DRY NEEDLING AND MANUAL THERAPY FOR THE MANAGEMENT OF PATIENTS WITH CERVICOGENIC HEADACHE

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I hereby declare that the dissertation entitled **"DRY NEEDLING AND MANUAL THERAPY FOR THE MANAGEMENT OF PATIENTS WITH CERVICOGENIC HEADACHE."** submitted for DOCTOR OF PHILOSOPHY (Ph.D) degree is entirely my original work and all the ideas references have been duly acknowledged. It does not contain any work for the award of any other degree or diploma.

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This dissertation is fit for the submission and the partial fulfillment of the conditions for the award **DOCTOR OF PHILOSOPHY (Ph.D).**

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ABBREVIATIONS

ANOVA- **:** Analysis of Variance

CGH- **:** Cervicogenic Headache

CROM **:** Cervical Range of Motion

DN- **:** Dry Needling

HDI- **:** Headache Disability Index

MDB- **:** Myo-dural Bridges

MT- **:** Manual Therapy

NPRS- **:** Numerical Pain Rating Scale

PPT- **:** Pressure Point Threshold

QOL- **:** Quality of Life

ROM- **:** Range of Motion

SNAGS- **:** Sustained Natural Apophyseal Glides

SPSS- **:** Statistical Package for the Social Sciences

TENS- **:** Transcutaneous Electrical Nerve Stimulation

WHO- **:** World Health Organization

ABSTRACT

Introduction

Headache caused by upper cervical spine is known as cervicogenic headache. It is one of the most common musculoskeletal conditions which are often misdiagnosed as either migraine headaches or cluster headaches in clinical practice. The main feature of the cervicogenic headache is the unilateral pain which is associated with neck pain, restriction of neck movements and tenderness in cervical muscle and is the prominent features of this chronic hemicranial pain.

Objective

To evaluate the effectiveness of dry needling in patient with cervicogenic headache on pain intensity, pressure pain threshold (PPT), range of motion, headache disability index and quality of life.

To evaluate the effectiveness of manual therapy in patient with cervicogenic headache on pain intensity, pressure pain threshold (PPT) range of motion, headache disability index and quality of life.

To evaluate the combined effectiveness of dry needling and manual therapy in patient with cervicogenic headache on pain intensity, pressure pain threshold (PPT) , range of motion, headache disability index and quality of life.

Methods

This study was conducted on one hundred and fifty patients. They were divided into three groups. Group-A was referred to as the dry needling group. Group-B was the manual therapy group. The patients in this group were subjected to C1-C2 SNAGs. Group-C was the combined group of dry needling and manual therapy. Patients belonging to this group were given C1-C2 SNAGs along with dry needling.

Results

Data was analyzed using SPSS version 16.0. Paired t-test was used for comparison pre and post values within the group. One-way ANOVA and Scheffe Post-hoc Test was used for between the group comparisons. Level of significance for this study was fixed at 5% ($P<0.05$).

Conclusion

There was a consistent reduction in pain, tenderness, improvement in pressure point threshold, range of motion, head disability index and quality of life of the patients belonging to both groups. However group C, where the patients were subjected to combined treatment, showed better results. Results of this study indicate that dry needling along with Mulligan C1-C2 SNAGs could be more beneficial in patients suffering from cervicogenic headaches.

Keywords: *Cervicogenic Headache, Dry Needling, C1-C2 SNAG, Pressure Point Threshold, Headache Disability Index, Quality of Life, Range of Motion*

CHAPTER 1

INTRODUCTION

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INTRODUCTION

1.1Background

The World Health Organization (WHO) has declared that headache is the one of the top most disabling symptoms. According to statistical data 66% of men and 57% of women suffer from headaches at least once in a year [1]. Headache is one of the most common complaints of the nervous system and a number of its subtypes lead to substantial levels of disability [2]. It is often related to personal, biomechanical and socioeconomic circumstances [3].According to the International Headache Society, fourteen different types and 250 sub classifications of headaches have being recognized [4]. There are two basic groups of headaches, viz. primary and secondary headaches. Primary headaches consist of those of vascular origin (cluster and migraine headaches) other than those of muscular origin (tension-type headaches). Secondary headaches cause from another source as well as inflammation or head and neck injuries.

