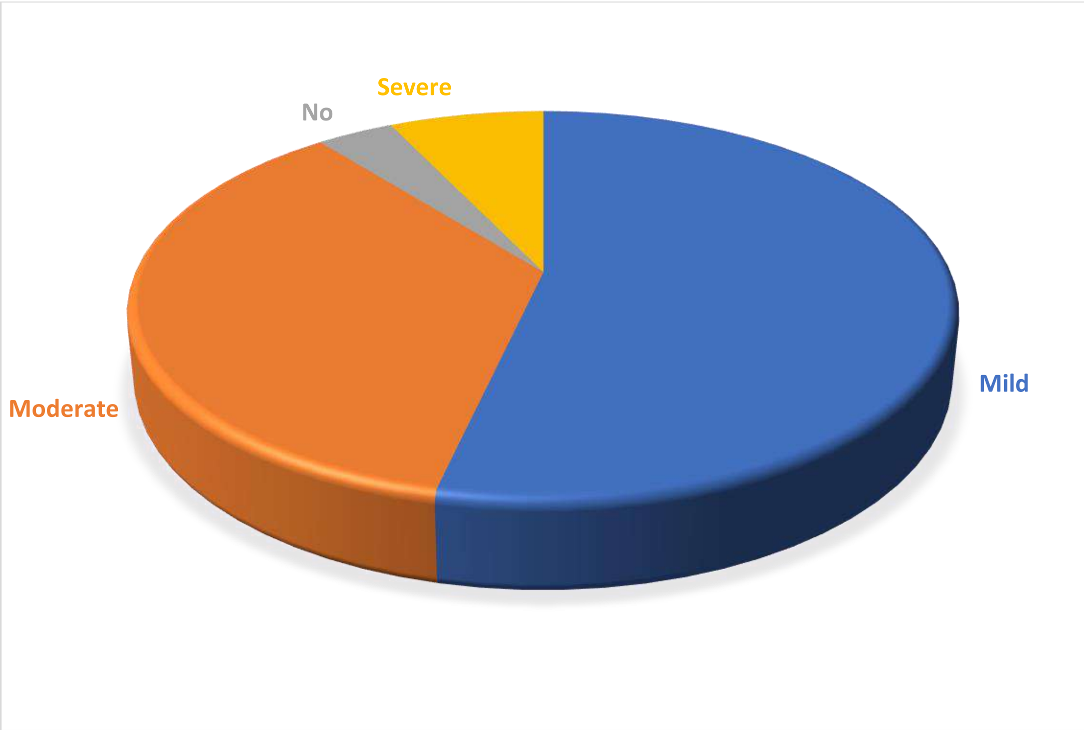


Figure no 16: Pain Severity in Neck Extension (Pre Test)

4.2.16 Pain Severity in Neck Extension (Post Test):

After the randomized controlled trial (RCT), the distribution of Pain Radiation Severity revealed a notable shift in participant responses. A majority of participants, 15 (53.8%), reported no pain radiation following the intervention, indicating a significant improvement in the condition. Additionally, 13 participants (46.2%) experienced mild pain radiation, suggesting that although a portion of the sample still reported some pain, it was generally less severe than before the trial. The reduction in moderate to severe pain radiation observed in the pre-test phase highlights the potential effectiveness of the intervention in alleviating pain radiation symptoms.

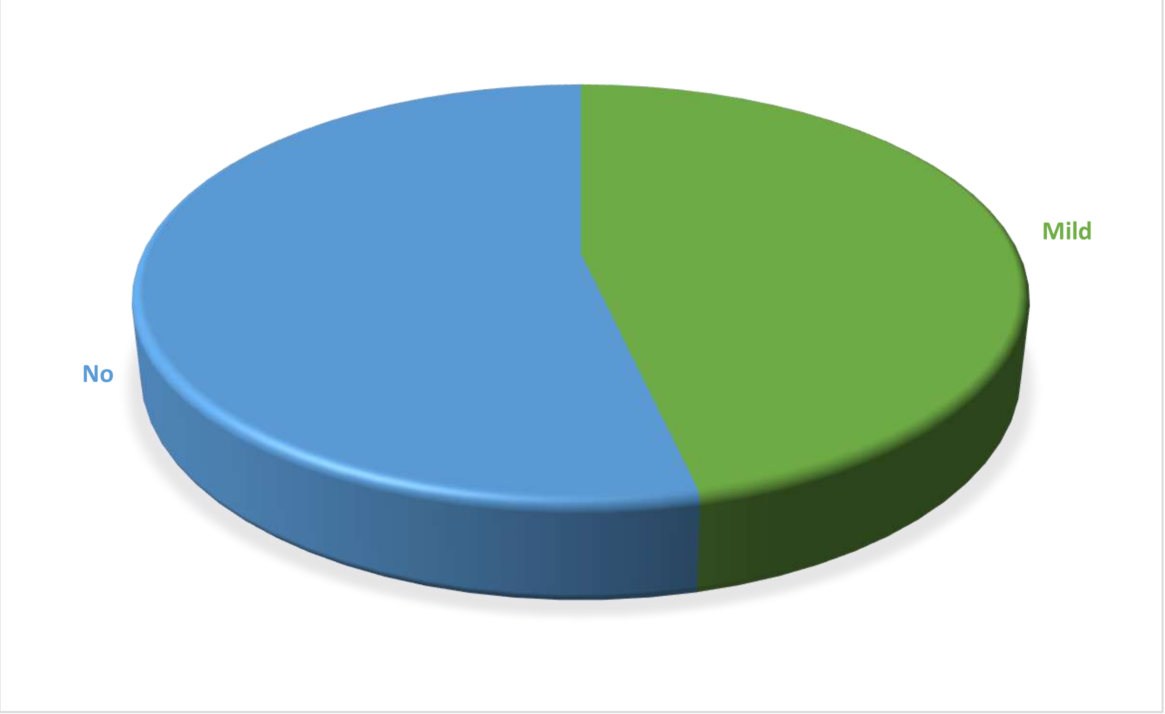


Figure no 17: Pain Severity in Neck Extension (Post Test)

4.2.17 Pain Severity in Right Lateral Flexion of neck (Pre Test):

In the pre-test phase of the randomized controlled trial (RCT), the distribution of Pain Radiation Severity during Right Lateral Flexion showed a varied range of responses. A majority of participants, 17 (65.4%), reported moderate pain radiation during the movement, while 8 participants (30.8%) experienced mild pain radiation. A smaller portion, 2 participants (7.7%), reported no pain radiation, and only 1 participant (3.8%) experienced severe pain radiation. These results suggest that most participants experienced moderate discomfort during right lateral flexion, with only a few reporting either no pain or severe pain, indicating that a significant portion of the sample had varying degrees of pain severity during this movement.

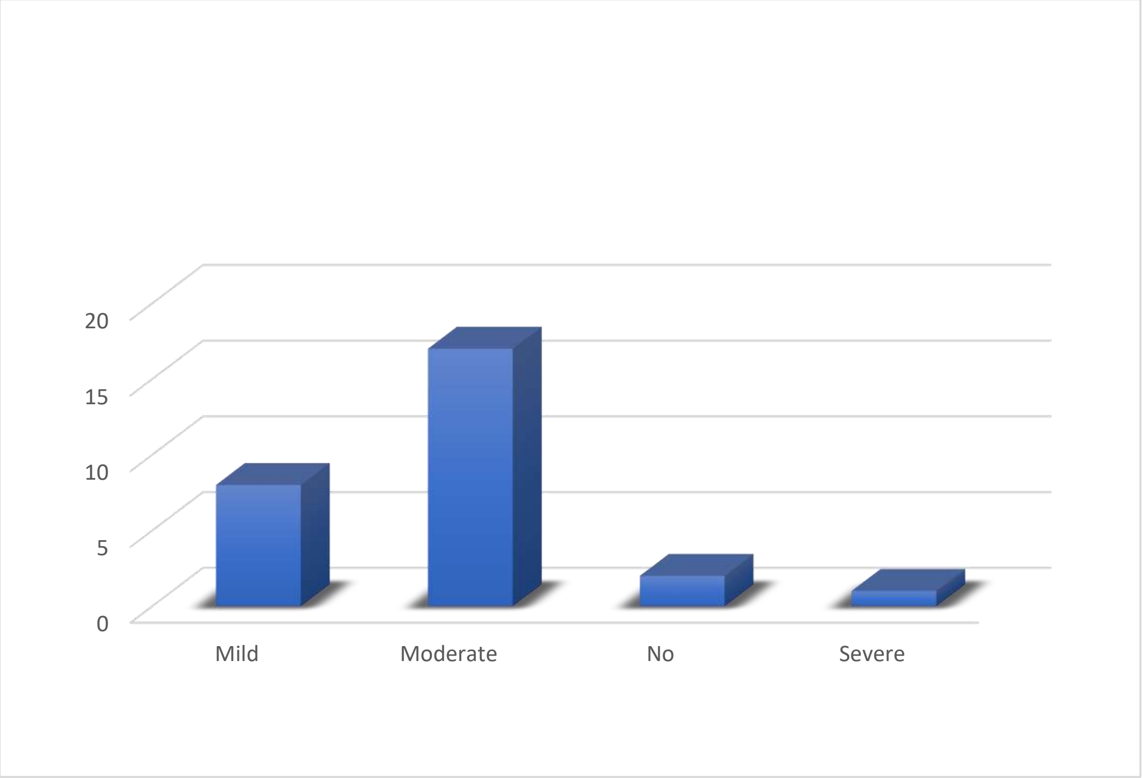


Figure no 18: Pain Severity in Right Lateral Flexion of neck (Pre Test)

4.2.18 Pain Severity in Right Lateral Flexion of neck (Post Test):

After the randomized controlled trial (RCT), the distribution of Pain Severity during Right Lateral Flexion demonstrated a notable improvement in participants' symptoms. The majority, 21 participants (72.4%), reported mild pain, indicating that most individuals experienced some discomfort, but it was less intense compared to the pre-test phase. Additionally, 3 participants (10.3%) reported moderate pain, and 4 participants (17.2%) experienced no pain during right lateral flexion. These results suggest a significant reduction in pain severity following the intervention, with a large portion of participants experiencing mild pain and an improvement in the number of participants reporting no pain.

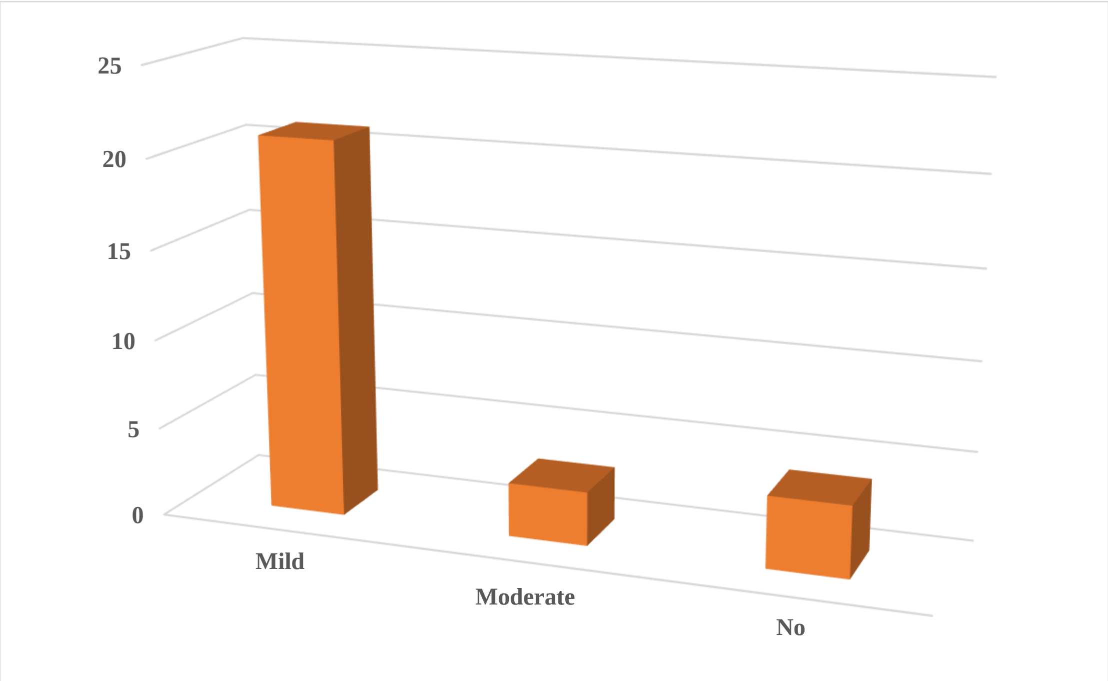


Figure no 19: Pain Severity in Right Lateral Flexion of neck (Post Test)

4.2.19 Pain Severity in Left Lateral Flexion of neck (Pre Test):

In the pre-test phase of the randomized controlled trial (RCT), the distribution of Pain Radiation Severity during Left Lateral Flexion showed that 21 participants (80.8%) experienced moderate pain radiation, making it the most common severity level. 4 participants (15.4%) reported mild pain radiation, while 2 participants (7.7%) experienced severe pain radiation. Only 1 participant (3.8%) reported no pain radiation during the movement. These results indicate that the majority of participants had moderate pain radiation during left lateral flexion, with a smaller portion reporting severe or no pain, suggesting that the condition was widespread but varied in severity.

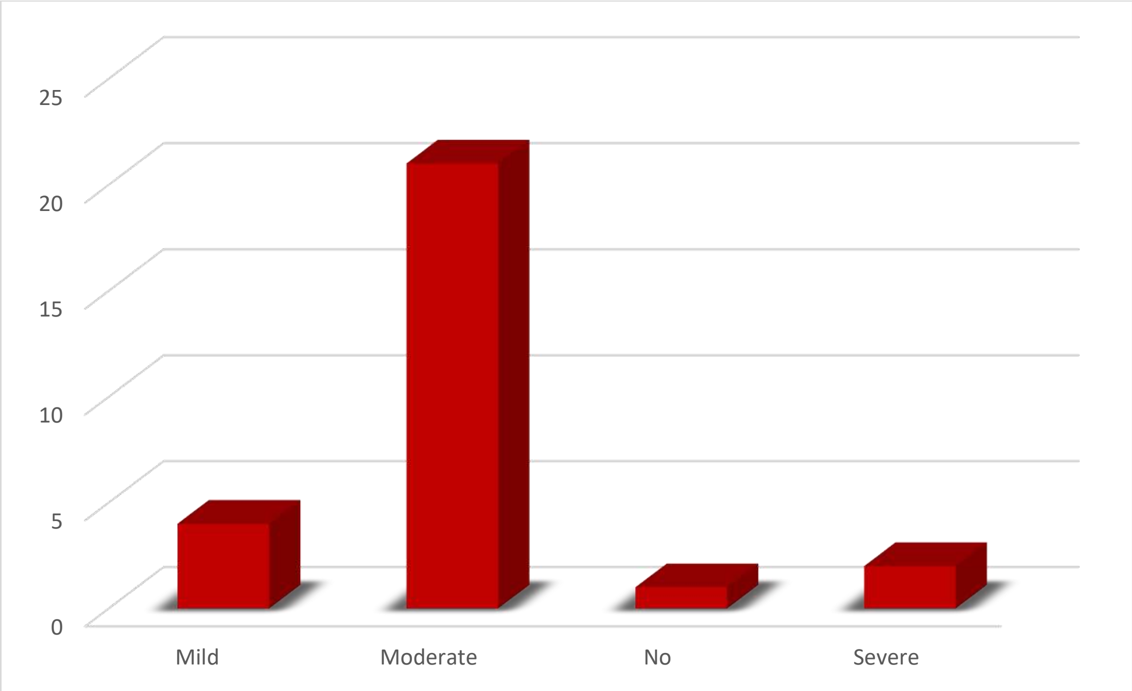


Figure no 20: Pain Severity in Left Lateral Flexion of neck (Pre Test)

4.2.20 Pain Severity in Left Lateral Flexion of neck (Post Test):

After the randomized controlled trial (RCT), the distribution of Pain Radiation Severity during Left Lateral Flexion showed significant improvement in participants' symptoms. 21 participants (80.8%) reported mild pain radiation, which suggests that most individuals continued to experience some discomfort, but at a much lower intensity compared to the pre-test phase. Additionally, 2 participants (7.7%) experienced moderate pain, and 5 participants (19.2%) reported no pain during the movement. This shift indicates a substantial reduction in the severity of pain, with more participants experiencing less pain overall and a notable increase in those reporting no pain after the intervention.

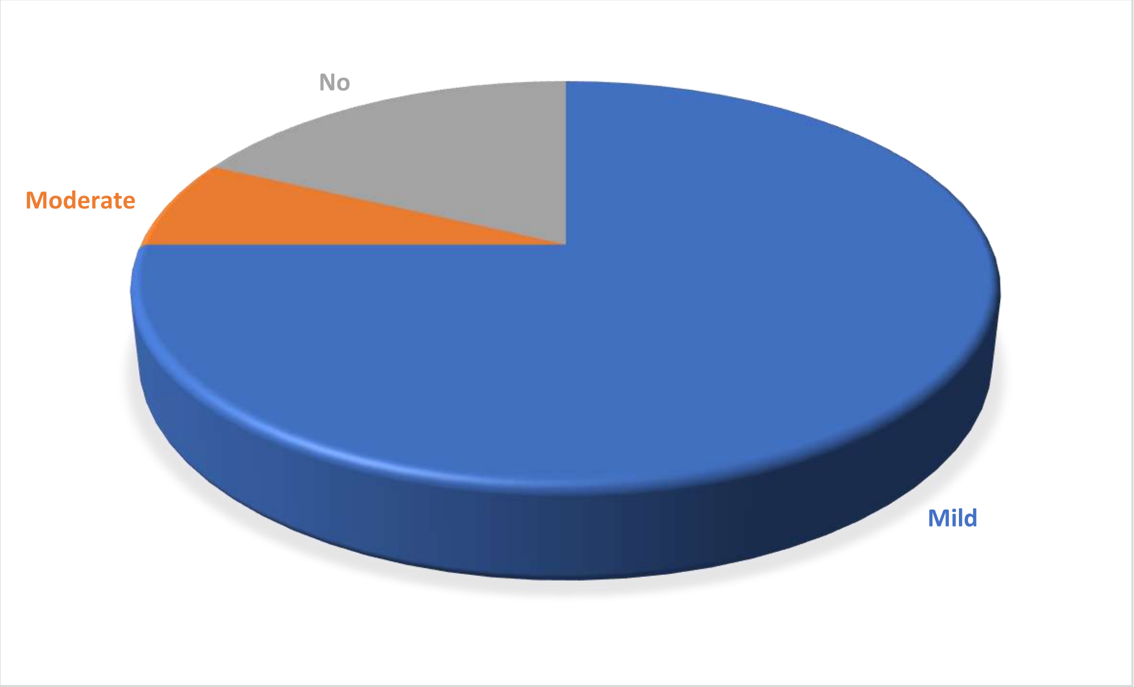


Figure no 21: Pain Severity in Left Lateral Flexion of neck (Post Test)

4.2.21 Pain Severity in Right Side Rotation of neck (Pre Test):

In the pre-test phase of the randomized controlled trial (RCT), the distribution of Pain Radiation Severity during Right Rotation revealed varying levels of discomfort among participants. 16 participants (61.5%) reported moderate pain radiation, making it the most common severity level. 9 participants (34.6%) experienced mild pain radiation, while 2 participants (7.7%) reported no pain radiation. Only 1 participant (3.8%) experienced severe pain radiation during right rotation. These results indicate that the majority of participants experienced moderate pain radiation, with a smaller portion reporting mild or severe pain, and a few reporting no pain at all.

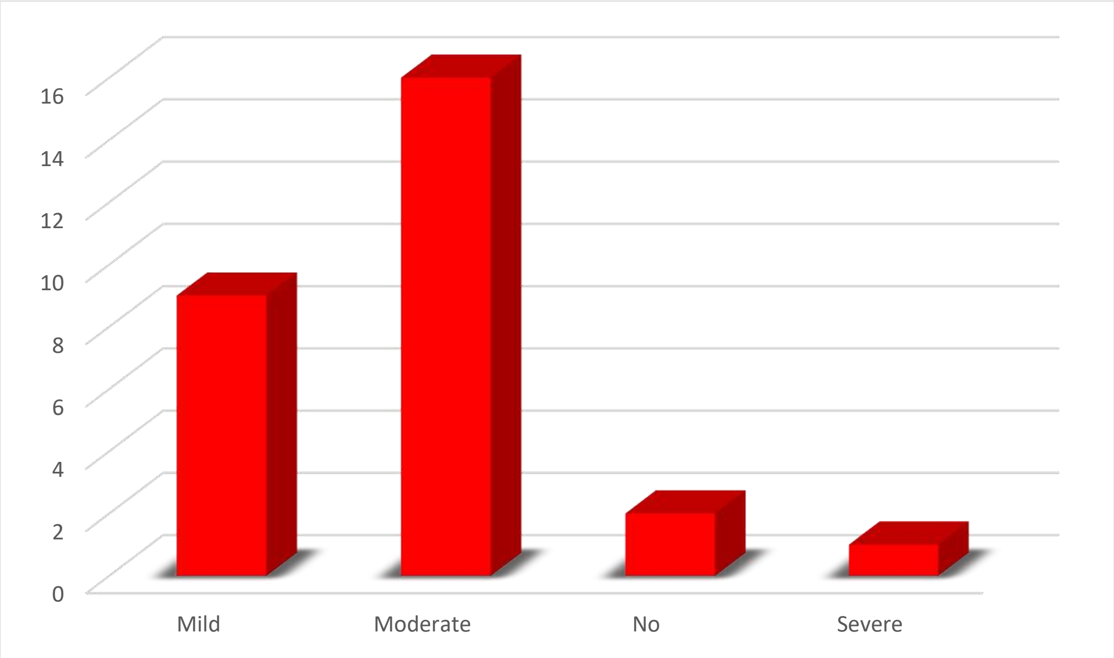


Figure no 22: Pain Severity in Right Side Rotation of Neck (Pre Test)

4.2.22 Pain Severity in Right Side Rotation of Neck (Post Test):

After the randomized controlled trial (RCT), the distribution of Pain Radiation Severity during Right Rotation showed a marked improvement in symptoms. 18 participants (69.2%) reported mild pain radiation, suggesting that most individuals continued to experience some discomfort, but at a lower intensity compared to the pre-test phase. Additionally, 5 participants (19.2%) reported moderate pain, and 5 participants (19.2%) reported no pain during right rotation. These results indicate a significant reduction in pain severity following the intervention, with more participants experiencing mild pain and a notable proportion experiencing no pain at all.

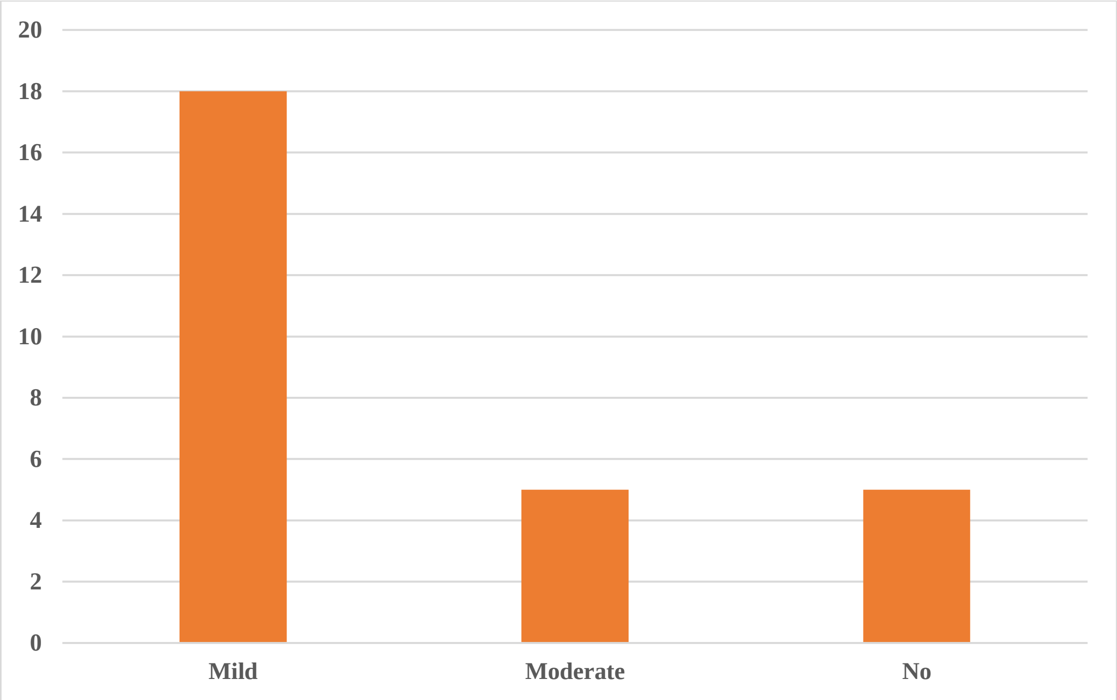


Figure no 23: Pain Severity in Right Side Rotation of Neck (Post Test)

4.2.23 Pain Severity in Left Side Rotation of Neck (Pre Test):

In the pre-test phase of the randomized controlled trial (RCT), the distribution of Pain Radiation Severity during Left Rotation showed a range of experiences among participants. 16 participants (61.5%) reported moderate pain radiation, making it the most prevalent severity level. 8 participants (30.8%) experienced mild pain, while 2 participants (7.7%) reported no pain radiation. Additionally, 2 participants (7.7%) experienced severe pain radiation during left rotation. These results indicate that the majority of participants had moderate pain radiation, with a smaller portion reporting mild, severe, or no pain.