1.2 Cervicogenic Headache

Cervicogenic Headache (CGH) defined as a dull aching pain referred to and perceived in any area of the head. Primary nociceptive source in any musculoskeletal tissue that is innervated by cervical nerves can cause this type of presentation and is often deteriorated by neck movement, sustained uncooperative head position or external pressure over the upper cervical or occipital area on the symptomatic side [5]. It is typically unilateral but can also extant bilateral [6] .In addition, this type of headache is thought to have a marked female preponderance, occurring after whiplash trauma. It could also be associated with a decrease of range of neck movements and with ipsilateral shoulder and arm pain [7].

About 47% of the worldwide population agonizes from headache, whereas 15-20% of them are suffering from CGH [2]. The prevalence of CGH is 2.5%-4.1% of global population where Females and males ratio is 4:1 [2]. While the frequency of CGH is lower than that of tension-type and migraine headaches but individuals tend to have a significantly lower quality of life in comparison to tension-type and migraine headache sufferers [8]. CGH is a multifactorial neuro-musculoskeletal condition where

the muscles, joints nerve situated just at the base of the occiput could be involved. This represents a mixed group of disorders that usually refer pain from structures in the cervical spine region (e.g. joints, muscle, and nerve) to various areas in the head. Major features are unilateral pain that characteristically starts at the occipital-nuchal area and spreads to the ipsilateral often initiated by neck movements and/or digital compression over trigger points such as the greater occipital nerve or the C2 area [9]. Additionally, there may be diffuse, vague ipsilateral arm pain or discomfort [5]. One concept of CGH etiology comes from anatomical studies. It has shows an connection of the craniobase (sub-occipital) tissues to the spinal duramater at the cervico-cranial junction, and the remark that mechanical traction on these soft tissue can cause movement of the dura mater [10]. Rectus capitus posterior minor and ligamentum nuchae have been shown to have direct connections to the sub-occipital dura. It suggests a part for the dura as a nociceptive structure in CGH [11]. Hypertonicity of the posterior neck muscles could also cause pain. A study suggested that the myodural bridges which is formed by suboccipital muscle and spinal duramater could be a source of CGH [12]. The duramater is a highly pain sensitive structure thus indicating that any change in the muscle properties cause pain referred to the head. The anatomical link between the ‘duramater and the musculoskeletal system has important consequences for the treatment of CGH [12].

1.3 Musculoskeletal Problems in CGH

Myofascial trigger point is one of the common factors associated with all forms of headaches is the presence of trigger points (TrPs) [13]. A myofascial trigger point (TrPs) is a hyperirritable spot associated with a taut band of a skeletal muscle that is painful on compression or stretch [14]. The causes of myofascial trigger point are overuse, physical, psychological stress, trauma, and joint dysfunction. Trigger points related with CGH are predominently found in cervical musculature [15]. Scientific studies strongly suggest that there are myofascial TrPs points present in posterior neck muscle that refer pain to the head which might have a vital role in producing the symptoms of CGH [13]. A scientific study found more number of Myofascial TrPs on the symptomatic side as compared to the other [7].

1.4 Dry Needling

Dry Needling is a widespread treatment practice in manual physical therapy practice. Though, a number of dry needling therapies subsist, the more widespread and best reinforced method aims myofascial trigger points. Healthcare providers in various nations use dry needling in the medical management of musculoskeletal pain as well as also trigger points. The benefits of dry needling are gradually more recognized and incorporated in physical therapy. The practice dry needling could decrease marginal and major sensitization [16]. Some recent study suggested that dry needling produce similar therapeutic effects as compared to tolidocaine injection, and oral flurbiprofen [17].

1.5 Manual Therapy

Manual therapy is typically introduced to treat myofascial release (abnormalities in muscle and its associated connective tissue) as well as joint dysfunctions using sustained natural apophyseal glides (SNAGs). Many study suggested cervical SNAGs is one the popular method to treat the patients with CGH but there is a lack of evidence. SNAGs are a combination of a sustained facet glide with movement. The SNAGs are defined as sustained repositioning of one articular surface on its neighbor while a movement or function is undertaken. SNAGs are always involved with end range of joint movement. SNAGs were developed by Brian Mulligan usually done in sitting or standing position. SNAGS mobilization done on facet where glides are sustained with active movement followed by overpressure and glides are maintained until the joint returns to its original position.