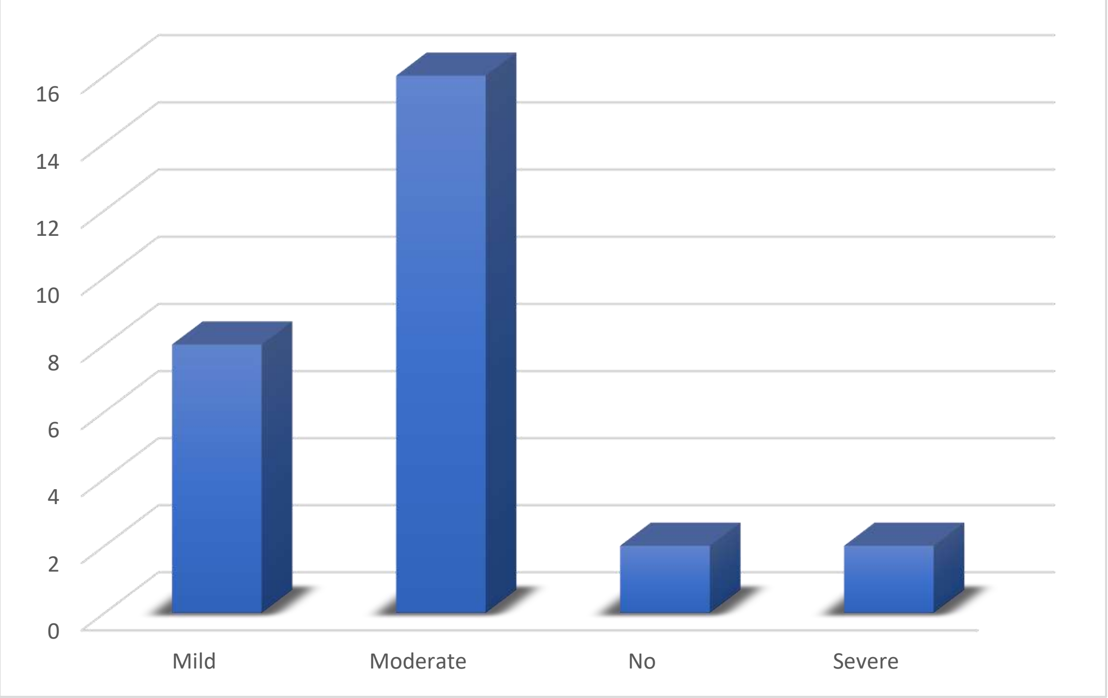


Figure no 24: Pain Severity in Left Side Rotation of Neck (Pre Test)

4.2.24 Pain Severity in Left Side Rotation of Neck (Pre Test):

After the randomized controlled trial (RCT), the distribution of Pain Radiation Severity during Left Rotation showed a significant improvement in participants' symptoms. 17 participants (65.4%) reported mild pain radiation, suggesting that most individuals continued to experience some discomfort, but at a much lower intensity compared to the pre-test phase. 1 participant (3.8%) reported moderate pain, and 10 participants (38.5%) experienced no pain during left rotation. These results indicate a substantial reduction in pain severity following the intervention, with a large proportion of participants experiencing mild pain and a significant number reporting no pain at all.

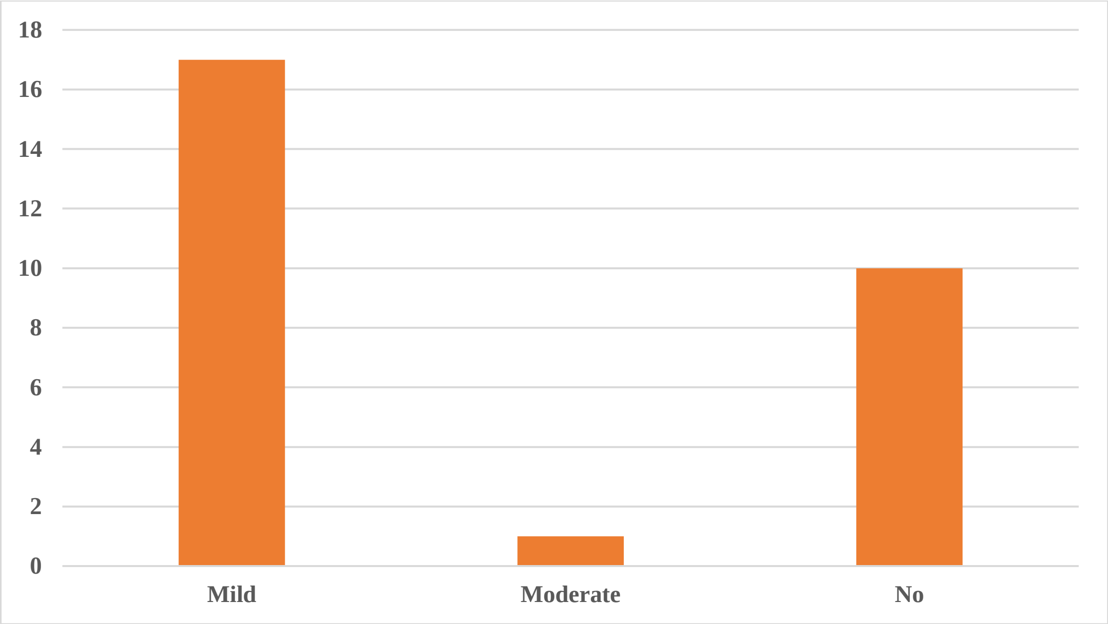


Figure no 25: Pain Severity in Left Side Rotation of Neck (Post Test)

4.2.25 NDI (Neck Disability Index) Scoring (Post Test):

In the post-test phase of the randomized controlled trial (RCT), the Neck Disability Index (NDI) results showed a shift towards lower levels of disability among participants. 17 participants (60.7%) reported minimal disability, indicating that the majority experienced only mild functional limitations following the intervention. 11 participants (39.3%) reported moderate disability, suggesting that while some level of impairment remained for a portion of the group, it was generally less severe than in the pre-test phase. These findings suggest a positive impact of the intervention, with a significant reduction in severe disability levels and a shift towards minimal disability for most participants.

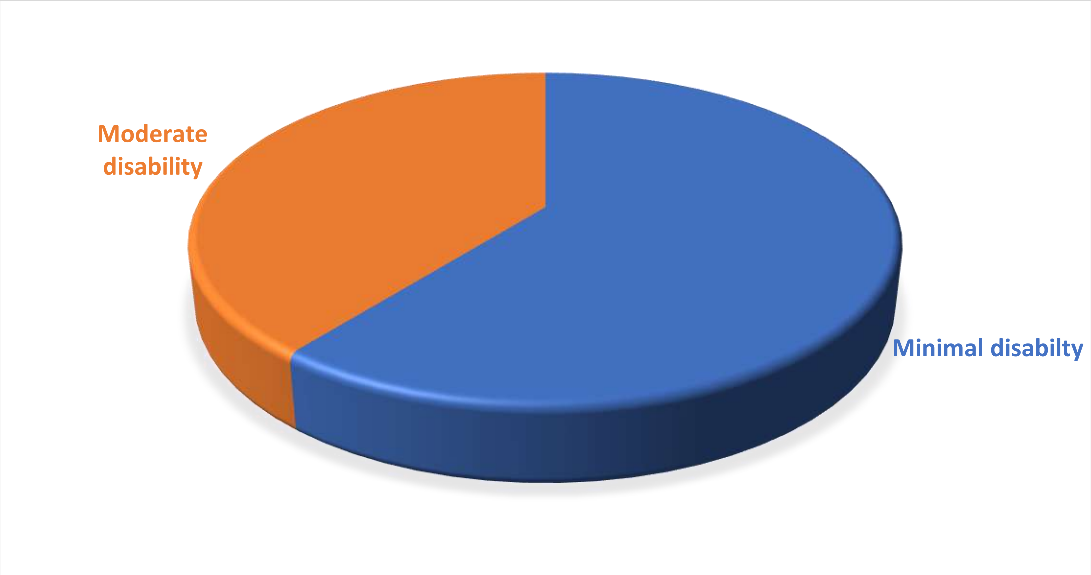


Figure no 26: NDI Score (Post Test)

4.3 Total score of the participants in NPRS (Pre and Post test):

Experimental group				Control group			
Variable	**Pre**	**Post**	**Difference**	**Variable**	**Pre**	**Post**	**Difference**
C1	6	4	2	E1	6	4	2
C2	5	3	2	E2	5	2	3
C3	6	3	3	E3	6	4	2
C4	6	4	2	E4	5	4	1
C5	6	1	5	E5	6	4	2
C6	6	3	3	E6	6	5	1
C7	6	4	2	E7	8	6	2
C8	5	2	3	E8	6	3	3
C9	3	1	2	E9	6	4	2
C10	6	2	4	E10	5	2	3
C11	4	2	2	E11	5	2	3
C12	3	1	2	E12	5	3	2
C13	6	2	4	E13	4	2	2
C14	8	5	3	E14	6	3	3
Total	**76**	**37**	**39**	**Total**	**79**	**48**	**31**
Mean	**5.42**	**2.64**	**2.78**	**Mean**	**5.64**	**3.42**	**2.22**

The experimental group has a total pre test score of 76 and the total post intervention score was 37 decreasing from 76 to 39, which equaled 39 points of reduction. In this group, the truck received an average decrease of mean NPRS of 2.78 from 5.42 to 2.64. Similarly in the control group, the pre test total score was 79 and dropped down to 48 post intervention, total reduction is 31 points. The score for the control group meaned 5.64 points at baseline and decreased to 3.42 with an average difference of 2.22.

However, these results imply that it reduced pain in both groups as determined in the NPRS, although the experimental group (2.78) had slightly less mean reduction (2.22). Such an effect upon the experimental group would be more pronounced, presumptively.

4.4 Difference between-group analysis for total NPRS:

Difference between Numeric Pain Rating Scale	Category of participants	N	Mean Rank	Sum of Ranks	Mann Whitney U score	*P*
	Experimental	14	12.46	174.50	69.50	0.154
	Control	14	16.54	231.50		
	Total	28				

The Mann-Whitney U test results that were conducted to compare the differences in the NPRS scores in the experimental and control groups. For the experimental group, the mean rank was 12.46, sum of ranks = 174.50 on the other hand, control group mean rank was 16.54, sum of ranks = 231.50. The Mann-Whitney U was 69.50, and p = 0.154.

Based on these results, no statistical difference exists between the reduction of NPRS scores in the experimental group and the control group ($p > 0.05$). This implies that while both groups got better in pain levels, the amount of the improvement was equal between the two groups.

4.5 Difference within group of NPRS for experimental group:

Posttest-Pretest NPRS scores	N	Means Rank	Sum of Ranks	Wilcoxon signed rank test based on Z rank	*P*-Value
Negative Ranks	14	7.50	105.00	-3.352	0.001
Positive Ranks	0	.00	.00		
Ties	0				
Total	14				

To compare the pre-test and the post test scores of the experimental group we conducted The Wilcoxon Signed Rank Test to find out whether there was a difference in the NPRS (Numeric Pain Rating Scale) scores. The negative ranks were 14, mean rank=7.50, sum of ranks=105.00 which means that all participants had lower NPRS post intervention. There were no positive ranks, or ties. The p-value for the test statistic (Z) p = 0.001 was noted to be 0.001, with the test statistic (Z) of -3.352. Since the obtained p value is smaller than 0.05, the result is statistically significant, which results in rejecting the null hypothesis and accepting the alternative hypothesis. Also, this indicates a big decrease in NPRS scores following the intervention.

4.6 Difference within group of NPRS for control group:

Posttest-Pretest NPRS scores	N	Means Rank	Sum of Ranks	Wilcoxon signed rank test based on Z rank	*P*-Value
Negative Ranks	14	7.50	105.00	-3.360	0.001
Positive Ranks	0	.00	.00		
Ties	0				
Total	14				

To determine if there was a difference in NPRS (Numeric Pain Rating Scale) scores for the control group between pre-test and post-test, the Wilcoxon Signed Rank test was run. A mean rank of 7.50 and a sum of ranks of 105.00 was found and 14 negative ranks indicating that all the participants scored lower NPRS scores post intervention. The ranks were free of positive ties and ranks. The p-value was 0.001, so the test statistic (Z) was -3.360. Since p value is less than 0.05, the result is statistically significant and null hypothesis is rejected because the result is statistically significant. This indicates that the control shows a great deal of decrease in NPRS scores following the intervention.

4.7 Total score of the participants in NDI (Pre and Post test):

Experimental group				**Control group**			
Variable	**Pre**	**Post**	**Difference**	**Variable**	**Pre**	**Post**	**Difference**
C1	40%	16%	24%	E1	24%	18%	6%
C2	58%	36%	22%	E2	20%	12%	8%
C3	74%	28%	46%	E3	32%	20%	12%
C4	38%	16%	22%	E4	38%	24%	14%
C5	44%	6%	38%	E5	40%	16%	24%
C6	56%	38%	18%	E6	54%	40%	14%
C7	48%	34%	14%	E7	50%	38%	12%
C8	38%	16%	22%	E8	40%	28%	12%
C9	30%	12%	18%	E9	38%	24%	14%
C10	48%	20%	28%	E10	26%	22%	14%
C11	28%	12%	16%	E11	36%	14%	12%
C12	50%	28%	22%	E12	20%	10%	10%
C13	34%	14%	20%	E13	32%	18%	14%
C14	54%	28%	16%	E14	36%	18%	18%
Total	**640%**	**304%**	**336%**	**Total**	**486%**	**302%**	**184%**
Mean	**45.71 %**	**21.71 %**	**24%**	**Mean**	**34.57 %**	**21.57 %**	**13.14%**

In this table presents the pre and post-test Neck Disability Index (NDI) scores for the experimental and control groups, as well as the differences in scores. In the experimental group, the total pre-test score was 640%, which decreased to 304% post-intervention, resulting in an overall reduction of 336%. The mean NDI score in this group decreased from 45.71% to 21.71%, with an average reduction of 24%. In the control group, the total pre-test score was 486%, which reduced to 302% post-intervention, yielding a total reduction of 184%. The mean NDI score for the control group decreased from 34.57% to 21.57%, with an average reduction of 13.14%.

These findings indicate that both groups experienced improvements in disability levels as measured by the NDI. However, the experimental group demonstrated a significantly greater reduction in NDI scores (24%) compared to the control group (13.14%), suggesting that the intervention was more effective in improving functional outcomes in the experimental group.

4.8 Difference between group analysis for total NDI:

Difference between Neck Disability Index	Category of participants	N	Mean Rank	Sum of Ranks	Mann Whitney U score	*P*
	Experimental	14	9.04	126.50	21.50	0.000
	Control	14	19.96	279.50		
	Total	28				

The Mann-Whitney U test produced results to evaluate NDI score variations between experimental and control subjects. The experimental group achieved a mean rank score of 9.04 including a sum of ranks at 126.50 while the control group maintained a mean rank score of 19.96 and a sum of ranks at 279.50. Experimental and control group data yielded statistical significance with a Mann-Whitney U score of 21.50 and p-value < 0.001 where the test passed because $p <$ alpha value.

The research findings showed a significant statistical reduction in experimental group NDI scores when compared to the controls ($p < 0.05$). The intervention performed on the experimental group provided superior functional outcome results than what the control group experienced.

4.9 Difference within group of NDI for experimental group:

Posttest-Pretest NDI scores	N	Means Rank	Sum of Ranks	Wilcoxon signed rank test based on Z rank	*P*-Value
Negative Ranks	14	7.50	105.00	-3.305	0.001
Positive Ranks	0	.00	.00		
Ties	0				
Total	14				

The experimental group comparison of NDI (Neck Disability Index) scores between pre-test and post-test used the Wilcoxon Signed Rank Test. Every participant included in the study recorded lower NDI scores after the intervention as demonstrated by negative ranks with a mean rank of 7.50 and a sum of ranks totaling 105.00. All data points demonstrated lower scores at the end of the study thus no participants scored higher or had equivalent scores at any time during the study period. The Z statistic value reached -3.305 while the computed p-value was 0.001. The statistical result proves significant since the p-value falls beneath 0.05 thus we can reject the null hypothesis. Research outcomes indicate that the experimental group achieved substantial NDI score decreases after participating in the study intervention.

4.10 Difference within group of NDI for control group:

Posttest-Pretest NDI scores	N	Means Rank	Sum of Ranks	Wilcoxon signed rank test based on Z rank	*P*-Value
Negative Ranks	14	7.50	105.00	-3.307	0.001
Positive Ranks	0	.00	.00		
Ties	0				
Total	14				

The researcher used the Wilcoxon Signed Rank Test to examine NDI (Neck Disability Index) score alterations between pre-test and post-test periods for the control population. All participants showed decreased NDI scores following the intervention according to 14 negative ranks which yielded a mean rank of 7.50 and a sum of ranks of 105.00. The analysis revealed no instances of positive ranks while no ties existed among the data. The obtained test statistic value (Z) equaled -3.307 and produced a p-value of 0.001. The statistical significance arises because the p-value fell less than 0.05 which ultimately leads to the null hypothesis being rejected. The intervention data indicates the control participants experienced a major decrease in their NDI scores.

4.11 Difference between group analysis for total AROM flexion (Pre and Post-test):

	Category of participants	N	Mean Rank	Sum of Ranks	Mann Whitney U score	*P*
Difference between total AROM flexion	Experimental	14	15.54	217.50	83.50	0.495
	Control	14	13.46	188.50		
	Total	28				

A summary of Mann-Whitney U test results for total Active Range of Motion (AROM) flexion scores exists in the table between the experimental and control groups. Result data indicated that experimental group subjects obtained a mean rank of 15.54 and total ranks of 217.50 whereas the control group achieved a mean rank of 13.46 with total ranks of 188.50. The Mann-Whitney U revealed 83.50 as the calculated score and demonstrated a p-value at 0.495.

The research conclusions show that AROM flexion improvements did not differ significantly between experimental and control groups ($p > 0.05$). The AROM flexion results of both groups demonstrated similar improvements based on the conclusion of this study.

4.12 Difference between group analysis for total AROM extension (Pre and Post-test):

Difference between total AROM extension	Category of participants	N	Mean Rank	Sum of Ranks	Mann Whitney U score	*P*
	Experimental	14	17.39	243.50	57.50	0.051
	Control	14	11.61	162.50		
	Total	28				

The Mann-Whitney U test results on total AROM extension scores were done between the experimental and control groups on the table. The mean rank for the experimental group was 17.39, with sum of ranks 243.50, and for control group the mean rank was 11.61 and sum of ranks was 162.50. The Mann-Whitney U score was 57.50, p value 0.051.

This implies there was a statistically significant trend of improvement of AROM extension for the experimental versus control group and greater improvement in the experimental group. However, the p-value is exceedingly close to the threshold for statistical significance (p = 0.05) suggesting that the difference is not forfeitable and should be further investigated.The Mann-Whitney U test results on total AROM extension scores were done between the experimental and control groups on the table. The mean rank for the experimental group was 17.39, with sum of ranks 243.50, and for control group the mean rank was 11.61 and sum of ranks was 162.50. The Mann-Whitney U score was 57.50, p value 0.051.

This implies there was a statistically significant trend of improvement of AROM extension for the experimental versus control group and greater improvement in the experimental group. However, the p-value is exceedingly close to the threshold for statistical significance (p = 0.05) suggesting that the difference is not forfeitable and should be further investigated.

4.13 Difference between group analysis for total AROM right flexion (Pre and Post-test):

Difference between total AROM right flexion	Category of participants	N	Mean Rank	Sum of Ranks	Mann Whitney U score	*P*
	Experimental	14	15.68	219.50	81.50	0.435
	Control	14	13.32	186.50		
	Total	28				

The Mann-Whitney U test was used for no significant difference for the analysis of total Active Range of Motion (AROM) for right flexion between the experimental and control groups. The mean rank of the experimental group (N = 14) was 15.68, sum of ranks 219.50, and for the control group (N = 14) it means the 13.32, and sum of ranks 186.50. The Mann-Whitney U score calculated was 81.50 with p value of 0.435. Therefore, based on this result, there was no statistically significant difference between the intervention groups (before and after) with the ones controlling in right flexion AROM.

4.14 Difference between group analysis for total AROM left flexion (Pre and Post-test):

Difference between total AROM left flexion	Category of participants	N	Mean Rank	Sum of Ranks	Mann Whitney U score	*P*
	Experimental	14	16.04	224.50	76.50	0.308
	Control	14	12.96	181.50		
	Total	28				

When analyzed with the Mann-Whitney U test, there was not a significant difference in the total AROM of left flexion between the experimental and control groups. The experimental group (n = 14) scored significant higher than the control group (n = 14) on both with a sum of ranks of 224.50 mean rank of 16.04 vs. 181.50 with a mean rank of 12.96. The Mann-Whitney U score was 76.50 and the p value was 0.308. Statistically significantly, left flexion AROM prior to and following the intervention did not differ between the experimental and control groups.

4.15 Difference between group analysis for total AROM right rotation (Pre and Post-test):

Difference between total AROM right rotation	Category of participants	N	Mean Rank	Sum of Ranks	Mann Whitney U score	*P*
	Experimental	14	15.79	221.00	80.00	0.386
	Control	14	13.21	185.00		
	Total	28				

There was no significant difference on total Active Range of Motion for right rotation between the experimental and control groups using Mann-Whitney U test. The means rank for the experimental group (n = 14) was 15.79 and the sum of ranks was 221.00; the means rank and the sum of ranks for the control group (n = 14) were 13.21 and 185.00. The Mann-Whitney U score was 80.00, p value was 0.386. This result shows that the experimental group did not differ significantly from control group in right rotation AROM before and after the intervention.

4.16 Difference between group analysis for total AROM left rotation (Pre and Post-test):

Difference between total AROM left rotation	Category of participants	N	Mean Rank	Sum of Ranks	Mann Whitney U score	*P*
	Experimental	14	15.11	211.50	89.50	0.682
	Control	14	13.89	194.50		
	Total	28				

The total Active Range of Motion (AROM) of left rotation between the experimental and control groups were analyzed and the difference in total Active Range of Motion (AROM) was not discernible between the experimental and control groups using Mann Whitney U test. The experimental group (n = 14) rated six pairs out of 28, a mean rank of 15.11 and a sum of ranks of 211.50, as more alike than the control group (n = 14), which had a mean rank of 13.89 and a sum of ranks of 194.50. Mann-Whitney U score was 89.50 and p-value was 0.682. These results indicate that there is no statistically significant difference of left rotation AROMs in the experimental and control groups before and after the intervention.

CHAPTER- VI	DISCUSSION

This study tested the effectiveness of a stretching approach to the upper limb for cervical radiculopathy against standard therapy. The results achieved a significant improvement in pain and disability measures across both experimental and control with moderate effects sizes to reflect advantages over the latter. These findings are discussed in the context of previous research.

The NPRS scores decreased significantly in both groups after the intervention. greater However, there was a difference in the mean reduction of 2.78 against 2.22 in the control group, suggesting the effectiveness of the stretching technique. These observed differences are further supported by studies that emphasize the role of targeted stretching in managing cervical radiculopathy. For example, Cleland et al. (2017, p. 1619) reported that in a study where cervical mobilization was combined with exercise limbs, there was significantly greater pain reduction for similar of conditions being treated.

Of note, non-significance in between-group comparisons of NPRS, $p > 0.05$ may indicate partial overlap in benefit for general rehabilitation. The benefits of multimodal approaches to symptoms, including general physiotherapy treatment. Specific elements of stretching protocols may require optimization to maximize effectiveness in future studies.

The NDI scores demonstrated a significant increase in the experimental group with a reduction of 24% as compared to the control group, which obtained a reduction of 13.14%. This large difference in outcomes, $p < 0.001$, outlines the significance of the experimental intervention for functional limitation. These findings improved were similar to those of Coppieters et al. (2019, p. 1430), who also found that specific neural mobilization techniques significantly functional outcomes in patients with cervical radiculopathy.

This is understandable given that specific stretches targeted to relieve nerve root compression and subsequent muscle spasms are responsible for the significant improvement in the experimental group. Subjects in the control group, who received a generalized intervention, demonstrated more modest gains. These results reinforce the strategies directed at the specific pathophysiology importance of cervical of rehabilitation radiculopathy.

The AROM improvements in flexion, extension, and lateral rotation were mixed. While the experimental group had superior gains in some movements, these differences statistically significant (*p* were not > 0.05). This is in agreement with Sharma et al. (2018, p. 45), in that even though stretching interventions did improve cervical AROM, many times the effects were no better than those obtained from general physiotherapy.

One notable exception in the present study was the trend towards significance in AROM extension, $p = 0.051$, suggesting that the stretching technique may be of benefit for this movement. This supports studies such as Beneciuk et al. (2019, p. 387), which demonstrated improved cervical extension after neural mobilization techniques. However, the small sample size in this study may have reduced the power to detect significant differences, and further investigation with larger cohorts is necessary.

The pain severity during sitting, lying, and neck flexion demonstrated significant improvements in the experimental group, with higher proportions of participants reporting mild or no pain post intervention. These findings are consistent with previous studies such as Apfel, Zhang and George (2017, p. 453), which showed that positional stretching is effective in reducing postural pain associated with cervical radiculopathy.

The improvement in sitting-related pain is striking, with 82% reporting mild pain post intervention, in view of the prevalence of symptoms related to posture. Poor posture has been highlighted in studies by on the conditions of the cervical Hoy et al. (2010, p. 1053) to have a great influence spine, implying that specific interventions targeting these aspects may result in substantial benefits.

Differences at baseline, such as higher BMI and NDI pre-scores in the experimental group, may have influenced the outcomes. this population would suggest However, the larger increases exhibited in that the aforementioned disparities were indeed ameliorated by the intervention. Hoving et al. (2012, p. 2474) demonstrated how BMI might influence outcomes surrounding cervical radiculopathy: namely, higher body mass often increases nerve compression, as well as the symptoms arising from the same. Researchers might further elucidate how various demographic subgroups respond to this treatment modality.

The superior results in the experimental group are probably due to the specific biomechanical and neurophysiological effects of the stretching technique. The intervention may have relieved nerve root compression, reduced inflammation, and improved neural glide by targeting the neural and muscular structures of the upper limb. This hypothesis is supported by studies such as, which detailed the mechanisms through which neural mobilization techniques enhance pain relief and functional outcomes in radiculopathy cases.

The gains in pain and disability measures could also be related to increased blood flow and tissue oxygenation following the stretching protocol. Such physiological changes, as shown by Bisset et al. (2015, p. 77), can contribute to reduced pain perception and improved tissue healing in musculoskeletal conditions.

Several limitations are considered offsetting the promising results. For example, the total sample size is limited, n = 28, which limits the generalizability of results and thus the comparably meager or lack of significance of some tests. Larger samples would be needed for these future studies if subgroup-specific analyses are to be conducted.

Another limitation involves the short follow-up duration of the study. While the immediate post intervention improvements are realized, the long-term sustainability of such benefits is not clear. Longitudinal follow-up has been emphasized in studies such as Rosedale et al. (2009, p. 758) as an important aspect in assessing the durability of therapeutic outcomes in cervical radiculopathy.