1.6 Problem Statement

Many treatments have been proposed for CGH but only few of them have been tested in multimodal approach. Current evidence suggests that physical therapy is probably the most appropriate therapeutic tool for managing CGH if it is conjunct with other treatment approach. Therefore, the main purpose of this research is to propose a new multimodal and effective treatment strategies for the management of CGH. CGH varies from other kind of headaches in terms of both its diagnosis and healing process. There are a lot of reasons of the pain that might create at different levels together with the lower portion of the neck. In this contemporary and technology-driven period,

people are literally placing their necks out at the stake of triggering much real headache. It leads to strong stress on both the front and backside of necks. That stress could create pain that exhibits as a severe CGH. General causes of this type of headache could be trigger point around sub-occipital area as well as trapezious muscle. For the practicing therapists, the utmost trouble is to accurately figure out CGH and differentiate it from similar syndromes that might even coexist in the similar patient. Dry needling and manual therapy becomes an increasingly widespread practice regardless of a scarcity of study evidence underpinning its practice.

CHAPTER 2

REVIEW OF LITERATURE

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LITERATURE REVIEW

2.1 Structure of Review

The principle point of this chapter is to depict background information about the study. This chapter will provide the detail concept and create a better understanding regarding the study. Previous research as well as evidence available within this field will be also discussed. The scientific evidence were gathered from electronic database like library genesis, Pub med, Chi-hub, springer link, Web of Science in between 2013 November to 2019 January.

2.2 Anatomical Relationship of Cervical Spine with CGH

2.2.1 Facet Joints

Cervical spine facet joints also known as zygoapophyseal joints are formed by posterior articulations of vertebral arches the zygoapophyseal joints situated between the superior and inferior articular process of adjoining vertibra .The infrior facet of superior vertibrae faces anterior and inferiorly while the superior facet of the inferior vertebra faces posteriorly and superiorly .Cervical spine facet joints are true diarthrodial joint which is consists of a loose capsule, articular cartilage, muscles and legaments [18]. The joint capsule of in the cervical spine is thin and loose in nature thus permitting a wide range of movement. These capsules attach to adjacent vertebrae by means of the articular surfaces of the articular processes. Stabilising ligaments join the transverse processes, laminae and spinous processes of connecting vertebrae to support in maintenance of the joints.These joints permit flexion, extension, rotation as well as lateral flexion because of the orientation of the facets.

2.2.2 Cervical Spine Biomechanics

2.2.2.1 Atlanto-Occipital joint

The atlanto-occipital joint allows flexion, extension, lateral flexion as well as rotation though its primary role as established by cadaveric studies is flexion and extension. These movements are primarily restricted by bony structures [19]. During flexion the occipital condyles move in a postero-superior direction and recede on the lateral masses of the atlas. Simultaneously, the occipital bone moves away from the

posterior arch of the atlas. During extension the occipital condyles move anteriorly on the lateral masses of the atlas and the occipital bone approximates the posterior arch of the atlas [20]. Rotation and lateral flexion occurs as a coupled movement due to the convexity of the occipital condyle and the convexity of the atlas [20].

2.2.2.2 Atlanto-Axial Joint

The atlanto-axial joint allows flexion, extension, lateral flexion, although its main function is rotation. These movements are primarily limited by ligamentous structures. The articulating surfaces of the lateral masses slides posteriorly on the side of rotation and anteriorly on the opposite side . The occiput and C1 move as a unit on C2 and thus rotation occurs. The odontoid process acts as the axis of rotation around which the atlas pivots [20].

2.2.2.3 Lower Cervical Spine

The primary function of lower cervical spine (C3-C7) is flexion and extension. During flexion the superior vertebral body tilts and slides anteriorly creating compression of the intervertebral space anteriorly and opening the intervertebral space posteriorly, as well as stretching the posterior annular fibres. During extension the opposite occurs [20].

2.3 Cervicogenic Headache (CGH)

2.3.1 Impact of Cervicogenic Headache

The cervicogenic headache (CGH) was first described in 1983. Cervicogenic headache is a unilateral headache, generally starting in the neck and "spreading" forwards [21]. CGH is headache arising from musculoskeletal disorders of the upper cervical spine and is a common form of chronic recurrent headache [21]. The North America Cervicogenic Headache Society (NACHS) defines cervicogenic headache as a dull, aching pain that is referred to and perceived in any area of the head.