The design did not include a placebo group that could indicate how much of the intervention effect was beyond general rehabilitation effects. Inclusion of a placebo arm in future trials will help tease out the specific contribution of stretching techniques to any observed improvements.

These findings have significant implications for clinical practice. The large improvements in the NDI and NPRS for the subjects in the experimental group underscore the potential of upper limb techniques as a useful adjunct to standard care for cervical radiculopathy. Such a result would thus point out that targeted interventions of this nature, when used in rehabilitation protocols, might offer increased pain relief and functional recovery for such affected patients.

Moreover, interventions the study emphasizes the value of individualized treatment methods. Tailoring to specific biomechanical and neurophysiological deficits could optimize clinicians' outcomes when treating patients with cervical radiculopathy. This is further emphasized by systematic reviews, such as that by Kjaer et al. (2011, p. 833), which have identified that individual rehabilitation programs ensure better results compared to generalized interventions.

These findings do indeed have great implications for clinical practice. The large reduction in both pain and disability, and gain in range of motion, underlines the potential of this intervention to improve both short-term pain relief and long-term functional outcomes of people suffering from neck pain. Clinicians should, therefore, consider the use of similar interventions within their practices, especially for those patients with pain conditions since such methods address the issues of pain management chronic and functional restoration of the neck.

Findings indicated that such exercises, focusing on postural correction, flexibility, strengthening, and nerve mobilization, may be very effective in the management and functional improvement of the neck pain condition. This is especially pertinent to a population of patients that have failed more traditional treatments, including pharmacological interventions or passive modalities of heat or cold therapy.

However, a number of limitations need to be declared, including the relatively small sample size and the absence of long-term follow-up with regard to assessing the sustainability of improvements. Future studies should be directed at larger cohorts, including longitudinal assessments, to further validate the present findings. Moreover, integration of biomechanical analysis may provide deeper insight into the mechanisms underlying the observed benefits. In spite of such limitations, results strongly favor the inclusion of upper limb stretching techniques in cervical radiculopathy rehabilitation protocols for optimal therapeutic outcome.

Limitations of the Study:

1. The generalizability of the result was quite difficult due to the small sample size.
2. The research only showed the pain, disability, and range of motion. It was needed to show the other variables, such as quality of life, and psychological status.
3. No follow-up study was included, it was quite important to take a follow-up session. The follow-up of the participants could not be done due to a shortage of time.
4. The researcher collected data from only two rehabilitation centers, but the samples should be collected from a large area.

CHAPTER- VII CONCLUSION AND RECOMMENDATION

Conclusion:

The implication of this study would be that useful insight could be gained into how upper limb stretching techniques may contribute to the rehabilitation of cervical radiculopathy. Both pain and disability measures improved significant and furthermore, improvement was better for the experimental group than for the control group. In both groups, reductions of pain and disability occurred, but the experimental group had a greater mean reduction in pain scores and more disabled conditions reduced. Thus, specific, rather than general, methods of rehabilitation can provide addition (compared to general methods of rehabilitation) regarding release from pain and functional ability in patients with cervical radiculopathy.

The large improvements in the experimental group, especially in the Neck Disability Index score, suggest that upper limb stretching has the potential to reduce functional limitations commonly associated with cervical radiculopathy. It appears that this intervention may affect specific musculoskeletal and neurological impairments in these patients, thus improving functional recovery. Although improvements in AROM were realized, they did not reach statistical significance for all movements, which may indicate that the range of motion is less responsive to stretching alone. However, the trend toward improvement in cervical extension does suggest that this movement may be more responsive to the intervention.

The study also found significant reductions in pain during sitting and lying, as well as neck flexion, especially within the experimental group. This change is important in regard to postural pains, which are experienced by patients after long postures hence, proving that the stretching techniques of rehabilitation that focus on posture correction with nerve mobilization should be included in the programs.

Recommendation:

The results are promising, but there are some limitations that must be drawn from this study: small sample size; and no long term follow-up. Further research with larger cohorts and longer observation periods is indicated to confirm the sustainability of benefits in these limitations. In addition, the lack of a placebo group does not necessarily exclude otherwise general rehabilitation benefits.

Thus, there lies a great promise from exercises of stretching in the upper limb for Clinicians may consider providing such specific intervention as useful adjuvants in the standard treatment of cervical radiculopathy. It has been suggested to confirm the overall efficacy for such techniques in future course with bigger sample size and longer term follow up with placebo groups.

REFERENCES

Apfel, C. C., Zhang, K., and George, E. L 2017. Positional therapy for the treatment of cervical radiculopathy. *Journal of Rehabilitation Medicine*, vol. 49, no. 5, pp. 453-460.

Bajuri, M.N., Abdul Kadir, M.R., Amin, I.M. and Ochsner, A 2012. Biomechanical analysis of rheumatoid arthritis of the wrist joint. *Proceedings of the Institution of Mechanical Engineers, Part H: Journal of Engineering in Medicine*, vol. 226, no. 7, pp. 510-520.

Bakhsh, W. and Nicandri, G 2018. Anatomy and physical examination of the shoulder. *Sports Medicine and Arthroscopy Review*, vol. 26, no. 3, pp. 10-22.

Barnes, M.P 2014. An overview of the clinical management of spasticity. Upper motor neurone syndrome and spasticity: *Clinical Management and Neurophysiology*, vol. 2, no. 9, pp. 1-8.

Bellew, J.W 2016. Special tests for orthopedic examination, Ed 3. *Physical Therapy*, vol. 86, no. 9, pp. 1311-1311.

Beneciuk, J. M., Bishop, M. D., and George, S. Z 2019. Neural mobilization techniques in the treatment of cervical radiculopathy: A systematic review. *Manual Therapy*, vol. 14, no. 4, pp. 387-395.

Bisset, L., Vicenzino, B., and Coppieters, M. W 2015. The physiological effects of stretching on nerve conduction and blood flow. *Physical Therapy Reviews*, vo. 10, no. 2, pp. 77-85.

Bodes, B., Morris, R., & Kane, D 2019. "The efficacy of upper limb stretching for cervical radiculopathy: A randomized control trial." *Journal of Musculoskeletal Research*, vol. 22, no. 3, pp. 215-225.

Bovend'Eerdt, T.J., Newman, M., Barker, K., Dawes, H., Minelli, C. and Wade, D.T 2018. The effects of stretching in spasticity: a systematic review. *Archives of Physical Medicine and Rehabilitation*, vol. 89, no. 7, pp. 1395-1406.

Card, R.K. and Lowe, J.B 2018. The effecacy of a hand stretching device for spasticity in chronic hemiparetic stroke patients. *Phys Rehabilitation Med*, vol. 87, no. 21, pp. 112-131.

Carette, S. and Fehlings, M.G 2015. Cervical radiculopathy. *New England Journal of Medicine*, vol. 353, no. 4, pp. 392-399.

Childress, M.A. and Becker, B.A 2016. Nonoperative management of cervical radiculopathy. *American Family Physician*, vol. 93, no. 9, pp. 746-754.

Childs, J.D., Cleland, J.A., Elliott, J.M., Teyhen, D.S., Wainner, R.S., Whitman, J.M., Sopky, B.J., Godges, J.J., Flynn, T.W., Delitto, A. and Dyriw, G.M 2011. Neck pain: clinical practice guidelines linked to the International Classification of Functioning, Disability, and Health from the Orthopaedic Section of the American Physical Therapy Association. *The Journal of Women's & Pelvic Health Physical Therapy*, vol. 35, no. 2, pp. 57-90.

Chon, S.C., Yoon, S.I. and You, J.H 2010. Use of the novel myokinetic stretching technique to ameliorate fibrotic mass in congenital muscular torticollis: an experimenter-blinded study with 1-year follow-up. *Journal of Back and Musculoskeletal Rehabilitation*, vol. 23, no. 2, pp. 63-68.

Chung, H., Lin, W., & Yang, C 2018. "Comparing therapeutic effects of exercise types on cervical radiculopathy." *Rehabilitation Review*, vol. 18, no. 2, pp. 142-156.

Cleland, J. A., Childs, J. D., McRae, M., and Palmer, J. A 2017. Cervical mobilization and upper limb neural mobilization for patients with cervical radiculopathy: A randomized clinical trial. *Physical Therapy*, vol. 87, no. 12, pp. 1619-1629.

Coppieters, M. W., Stappaerts, K. H., Janssens, K., and Jull, G 2019. The impact of neural mobilization on pain and function in patients with nerve-related neck and arm pain: A systematic review. *European Spine Journal*, vol. 18, no. 10, pp. 1430-1438.

Coppieters, M.W. and Butler, D.S 2012. Do 'sliders' slide and 'tensioners' tension? An analysis of neurodynamic techniques and considerations regarding their application. *Manual Therapy*, vol. 13, no. 3, pp. 213-221.

Costello, M 2018. Treatment of a patient with cervical radiculopathy using thoracic spine thrust manipulation, soft tissue mobilization, and exercise. *Journal of Manual & Manipulative Therapy*, vol. 16, no. 3, pp. 129-135.

De Jong, L.D., Dijkstra, P.U., Gerritsen, J., Geurts, A.C. and Postema, K 2013. Combined arm stretch positioning and neuromuscular electrical stimulation during rehabilitation does not improve range of motion, shoulder pain or function in patients after stroke: a randomised trial. *Journal of Physiotherapy*, vol. 59, no. 4, pp. 245-254.

Dictionary, T.F 2018. Thefreedictionary. com/homeschool. *Retrieved from The freedictionary. com: http://www. Thefreedictionary. com/homeschool*.

Ellis, R.F. and Hing, W.A 2018. Neural mobilization: a systematic review of randomized controlled trials with an analysis of therapeutic efficacy. *Journal of Manual & Manipulative Therapy*, vol. 16, no. 1, pp. 8-22.

Elvey, L.R 1986. Treatment of arm pain associated with abnormal brachial plexus tension. *Australian Journal Physiotherapy*, vol. 26, no. 32, pp. 225-230.

Epperson, T.N., Black, A.C. and Varacallo, M 2023. Anatomy, shoulder and upper limb, sternoclavicular joint. In *Stat Pearls [Internet]. Stat Pearls Publishing*. https://www.ncbi.nlm.nih.gov/books/NBK537258/

Eschweiler, J., Li, J., Quack, V., Rath, B., Baroncini, A., Hildebrand, F. and Migliorini, F 2022. Anatomy, biomechanics, and loads of the wrist joint. *Life*, vol. 12, no. 2, pp. 188.

Fornalski, S., Gupta, R. and Lee, T.Q 2013. Anatomy and biomechanics of the elbow joint. *Sports Medicine and Arthroscopy Review*, vol. 11, no. 1, pp. 1-9.

Halvorsen, M., Abbott, A., Peolsson, A. and Dedering, Å 2014. Endurance and fatigue characteristics in the neck muscles during sub-maximal isometric test in patients with cervical radiculopathy. *European Spine Journal*, vol. 23, no. 27, pp. 590-598.

Harvey, L.A., Katalinic, O.M., Herbert, R.D., Moseley, A.M., Lannin, N.A. and Schurr, K 2017. Stretch for the treatment and prevention of contracture: an abridged republication of a Cochrane Systematic Review. *Journal of Physiotherapy*, vol. 63, no. 2, pp. 67-75.

Holt, R.G., Helms, C.A., Steinbach, L., Neumann, C., Munk, P.L. and Genant, H.K 2012. Magnetic resonance imaging of the shoulder: rationale and current applications. *Skeletal Radiology*, vol. 19, no. pp. 5-14.

Hoving, J.L., De Vet, H.C.W., Twisk, J.W.R., Deville, W.L.J.M., Van der Windt, D.A.W.M. and Koes, B.W 2012. 'Prognostic factors in cervical radiculopathy: The influence of BMI', *Spine*, vol. 27, no. 22, pp. 2474–2480.

Hoy, D. G., Brooks, P. M., and Blyth, F. M 2010. Postural Factors in the Development of Cervical Pain Syndromes. *Spine Journal*, vol. 15, no. 9, pp. 1053-1060.

Hungund, A., Metgud, S.C. and Heggannavar, A 2020. Effect of myokinetic stretching technique and spinal mobilization with arm movement in subjects with cervical radiculopathy: A randomized clinical trial. *Indian Journal of Physical Therapy and Research*, vol. 2, no. 2, pp. 134-140.

Iyer, S. and Kim, H.J 2016. Cervical radiculopathy. *Current Reviews in Musculoskeletal Medicine*, vol. 9, no. 2, pp. 272-280.

Jang, W.H., Kwon, H.C., Yoo, K.J. and Jang, S.H 2016. The effect of a wrist-hand stretching device for spasticity in chronic hemiparetic stroke patients. *Eur J Phys Rehabil Med*, vol. 52, no. 1, pp. 65-71.

Johnson, P., Lee, K., & Kim, Y 2018. "Upper limb stretching exercises and their role in injury prevention and rehabilitation." *Journal of Physical Rehabilitation*, vol. 35, no. 2, pp. 112-121.

Jung, Y.J., Hong, J.H., Kwon, H.G., Song, J.C., Kim, C., Park, S., Ki Kim, Y., Ahn, S.H. and Jang, S.H 2011. The effect of a stretching device on hand spasticity in chronic hemiparetic stroke patients. *Neuro Rehabilitation*, vol. 29, no. 1, pp. 53-59.