2.3.2 Prevalence of CGH and its Impact

According to the United Nations, 350 million peoples have been recognized as suffering from migraine, 624 million tension type headache (TTH) and 112 million cervicogenic headache(CGH) in the sub-continent area, which corresponds to an unlikely population of 3.85 billion in 2010 [5]. According to a study conducted in India (Bengaluru), the prevalence of 1 year of the headache was 63.9% and the incidence of 1

day was 5.9% [22]. The incidence was greater in the age groups of 18-5 years and among females. The incidence was greater in rural areas than in urban areas of 57.3%. About 1.1% of the proportion of days was paid, while overall productivity was 2.8% [22]. In a survey to estimate prevalence on cervicogenic headache in general population an incidence of 15.6% for CGH was found prevalent in individuals of age group 18-30 years [23].

2.3.3 Diagnostic Criteria of Cervicogenic Headache

Major criteria of cervicogenic headache include symptoms and signs of neck involvement, restricted range of motion, ipsilateral neck, shoulder or arm pain of nonradicular nature, unilateral head pain without side shift. Other features can be nausea, dizziness, photophobia and phonophobia, ipsilateraledema (perioccular), ipsilateral blurred vision. Following is a list of criteria for CGH given by various agencies (Table 2.1).

Table 2.1: Characteristic and Definition Variances of Cervicogenic Headache

Characteristic and Definition Variances of Cervicogenic Headache [24]	International Headache Society	World Cervicogenic Headache Society	Cervicogenic Headache International Study Group
Location of Pain	-Neck -Occipital	-Ipsilateral neck -Shoulder -Arm	-Neck -Occipital -Parietal-temporal -Frontal -Orbital
Pain Characteristics	--	-Moderate to severe	-Unilateral or bilateral stabbing
Palpation Findings	Muscle properties -Tenderness of neck muscles	-Identifies neck as source of pain	--
Aggravating Factors	-Posture -Neck movement	-Neck movement	-Neck movement -Awkward positioning of head -Pressure over ipsilateral cervical or occipital area
Radiological Findings	-Flexion/Extension abnormalities -Congenital anomaly	--	--

Headache classification committee of the International Headache Society (IHS) describe CGH as headache initiated by a disorder of the cervical spine and its component bony, disc and/or soft tissue components, frequently but not invariably accompanied by neck pain. The diagnostic criteria given by IHS are following-

A. Pain referred from a source in the neck and perceived in one or more regions of the head and/or face, fulfilling criteria C and D.

B. Clinical, laboratory and/or imaging evidence of either a disorder or a lesion within the cervical spine or soft tissues of the neck that is known to be or generally accepted as a valid cause of headache.

C. Evidence that the pain can be attributed to a neck disorder or lesion based on at least one of the following:

- A demonstration of clinical signs that implicate a source of pain in the neck.
- Cessation of headache following diagnostic blockade of a cervical structure or its nerve supply using placebo or adequate controls.

D. Pain that resolves within 3 months after successful treatment of the causative disorder or lesion.

2.4 Neuroanatomical Basis of Cervicogenic Headache

2.4.1 Structures involved at the Cervical Spine

Pain generating structures within the cervical spine are innervated by nociceptive nerve endings thus producing pain when stimulated. These pain generating structures are innervated by the dorsal rami, ventral rami, recurrent meningeal nerve as well as the sensory nerves associated with the autonomic nervous system in the cervical spine. Cervicogenic headache occur when there is referred pain from these structures to the head [25]. These pain generating structures within the cervical spine include the ture, ligaments, capsules, vertebrae, intervertebral discs and neural eliments [25].

A. Dorsal Ramus

Darby and Cramer (1994), defines the dorsal ramus of C2 to be unique as it also branches into a medial and a lateral. The greater occipital nervel from the medial branch has a large sensory zone of supply, supplying the suboccipital area and the skin extending from the occiput to the vertex. Dorsal ramus of C1 also contributes to the innervations of the C1/C2 facet joints.The dorsal ramus of C3 also well-known as the

third occipital nerve has a sensory supply to the suboccipital area where it supports the greater occipital nerve and contributes to the innervations of the C2/C3 facet joints [25]. Thus dorsal rami could be a potential source of CGH.

B. The Ventral Ramus

The cervical and brachial plexuses are formed from the ventral rami of the cervical spine. Nociceptive input from above listed structures may result in referred pain to the head thus contributing to CGH

C. Recurrent Meningeal Nerve

The recurrent meningeal nerve also known as the sinuvertebral nerve originates from the ventral rami sympathetic nerves that courses with the vertebral artery. With more than one of these nerves at each vertebral level it innervates anterior spinal duramater which could again be a cause of CGH.