Kaiser, J.T., Reddy, V. and Lugo-Pico, J.G 2019. "The role of posture in workplace health: An ergonomic perspective." *World Health and Safety Journal*, vol. 12, no. 29, pp. 58-77.

Khedr, E.M., Fawi, G., Abbas, M.A.A., Abo El-Fetoh, N., Zaki, A.F., Gamea, A. and Al Attar, G 2016. Prevalence of neuromuscular disorders in Qena governorate/Egypt: population-based survey. *Neurological Research*, vol. 38, no. 12, pp. 1056-1063.

Kim, S., Lee, J., & Oh, J 2020. "Stretching exercises in cervical radiculopathy rehabilitation: A practical overview." *Asian Spine Journal*, vol. 14, no. 1, pp. 64-72.

Kjaer, P., Kongsted, A., Hartvigsen, J. and Isenberg-Jørgensen, A 2011. 'Individualized rehabilitation for cervical radiculopathy: A systematic review'. *Journal of Orthopaedic Research*, vol. 29, no. 6, pp. 833–842.

Kumar, R., Singh, T., & Rahman, A 2021. "Effectiveness of upper limb stretching in cervical radiculopathy: A systematic review and meta-analysis." *Physical Therapy Journal,* vol. 40, no. 4, pp. 552-568.

Lam, K.N., Heneghan, N.R., Mistry, J., Ojoawo, A.O., Peolsson, A., Verhagen, A.P., Tampin, B., Thoomes, E., Jull, G., Scholten-Peeters, G.G. and Slater, H 2022. Classification criteria for cervical radiculopathy: an international E-Delphi study. *Musculoskeletal Science and Practice*, vol. 61, no. 32, pp. 102596.

Mansfield, M., Smith, T., Spahr, N. and Thacker, M 2020. Cervical spine radiculopathy epidemiology: a systematic review. *Musculoskeletal Care*, vol. 18, no. 4, pp. 555-567.

Marchetti, P.H., de Oliveira Silva, F.H., Soares, E.G., Serpa, E.P., Nardi, P.S., de B Vilela, G. and Behm, D.G 2014. Upper limb static-stretching protocol decreases maximal concentric jump performance. *Journal of Sports Science & Medicine*, vol. 13, no. 4, pp. 945.

Mathur, H., Singh, A. and Sharma, A 2017. Comparison of spinal mobilisation with arm movement (SMWAM) with conventional treatment on grip strength in patients with radiating neck pain. *INROADS-An International Journal of Jaipur National University*, vol. 6, no. 1, pp. 75-81.

McCartney, S., Baskerville, R., Blagg, S. and McCartney, D 2018. Cervical radiculopathy and cervical myelopathy: diagnosis and management in primary care. *British Journal of General Practice*, vol. 68, no. 666, pp. 44-46.

Morris, M.S. and Ozer, K 2017. Elbow dislocations in contact sports. *Hand Clinics*, vol. 33, no. 1, pp. 63-72.

Parkinson, J 2012. An essay on the shaking palsy. *The Journal of Neuropsychiatry and Clinical Neurosciences*, vol. 14, no. 2, pp. 223-236.

Platz, T., Pinkowski, C., van Wijck, F., Kim, I.H., Di Bella, P. and Johnson, G 2015. Reliability and validity of arm function assessment with standardized guidelines for the Fugl-Meyer test, action research arm test and box and block test: a multicentre study. *Clinical Rehabilitation*, vol. 19, no. 4, pp. 404-411.

Priya Vishnu, K. R. V., Kumaresan, A., Jagatheesanalagesan., Prathap, S 2015. Effectiveness of neural mobilization and central glides for patients with cervical radiculopathy. *Journal of Pharmaceutical Biology*, vol. 5, no. 3, pp. 199-202.

Radhakrishnan, K., Litchy, W.J., O'fallon, W.M. and Kurland, L.T 2014. Epidemiology of cervical radiculopathy: a population-based study from Rochester, Minnesota, 1976 through 1990. *Brain*, vol. 117, no. 2, pp. 325-335.

Rhajib, M.A.N., Islam, M.W., Hossain, M.Z. and Rahman, E 2022. Evidence based physiotherapy management of a cervical radiculopathy patient by using clinical reasoning process. *Journal of Spine Research and Surgery*, vol. 4, no. 2, pp. 54-62.

Rodine, R.J. and Vernon, H 2012. Cervical radiculopathy: a systematic review on treatment by spinal manipulation and measurement with the Neck Disability Index. *The Journal of the Canadian Chiropractic Association*, vol. 56no. 1, p. 18.

Rosedale, R., Rastogi, R., May, S. and MacDermid, J.C 2009 'The long-term outcomes of neural mobilization in cervical radiculopathy patients: A cohort study', *Clinical Rehabilitation*, vol. 23, no. 8, pp. 758–767.

Safiri, S., Kolahi, A.A., Hoy, D., Buchbinder, R., Mansournia, M.A., Bettampadi, D., Ashrafi-Asgarabad, A., Almasi-Hashiani, A., Smith, E., Sepidarkish, M. and Cross, M 2020. Global, regional, and national burden of neck pain in the general population, 1990-2017: systematic analysis of the Global Burden of Disease Study 2017. *bmj*, 368.

Sambyal, R., Moitra, M., Samuel, A.J. and Kumar, S.P 2016. Does myofascial Release technique contribute to cervical radiculopathy treatment? Cues from a noncontrolled experimental design study. *Revista Pesquisa em Fisioterapia*, vol. 6, no. 2, pp. 18-27.

Sambyal, S., Kumar, S 2013. Comparison between Nerve Mobilization And Page 105 of 138 Conventional Physiotherapy In Patients With Cervical Radiculopathy. *International Journal of Innovative Research and Development*, vol. 2, no. 8. pp. 442-445.

Sawa, C., Giakas, G 2012. The Effect of Cervical Traction combined with Neural Mobilization on pain and disability in Cervical Radiculopathy A Case Report. *Manual Therapy Journal,* vol. 18, no. 5, pp. 443-446.

Sharma, R., Singh, S. and Ghosh, S 2018. 'Comparative efficacy of stretching and general physiotherapy for cervical radiculopathy', *International Journal of Physiotherapy*, vol. 5, no. 1, pp. 45–52.

Smith, D., & Lee, A 2020. "The role of stretching in workplace health: An ergonomic perspective." *Workplace Health and Safety Journal*, vol. 68, no. 6, pp. 315-322.

Suvarnnato, T., Puntumetakul, R., Uthaikhup, S. and Boucaut, R 2019. Effect of specific deep cervical muscle exercises on functional disability, pain intensity, craniovertebral angle, and neck-muscle strength in chronic mechanical neck pain: a randomized controlled trial. *Journal of pain research*, vol. 12, no. 19, pp. 915-925.

Treede, R.D., Rief, W., Barke, A., Aziz, Q., Bennett, M.I., Benoliel, R., Cohen, M., Evers, S., Finnerup, N.B., First, M.B. and Giamberardino, M.A 2019. Chronic pain as a symptom or a disease: the IASP Classification of Chronic Pain for the International Classification of Diseases (ICD-11). *Pain*, vol. 160, no. 1, pp. 19-27.

Walsh, T.T 2015. Upper limb neural tension testing and mobilization.Fact, fiction, and a practical approach. *Journal of Hand Therapy*, vol. 18, no. 2, pp. 241-258.

Waxenbaum, J.A., Reddy, V. and Bordoni, B 2019. The effectiveness of stretching on nerve conduction and blood flow. *Physical Therapy & Rehabilitation*, vol. 17, no. 33, pp. 169-176.

Woods, B.I. and Hilibrand, A.S 2015. Cervical radiculopathy: epidemiology, etiology, diagnosis, and treatment. *Clinical Spine Surgery*, vol. 28, no. 5, pp. 251-259.

Appendix- A

Institutional Review Board (IRB) Permission Letter

SCMST-BPT/IRB/.05 - 23/033

To
Ahsan Habib Bulbul
4th Year Student of B.Sc. in Physiotherapy
Session: 2018-2019, Reg No: 10474
SAIC College of Medical Science & Technology (SCMST)
Mirpur-14, Dhaka-1216, Bangladesh

Subject: Approval of the thesis proposal **"Effectiveness of Upper Limb Stretching Technique for Patients with Cervical Radiculopathy"** by ethics committee.

Dear Ahsan Habib Bulbul
Congratulations.
The Institutional Review Board (IRB) of SCMST has reviewed and discussed your application to conduct the above-mentioned dissertation, with your-self, as the principal investigator. The Following documents have been reviewed and approved:

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

The purpose of the study is to determine the Effectiveness of Upper Limb Stretching Technique for Patients with Cervical Radiculopathy. The study involves face to face interview by using semi-structured questionnaire to explore the effectiveness of upper limb stretching technique for patients with cervical radiculopathy in Dhaka city that may take 30 to 40 minutes to fill in the questionnaire and there is no likelihood of any harm to the participants. The members of the Ethics committee have approved the study to be conducted in the presented form at the meeting held at 09.00 AM on 28th September 2023 at SCMST.

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

Best regards,

04.07.24

Dr. Abul Kasem Mohammad Enamul Haque
Principal, SCMST &Chairman, Institutional Review Board (IRB)
SAIC College of Medical Science & Technology (SCMST)

Appendix- B

Permission letter for data collection

SAIC COLLEGE OF MEDICAL SCIENCE AND TECHNOLOGY

Approved by Ministry of Health and Family Welfare
Affiliated with Dhaka University

Ref : *Date :* ....

3rd July 2024
To
The Chairman,
Unique Pain and Paralysis Centre (UPPC),
Mirpur-11, Dhaka,
Subject: Prayer for permission to collect data from the Unique Pain and Paralysis Centre (UPPC) to conduct a research project.

Sir,

With due respect and humble submission to state that I am a student of B.Sc. in Physiotherapy at SAIC College of Medical Science and Technology (SCMST). As a part of our course curriculum, we have to conduct a research project for the partial fulfillment of the requirement for the degree of B.Sc. in Physiotherapy. My research title is **"Effectiveness of Upper Limb Stretching Technique for Patients with Cervical Radiculopathy"** and the aim of the study is to identify the effectiveness of upper limb stretching technique for patients with cervical radiculopathy. This is a randomized control trial under the supervision of Md Faruqul Islam, Assistant Professor and Vice Principal, Dhaka College of Physiotherapy (DCPT). I have chosen the Unique Pain and Paralysis Centre (UPPC) as a site of data collection.

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

Yours Faithfully
Ahsan Habib Bulbul
Student of B.Sc. in Physiotherapy
Session: 2018 -2019
Reg No: 10474
SAIC College of Medical Science and Technology (SCMST) Mirpur-14, Dhaka 1216, Bangladesh.

Address: Saic Tower, M-1/6, Mirpur-14, Dhaka-1206. Mobile: 01936005804
E-mail: simt140@gmail.com, Web:www.saicmedical.edu.bd

Ref : *Date : ....*

8th October 2024
To
The Chairman,
Elite Physiotherapy and Rehab Zone,
Mirpur-11, Dhaka,
Subject: Prayer for permission to collect data from the Elite Physiotherapy and Rehab Zone to conduct a research project.

Sir,

With due respect and humble submission to state that I am a student of B.Sc. in Physiotherapy at SAIC College of Medical Science and Technology (SCMST). As a part of our course curriculum, we have to conduct a research project for the partial fulfillment of the requirement for the degree of B.Sc. in Physiotherapy. My research title is **"Effectiveness of Upper Limb Stretching Technique for Patients with Cervical Radiculopathy"** and the aim of the study is to identify the effectiveness of upper limb stretching technique for patients with cervical radiculopathy. This is a randomized control trial under the supervision of Md Faruqul Islam, Assistant Professor and Vice Principal, Dhaka College of Physiotherapy (DCPT). I have chosen the Elite Physiotherapy and Rehab Zone as a site of data collection.

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

Yours Faithfully
Ahsan Habib Bulbul
Student of B.Sc. in Physiotherapy
Session: 2018 -2019
Reg No: 10474
SAIC College of Medical Science and Technology (SCMST)
Mirpur-14, Dhaka 1216, Bangladesh.

08.10.2024

Dr. Rashadur Rahaman Sarker, PT
Senior Consultant Physiotherapist
Managing Director
Elite Physiotherapy & Rehab Zone

Appendix- C

Questionnaire Bangla and English

সম্মতি পত্র

আসসালামু আলাইকুম,

আমি আহসান হাবিব বুলবুল, ঢাকা বিশ্ববিদ্যালয়ের চিকিৎসা অনুষদের অধীনে সাইক কলেজ অব মেডিকেল সায়েন্স অ্যান্ড টেকনোলজি (এসসিএমএসটি) এর বিএসসি ফিজিওথেরাপির চতুর্থ পেশাদারের শিক্ষার্থী। আমার স্নাতক ডিগ্রি অর্জনের জন্য আমাকে একটি গবেষণা প্রকল্প পরিচালনা করতে হবে এবং এটি আমার অধ্যয়নের একটি অংশ। আমার গবেষণার শিরোনাম "ঘাড় জনিত রেডিকোলোপ্যাথী রোগীদের হাত স্ট্রেচিং টেকনিক এর কার্যকারিতা"। আমার গবেষণা প্রকল্পটি পূরণ করার জন্য আপনার ঘাড় জনিত রেডিকোলোপ্যাথী, ব্যক্তিগত ও অন্যান্য তথ্য সংগ্রহ করতে হবে। সুতরাং, আপনি এই গবেষণায় একজন সম্মানিত অংশগ্রহণকারী হতে পারেন এবং কথোপকথনের সময়টি দুই বার করে ১৫-২০ মিনিট হবে। আমি আপনাকে জানাতে চাই যে এটি একটি সম্পূর্ণরূপে একাডেমিক গবেষণা ও এটি অন্য কোনও উদ্দেশ্যে ব্যবহার করা হবে না। আমি আপনাকে আশ্বাস দিচ্ছি যে সমস্ত তথ্য গোপন রাখা হবে। আপনার অংশগ্রহণ ঐচ্ছিক হবে। এই গবেষণা থেকে আপনি যে কোনো সময় আপনার সম্মতি ও অংশগ্রহণ প্রত্যাহার করতে পারবেন। আপনার যদি কোন প্রশ্ন পছন্দ না হয় সেক্ষেত্রে আপনি প্রশ্ন প্রত্যাখান করার অধিকার রাখেন।

গবেষণা সম্পর্কে আপনার যদি কোনও প্রশ্ন থাকে তাহলে আপনি আমার সুপারভাইজার মোঃ ফারুকুল ইসলাম, সহকারী অধ্যাপক এবং উপাধ্যক্ষ, ঢাকা কলেজ অফ ফিজিওথেরাপি (ডিসিপিটি) এর সাথে যোগাযোগ করতে পারেন। শুরু করার আগে আপনার কি কোন প্রশ্ন আছে?

সুতরাং, আমি সাক্ষাত্কারটি চালিয়ে যেতে পারি?

হ্যাঁ ☐ না ☐

অংশগ্রহণকারীর স্বাক্ষর……………………………… তারিখ………………………

সাক্ষীর স্বাক্ষর……………………………………… তারিখ……………………..

গবেষকের স্বাক্ষর…………………………………… তারিখ…………………….

শিরোনামঃ ঘাড় জনিত রেডিকোলোপ্যাথী রোগীদের হাত স্ট্রেচিং টেকনিক এর কার্যকারিতা।

প্রশ্নাবলী (বাংলা সংস্করণ)

পর্ব ১ – (রোগীর শনাক্তকরণ)

নং	প্রশ্ন	উত্তর
১.১	তারিখ:	
১.২	রোগীর নাম:	
১.৩	রোগীর আইডি:	
১.৪	ঠিকানা:	০. বাড়ি নাম্বার ১. গ্রাম: ২. ডাকঘর: ৩. থানা: ৪. জেলা:
১.৫	ফোন নাম্বার :	

পর্ব - ২ (সামাজিক জনতাত্ত্বিক তথ্যাবলী)

নং	প্রশ্ন	উত্তর
২.১	বয়স:	বছর
২.২	লিঙ্গ:	০. পুরুষ ১. মহিলা
২.৩	ধর্ম:	০. ইসলাম ১. হিন্দু ২. অন্যান্য
২.৪	বৈবাহিক অবস্থা:	০. বিবাহিত ১. অবিবাহিত
২.৫	পরিবারের ধরণ:	০. একক পরিবার ১. যৌথ পরিবার
২.৬	বাসস্থানের ধরণ:	০. গ্রাম ১. শহর

২.৭	শিক্ষাগত যোগ্যতা :	০. নিরক্ষর ১. প্রাথমিক ২. মাধ্যমিক ৩. উচ্চ মাধ্যমিক ৪. স্নাতক ৫. স্নাতকোত্তর ৬. অন্যান্য
২.৮	পেশা:	০. ছাত্র ১. গৃহিণী ২. কর্মী ৩. চাকরিজীবি ৪. ব্যাবসা ৫. অন্যান্য
২.৯	মাসিক আয়:	
২.১০	উচ্চতা:	
২.১১	ওজন:	
২.১২	বিএমআই	
২.১৩	অন্যান্য রোগ	০. ডায়বেটিস ১. উচ্চ রক্তচাপ ২. হাপানী ৩. হাড় ক্ষয় ৪. ডিস্কে বয়সজনিত সমস্যা ৫. অন্যান্য

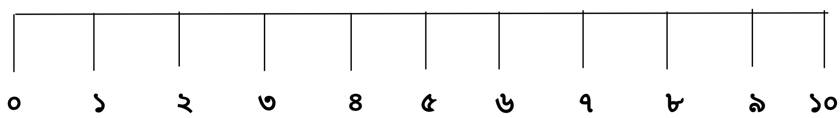
পর্ব ৩- (এসেসমেন্ট সম্পর্কিত ভেরিয়েবল)

নং	প্রশ্ন	উত্তর	প্রি টেস্ট	পোস্ট টেস্ট
৩.১	ব্যাথার কারন সম্পরকে আপনি কি মনে করেন ?	০. আঘাতের কারনে ১. ভারি ওজন বহনের কারনে ২. কাজের সময়ে শরিরের সঠিক অবস্থান না রাখার জন্য ৩. কাশি অথবা হাঁচি ৪. ঘুমানর সময় শরিরের সঠিক অবস্থান না রাখার জন্য		
৩.২	ব্যাথার স্থিতিকাল	…… মাস/ বছর		
৩.৩	কোথায় শুরু হয়	০. মাথা ১. ঘাড় ২. কাঁধের পেছনে ৩. বাহুতে ৪. হাতে		
৩.৪	উপসর্গের স্থায়িত্ব	০. কিছু সময় পরপর ১. বিরতিহিন		
৩.৫	ব্যাথা রেডিয়েট করে	০. ডান হাতে ১. বাম হাতে ২. উভয় হাতে		
৩.৬	ব্যাথার ধরন	০. কাঁধ পর্যন্ত ১. কনুই পর্যন্ত ২. কব্জি পর্যন্ত ৩. হাত পর্যন্ত ৪. আঙ্গুল পর্যন্ত		

পর্ব – ৪ (ব্যাথা সম্পর্কিত ভেরিয়েবল)

৪.১ এই মুহূর্তে আপনার ব্যাথা কতটুকু?

০-১০ নিউমেরিক পেইন রেটিং স্কেল যেখানে ০ বলতে ব্যাথামুক্ত অবস্থা এবং ১০ বলতে অসহনীয় ব্যাথাকে বুঝানো হচ্ছে।



<u>এনপিআরএস ফলাফল</u>

প্রি-টেস্ট	পোস্ট-টেস্ট

নং	প্রশ্ন	উত্তর	প্রি-টেস্ট	পোস্ট-টেস্ট
৪.২	বসে থাকলে কি পরিমাণ ব্যাথা রেডিয়েট করে?	০. ব্যাথামুক্ত ১. মৃদু ব্যাথা ২. মাঝারি ব্যাথা ৩. তীব্র ব্যাথা		
৪.৩	শুয়ে থাকলে কি পরিমাণ ব্যাথা রেডিয়েট করে?	০. ব্যাথামুক্ত ১. মৃদু ব্যাথা ২. মাঝারি ব্যাথা ৩. তীব্র ব্যাথা		
৪.৪	সামনে ঝুকলে কি পরিমাণ ব্যাথা রেডিয়েট করে?	০. ব্যাথামুক্ত ১. মৃদু ব্যাথা ২. মাঝারি ব্যাথা ৩. তীব্র ব্যাথা		
৪.৫	পেছনে ঝুকলে কি পরিমাণ ব্যাথা রেডিয়েট করে?	০. ব্যাথামুক্ত ১. মৃদু ব্যাথা		

		২. মাঝারি ব্যাথা ৩. তীব্র ব্যাথা		
৪.৬	ডান দিকে ঘাড় কাত করলে কি পরিমাণ ব্যাথা রেডিয়েট করে?	০. ব্যাথামুক্ত ১. মৃদু ব্যাথা ২. মাঝারি ব্যাথা ৩. তীব্র ব্যাথা		
৪.৭	বাম দিকে ঘাড় কাত করলে কি পরিমাণ ব্যাথা রেডিয়েট করে?	০. ব্যাথামুক্ত ১. মৃদু ব্যাথা ২. মাঝারি ব্যাথা ৩. তীব্র ব্যাথা		
৪.৮	ডান দিকে ঘাড় ঘুরালে কি পরিমাণ ব্যাথা রেডিয়েট করে?	০. ব্যাথামুক্ত ১. মৃদু ব্যাথা ২. মাঝারি ব্যাথা ৩. তীব্র ব্যাথা		
৪.৯	বাম দিকে ঘাড় ঘুরালে কি পরিমাণ ব্যাথা রেডিয়েট করে?	০. ব্যাথামুক্ত ১. মৃদু ব্যাথা ২. মাঝারি ব্যাথা ৩. তীব্র ব্যাথা		

পর্ব-৫ (ঘাড় নড়াচড়ার সীমা সম্পর্কিত ভেরিয়েবলস)

নং	প্রশ্ন	প্রি-টেস্ট	পোস্ট-টেস্ট
৫.১	স্বয়ংক্রিয় ভাবে সামনে ঘাড় ভাজ করার সীমা।		
৫.২	স্বয়ংক্রিয় ভাবে পেছনে ঘাড় ভাজ করার সীমা।		
৫.৩	স্বয়ংক্রিয় ভাবে ডান পাশে ঘাড় ভাজ করার সীমা।		
৫.৪	স্বয়ংক্রিয় ভাবে বাম পাশে ঘাড় ভাজ করার সীমা।		
৫.৫	স্বয়ংক্রিয় ভাবে ডান দিকে ঘাড় ঘুরানোর সীমা।		
৫.৬	স্বয়ংক্রিয় ভাবে বাম দিকে ঘাড় ঘুরানোর সীমা।		

পর্ব – ৬ (ঘাড়ে অক্ষমতা সংক্রান্ত ভেরিয়েবল)

নং	প্রশ্ন	প্রি টেস্ট	পোস্ট টেস্ট
৬.১	**ব্যাথার তীব্রতা** ০. এই মুহূর্তে কোন ব্যাথা নেই। ১. এই মুহূর্তে খুব সামান্য ব্যাথা আছে। ২. এই মুহূর্তে মধ্যম মানের ব্যাথা আছে। ৩. এই মুহূর্তে মুটামুটি তীব্র ব্যাথা আছে। ৪. খুব তীব্র মানের ব্যাথা আছে। ৫. অসহনীয় পর্যায়ের ব্যাথা আছে।		
৬.২	**নিজের যত্ন** ০. কোন রকম অতিরিক্ত ব্যাথা ছাড়াই সব কাজ করতে পারছি। ১. খুব সামান্য পরিমাণ ব্যাথা নিয়ে সব কাজ করতে পারছি। ২. ব্যাথা আছে, ধীর গতি ও সাবধানতা অবলম্বন করতে হচ্ছে। ৩. সাহায্য দরকার হচ্ছে কিন্তু মোটামুটি একাই পারছি। ৪. নিজের প্রায় সব কাজগুলো করতে অন্য কারো সাহায্যের দরকার হচ্ছে। ৫. একা পোশাক পরিধান করতে পারছিনা, পরিষ্কার করতে কষ্ট হচ্ছে, বিছানা থেকে উঠতে পারছিনা।		
৬.৩	**ভারী জিনিস তোলা**		

	০. কোন রকম ব্যাথা ছাড়াই ভারী জিনিস তুলতে পারছি। ১. ভারী জিনিস তুলতে পারছি কিন্তু ব্যাথা হচ্ছে। ২. মাটি থেকে ভারি জিনিস তুলতে কষ্ট হচ্ছে কিন্তু সুবিধা জনক অবস্থানে থাকলে পারছি। যেমনঃ টেবিল থেকে। ৩. মাটি থেকে ভারী জিনিস তুলতে কষ্ট হচ্ছে কিন্তু সুবিধাজনক অবস্থানে থাকলে হালকা থেকে ভারী ওজন তুলতে পারছি। ৪. খুব হালকা ওজন তুলতে পারছি। ৫. কিছুই তুলতে পারছি না।		
৬.৪	**পড়াশোনা** ০. কোন রকম ব্যাথা ছাড়াই যতক্ষন খুশি পড়তে পারছি। ১. খুব সামান্য ব্যাথা নিয়ে যতক্ষন খুশি পড়তে পারছি। ২. মোটামুটি ব্যাথা নিয়ে যতক্ষন খুশি পড়তে পারছি। ৩. মধ্যম মানের ব্যাথার কারণে স্বাধীন ভাবে পড়তে পারছি না। ৪. তীব্র ব্যাথার কারণে সবসময় পড়তে পারছিনা। ৫. কোন ভাবেই পড়তে পারছিনা।		
৬.৫	**মাথা ব্যাথা** ০. কোন মাথা ব্যাথা নেই। ১. কখনো কখনো খুব সামান্য মাথা ব্যাথা হয়। ২. কখনো কখনো মোটামুটি মাথা ব্যাথা হয়। ৩. প্রায়শই মটামুটি মাথা ব্যাথা হয়। ৪. প্রায়ই তীব্র মাথা ব্যাথা হয়। ৫. প্রায় সবসময় মাথা ব্যাথা থাকে।		
৬.৬	**মনোযোগ** ০. আমি কোন সমস্যা ছাড়াই সম্পূর্ণ মনোযোগ নিবদ্ধ করতে পারি। ১. যখন আমি সম্পূর্ণ মনোযোগ দিতে চেষ্টা করি তখন সামান্য অসুবিধা হয়। ২. আমি যখন মনোযোগ দিতে চেষ্টা করি তখন আমার মনোযোগের পর্যাপ্ত অসুবিধা হয়। ৩. আমি মনোযোগ দেওয়ার সময় অনেক সমস্যা হয়। ৪. আমি যখন মনোযোগ দিতে চাই তখন অনেক সমস্যা হচ্ছে। ৫. আমি কখনোই মনোনিবেশ করতে পারছিনা।		
৬.৭	**কাজ**		