D. Trigeminal System

The contribution from the cervical spine to chronic headaches can be attributed to the convergence within the trigeminocervical nucleus flanked by the nociceptive afferents of the trigeminal nerve and the first three cervical nerves. It has been shown that structures innervated by C1-C3 spinal nerve roots are capable of causing headache [25].

2.5 Pathophysiology of Myofascial Trigger Point

The pathogenesis of CGH is a controversial area with the CGH literature. Sources of these headaches can be attributed to almost every pathology and structure within the cervical spine [24].Vernon (2001), suggested four diagnostic categories classifying the mechanism of cervicogenic headaches, localising both anatomical and pathological agents that are implicated [26].

A. Extrasegmental

Extrasegmental structure refers to structure that are more superficial within the cervical spine and include the cervical musculature and ligaments. Myofascial dysfunction and the formation of trigger points within muscles can be attributed to postural strain as well as micro/macro trauma. Other extrasegmental structures include the vertebral artery, cervical ganglia and sympathetic chain [26].

B. Intrasegmental

Intersegmental structures refer to the joint complexes of C2/C3 as well as C3/C4, the articular surfaces, ligaments and deep intersegmental musculature that is suboccipital muscles, semispinalis muscles and multifidi [26]. It is believed that the most common cause of cervicogenic headache is mechanical pain originating from upper cervical musculature, joints and ligaments. With mechanical pain being defined as, pain that is not associated with any severe underlying pathology, although aggravated by movement and relieved by rest [27].

C. Infrasegmental

Infrasegmental structures refer to the nerves that surround the intervertebral foramina of the cervical spine. These include anterior andposterior ramirami of C1 and C2, dorsal root of ganglion of C2 and posterior nerve root of C3 [26].

D. Intrasegmental

The intrasegmental structures refer to the spinal cord and the medullary dorsal horn which includes the nucleus subcaudalis of the trigeminal nerve [26].

2.6 Clinical Features of Cervicogenic Headache [28]

- Pain
- Located unilaterally or bilaterally.
- Positioned in occipital, parietal, temporal or orbital region regions of the head.
- Dull or aching in nature, no stabbing pain.
- Indication of abnormality in the cervical spine.
- Neck pain.
- Focal neck tenderness.
- Reduced cervical range of motions.
- Aggravated by neck movements.
- Relieved by rest.

2.7 Myofacial Trigger Points in Cervicogenic Headache

Myofascial trigger points can be defined as a hyper irritable spot within the skeletal muscle associated with a hypersensitive nodule in a taut band that can be felt on palpation. This spot is painful when compressed and could possibly give rise to

characteristic referred pain or CGH. Myofascial trigger points can be active or latent. Active myofascial trigger points are painful even when they are not palpated. Latent myofascial trigger points only produce pain when they are palpated [29]. The trigger point is typically stimulated by acute or chronic injury to a muscle, tendon, ligament, joint, disc or nerve. It has been suggested that there are numerous sensitive locus in a trigger point area. A sensitive locus may have one or more sensitized nociceptive nerve endings. Mechanical stimulus of a sensitive locus can provoke a local twitch response which is often related with typical referred pain. Hypothetically, sensitive locus can be originate in any spot of a skeletal muscle, but is typically disseminated with peak concentration near the endplate area where a trigger point is normally found. Trigger points have been revealed to be active in fibromyalgia. Moreover, a study established that 100% of neck pain sufferers haunted the presence of trigger points and almost 53% of them had non-dermatomal referral [30]. The studies showed by Couppe et al (2007) established that subjects with chronic headaches had a higher prevalence of TrPs and the presence of TrPs may be a causal issue in the origination and /or continuation of chronic headaches [31]. The suggested that myofascial TrP may be a significant pain creating mechanism in cervicogenic headache [31].

2.8 Dysfunction of the Sub-occipital Muscles in CGH

The sub-occipital muscles have a poor definition of referred pain, but are experienced as a deep head pain radiating from occiput to the orbit and are a common source of headache Articular dysfunctions especially C0/C1, C1/C2 and C2/C3 and trigger points in the suboccipital muscles coexist and perpetuate each other cyclically [29].