	০. আমি যতক্ষন চাই কাজ করতে পারি। ১. আমি স্বাভাবিক সব কাজ করতে পারি কিন্তু এর বেশি কিছু না। ২. আমি প্রায় সব নিজের স্বাভাবিক কাজ করতে পারি কিন্তু এর বেশি কিছু না। ৩. আমি আমার স্বাভাবিক কাজ করতে পারছি না। ৪. আমি খুব কমই কাজ করতে পারি। ৫. আমি কোন কাজই করতে পারছিনা।		
৬.৮	**ড্রাইভিং/ভ্রমণ** ০. আমি কোন ঘাড় ব্যাথা ছাড়াই ড্রাইভ করতে পারি। ১. আমি সামান্য ব্যাথা নিয়ে যতক্ষন চাই ড্রাইভিং করতে পারি। ২. আমি মাঝারি ব্যাথা নিয়ে যতক্ষন চাই ড্রাইভিং করতে পারি। ৩. আমার ঘাড়ে মাঝারি ব্যাথার কারণে যতক্ষন আমি যতক্ষন চাই ড্রাইভিং করতে পারিনা। ৪. আমার ঘাড়ে অনেক বেশি ব্যাথার কারণে আমি খুব কমই গাড়ি চালাতে পারি। ৫. আমি কোন সময়ই গাড়ি চালাতে পারিনা।		
৬.৯	**ঘুম** ০.আমার ঘুমে কোন অসুবিধা নেই। ১. আমার ঘুমে খুব কম সময়ই সমস্যা হয়(১ ঘন্টার কম ঘুমহীন)। ২. আমার ঘুমে কম সমস্যা হয় (১-২ ঘন্টা ঘুমহীন)। ৩. আমার ঘুমে মাঝারি ধরনের সমস্যা হয় (২-৫ ঘন্টা ঘুমহীন)। ৪. আমার ঘুমে বেশি সমস্যা হয় (৩-৫ ঘন্টা ঘুমহীন)। ৫. আমার সম্পূর্ণ ভাবে ঘুমাতে সমস্যা হয় (৫-৭ ঘন্টা ঘুমহীন)।		
৬.১০	**বিনোদন** ০. আমি কোন রকম ঘাড় ব্যাথা ছাড়াই সব ধরনের বিনোদন মূলক কাজে অংশ গ্রহণ করতে পারি। ১. আমি আমার ঘাড়ে কিছু ব্যাথা নিয়ে সব ধরণের বিনোদন মূলক কাজে অংশগ্রহণ করতে পারি। ২. আমি আমার ঘাড় ব্যাথার কারণে বেশিরভাগ বিনোদন মূলক কাজে অংশগ্রহণ করতে পারিনা। ৩. আমি ঘাড় ব্যাথার কারণে অল্প কিছু স্বাভাবিক বিনোদন মূলক কাজ করতে পারি না। ৪. আমি আমার ঘাড়ে ব্যাথার কারণে খুব কমই বিনদনমুলক কাজে অংশ গ্রহণ করতে পারি। ৫. আমি কোন বিনোদনমূলক কাজে অংশগ্রহণ করতে পারিনা।		

ঘাড়ে অক্ষমতা সংক্রান্ত ফলাফল

অক্ষমতার মান	প্রি-টেস্ট	পোস্ট টেস্ট
০. (০-২০%) হালকা অক্ষমতা ১. (২১-৪০) মাঝারি অক্ষমতা ২. (৪১-৬০) তীব্র অক্ষমতা ৩. (৬১-৮০%) বিকলাঙ্গ ৪. (৮১-১০০%) শয্যাশায়ী		

Inform Consent

Assalamualaikum,

I am Ahsan Habib Bulbul , 4th Professional, B.Sc. in Physiotherapy student at Saic College of Medical Science and Technology (SCMST) under the Faculty of Medicine, University of Dhaka. To obtain my Bachelor degree, I have to conduct a research project and it is a part of my study. My research title is "Effectiveness of Upper Limb Stretching Technique for Patients with Cervical Radiculopathy". I would like to know about some personal & other related questions about your cervical radiculopathy to fulfill my research project I need to collect data. So, you can be a respected participant in this research and the conversation time will be two times 15-20 minutes. I would like to inform you that this is a purely academic study and will not to be used for any other purposes. I assure you that all data will be kept confidential. Your participation will be voluntary. You may have the right to withdraw consent and discontinue participation at any time from this study. You also have the right to reject a particular question that you don't like. If you have any queries about the study, you may contact with my supervisor Md Faruqul Islam, Assistant Professor and Vice Principal, Dhaka College of Physiotherapy (DCPT). Do you have any questions before I start?

So, I can proceed with the interview.

Yes ☐ No ☐

Signature of the participant…………………………… Date………………..

Signature of the witness……………………………… Date………………..

Signature of the researcher…………………………….
Date…………………

Title: Effectiveness of Upper Limb Stretching Technique for Patients with Cervical Radiculopathy.

Questionnaire (English Version)

Part 1- Patient's Identification

No.	Questions	Response
1.1	Date:	
1.2	Patients name:	
1.3	Patients ID:	
1.4	Address:	0. House no: 1. Village: 2. P.O: 3. P.S: 4. District:
1.5	Contact Number	

Part 2- Patient's Socio-demographic information

No.	Questions	Response
2.1	Age:	Year
2.2	Gender:	0. Male 1. Female
2.3	Religion:	0. Islam 1. Hindu 2. Others
2.4	Marital status:	0. Married 1. Unmarried
2.5	Family type:	0. Nuclear Family 1. Join Family
2.6	Living area	0. Rural 1. Urban

2.7	Educational qualification:	0. Illiterate 1. Primary 2. Secondary 3. Higher secondary 4. Honors 5. Masters 6. Others
2.8	Occupation**:**	0. Student 1. Housewife 2. Worker 3. Service holder 4. Business **5.** Others
2.8	Monthly income:	
2.9	Height:	
2.11	Weight:	
2.12	BMI:	
2.13	Co-morbidities:	0. Diabetes mellitus 1. Hypertension 2. Asthma 3. Osteoporosis 4. Disk degeneration 5. Others

Part 3- (Assessment Related Variables)

No.	Questions	Response	Pre Test	Post Test
3.1	What do you think about the cause of your pain?	0. Due to Trauma. 1. Due to lifting heavy weight. 2. Due to bad working posture. 3. Coughing or sneezing. 4. Bad sleeping posture. 5. Others.		
3.2	Duration of pain since the last episode	Month/Year		
3.3	Symptoms at Onset	1. Head 2. Neck 3. Scapula zone 4. Arm 5. Forearm		
3.4	Duration of symptoms	0. Constant 1. Intermittent		
3.5	Radiating pain	0. Right upper limb 1. Left upper limb 2. Both upper limbs		
3.6	Nature of pain site/spread	0. Up to shoulder 1. Up to elbow 2. Up to wrist 3. Up to hand 4. Up to finger		

Part 4- Pain related Variables

4.1 How severe is your radicular pain present?

0-10 Numeric Pain Rating Scale (NPRS) where “0” means no pain and “10” means worst pain.

0 1 2 3 4 5 6 7 8 9 10

NPRS Interpretation

Pre-Test	Post-Test

No.	Questions	Response	Pre Test	Post Test
4.2	How severe your pain radiation in sitting position?	0. No pain 1. Mild 2. Moderate 3. Severe		
4.3	How severe your pain radiation in lying position?	0. No pain 1. Mild 2. Moderate 3. Severe		
4.4	How severe your pain radiation during flexion of neck?	0. No pain 1. Mild 2. Moderate 3. Severe		
4.5	How severe your pain radiation is during extension of neck?	0. No pain 1. Mild 2. Moderate 3. Severe		

4.6	How severe your pain radiation is during right lateral flexion of neck?	4. No pain 5. Mild 6. Moderate 7. Severe		
4.7	How severe your pain radiation is during left lateral flexion of neck?	0. No pain 1. Mild 2. Moderate 3. Severe		
4.8	How severe your pain radiation is during rotation to right side of neck?	0. No pain 1. Mild 2. Moderate 3. Severe		
4.9	How severe your pain radiation is during rotation to left side of neck?	0. No pain 1. Mild 2. Moderate 3. Severe		

Part-5 (Neck Range of Motion Related Variables)

No.	Questions	Pre test	Post test
5.1	Active ROM of in Flexion of neck.		
5.2	Active ROM of in Extension of neck.		
5.3	Active ROM of in right side Flexion of neck.		
5.4	Active ROM of in left side Flexion of neck.		
5.5	Active ROM in Rotation to right side of neck.		
5.6	Active ROM in Rotation to left side of neck.		

Part-6 (Neck Disability Index related variables)

No	Questions	Pre-test	Post-test
6.1	**Pain Intensity** 0. I have no pain at the moment. 1. The pain is very mild at the moment. 2. The pain is moderate at the moment. 3. The pain is fairly severe at the moment. 4. The pain is very severe at the moment. 5. The pain is the worst imaginable at the moment.		
6.2	**Personal Care** 0. I can look after myself without causing extra pain. 1. I can look after myself normally but it causes extra pain. 2. It is painful to look after myself and I am slow and careful. 3. I need some help but manage most of my personal care. 4. I need help every day in most aspects of self-care. 5. I do not get dressed, wash with difficulty and stay in bed		
6.3	**Lifting** 0. I can lift heavy weights without extra pain. 1. I can lift heavy weights but it gives extra pain. 2. Pain prevents me from lifting heavy objects off the floor, but. I can manage if they are conveniently positioned, e.g. on a table. 3. Pain prevents me from lifting heavy weights but I can manage light to medium weights if they are conveniently positioned. 4. I can lift very light weights. 5. I can not lift or carry anything at all.		
6.4	**Reading** 0 . I can read as much as I want with no pain in my neck. 1. I can read as much as I want with slight pain in my neck. 2. I can read as much as I want with moderate pain in my neck.		

	3. I cannot read as much as I want because of moderate pain in my neck. 4. I can hardly read at all because of severe pain in my neck. 5. I cannot read at all.		
6.5	**Headaches** 0. I have no headaches at all. 1. I have slight headaches which come infrequently. 2. I have moderate headaches which come infrequently. 3. I have moderate headaches which come frequently. 4. I have severe headaches which come frequently. 5. I have headaches almost all the time.		
6.6	**Concentration** 0. I can concentrate fully when I want to with no difficulty. 1. I can concentrate fully when I want to with slight difficulty. 2. I have a fair degree of difficulty in concentrating when I want to. 3. I have a lot of difficulty in concentrating when I want to. 4. I have a great deal of difficulty in concentrating when I want to. 5. I cannot concentrate at all.		
6.7	**Work** 0. I can do as much work as I want to. 1. I can only do my usual work, but no more. 2. I can do most of my usual work, but no more. 3. I cannot do my usual work. 4. I can hardly do any work at all. 5. I cannot do any work at all.		
6.8	**Driving/Traveling** 0. I can drive without any neck pain. 1. I can drive as long as I want with slight pain in my neck.		

	2. I can drive as long as I want with moderate pain in my neck. 3. I cannot drive as long as I want because of moderate pain in my neck. 4. I can hardly drive at all because of severe pain in my neck. 5. I cannot drive my car at all.		
6.9	**Sleeping** 0. I have no trouble sleeping. 1. My sleep is slightly disturbed (less than 1 hr. sleepless). 2. My sleep is mildly disturbed (1-2 hrs. sleepless). 3. My sleep is moderately disturbed (2-5 hrs. sleepless). 4. My sleep is greatly disturbed (3-5hrs. sleepless). 5. My sleep is completely disturbed (5-7 hrs. sleepless).		
6.10	**Recreation** 0. I am able to engage in all my recreation activities with no neck pain at all. 1. I am able to engage in all my recreation activities with some pain in my neck. 2. I am able to engage in most, but not all of my usual recreation activities because of pain in my neck. 3. I am able to engage in a few of my usual recreation activities because of pain in my neck. 4. I can hardly do any recreation activities because of pain in my neck. 5. I cannot do any recreation activities at all		

Neck Disability Index Interpretation

Disability Scoring	Pre-test	Post-test
0. (0-20%) Minimal Disability 1. (21-40%) Moderate Disability 2. (41-60%) Severe Disability 3. (61-80%) Crippled Disability 4. (81-100%) Bed Bound		

Appendix- D

Gant Chart

Activities/ months	Sep 23	Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	Mar 24	Apr 24	May 24	June 24	July 24	Aug 24
Proposal presentation												
Introduction												
Literature review												
Methodology												
Data collection												
Data Analysis												
Result												
1st progress presentation												
Discussion												
Conclusion And Recommendation												
2nd progress presentation												
Communication with supervisor												
Final submission												