2.9 Myodural Bridges in CGH

Connective tissue bridges also known as myodural bridges are known now to connect the suboccipital muscle fascia to the duramater [32]. The duramater is more specifically attached to the rectus capitis posterior major and minor and the obliquus capitis inferior. With it being a highly pain sensitive structure, the duramater could cause CGH. Dissection of 30 human cadavers followed by MRI of 4 specimens by Humphreys, Kenin, Hubbard and Cramer (2003) agreed with former findings of myodural bridges between the duramater and rectus capitis posterior minor [33]. Increased dural tension because of failure of this system to keep constant tension or

hypertrophic suboccipital muscles may result in clinical appearances such as changed cerebral spinal fluid flow, dural related pathologies, and changes in sensory motor function and cervicogenic headaches [32].

2.10 Physiotherapy Treatment of CGH

Cervicogenic headache treatment generally needs a multidimensional method using pharmacological, non-pharmacological and occasionally surgical intervention in severe cases [34].

2.10.1 Modalities

Modalities are used to help decrease pain and assist healing of the tissue. Examples of such modalities consist of TENS, cryo-therapy and low level laser therapy. There are insufficient studies that support TENS and cryotherapy in combined with other therapies in the treatment of CGH. Low level laser therapy is becoming more and more popular for the management of musculoskeletal disorders. Though, there are no known studies on the effect of this treatment modality in CGH patients [15]. These modalities are mostly used by physical therapists.

2.10.2 Therapeutic Exercise

There are insufficient studies that have motivated on the effectiveness of therapeutic exercise in patients with CGH. A randomized controlled trial of 200 patients with CGH found that six weeks of cranio-cervical flexion exercise was as effective as spinal manipulation at reducing headache intensity and frequency [36]. Therapeutic exercises are recommended by bio-kinetists, physical therapists and chiropractors.

2.10. 3 Clinical Evidence for Dry Needling on CGH

Dry needling has been advocated as the treatment of choice in aiding myofascial trigger points and appears to be an effective treatment modality. It is minimally invasive, inexpensive, easy to learn with appropriate training, and carries a low risk. Dry needling uses an acupuncture needle insertion into a trigger point that reproduces the pain, causes a local twitch response followed by pain relief and relaxes the tension in the muscle. The local twitch response is a reflex contraction and is a confirmation of trigger point localization. Dry needling effectiveness is achieved by direct stimulation or mechanical disruption by the needle which decreases or ceases the pain.

Many studies in the literature have proven the effectiveness of dry needling. A study found therapeutic efficacy of invasive needling techniques in the management of myofascial pain and dysfunction syndrome [36]. The study involved the use of dry needling and saline injection for trigger point treatment. The study hypothesized that saline would be superior form of treatment. Cummings study on the relative effectiveness of ultrasound versus dry needling of myofascial trigger points revealed treatment of pain via dry needling to be more effective [37]. A meta-analysis on acupuncture and dry needling in the management of myofascial trigger point pain; revealed that deep needling directly into myofascial trigger points has an overall treatment effect when compared to other standardized care [38]. Sedighi et al. (2017) compared the acute effects of superficial and deep dry needling of the trigger points of the sub occipital and upper trapezius muscles in patients with CGH [39]. A headache disability index, pressure point threshold, cervical range of motion (CROM) and a functional rating index were used to take measurements at baseline, immediately and one week afterwards the treatment. The outcomes of dry needling revealed decrease in headache index and pressure point threshold. The deep dry needling group revealed a significant improvement of range of motion ($p < 0.001$).

Melchart et al. (2005) had made an analysis to examine the viability of needle therapy with no needle therapy in patients with tension-type headache [40]. In their study they employed 270 patients (74% females, mean age 43 years) with rambling or interminable strain composes cerebral pain. Needle therapy and insignificant needle therapy were directed by specific doctors and comprised of 12 sessions for each patient more than two months. The needle therapy intervention examined in this trial was more powerful than no treatment yet not essentially more powerful than insignificant needle therapy for the treatment of tension-type headache.

Walters (2014) reported in their systematic review that dry needling could be well known among physiotherapists for the administration of myofascial treatment [41]. There is some proof to recommend that dry needling can for all time deactivate myofascial trigger focuses. Three relevant studies were identified and all three showed statistically significant improvements after drying needling, but no significant difference between the groups. Only one study reported on the frequency or intensity of the headache, reporting an improvement in the VAS score after adding dry needles to

conventional physiotherapy. Two studies showed significant improvements with dry puncture over 4-5 weeks of treatment. There were no adverse events reported. One case study done by Bond and Kinslow (2015) found an improvement in clinical outcomes after dry needling in a patient with occipital neuralgia [42]. After given informed consent, the participant received a total of four needling dry (DN) sessions over a two-week period. During the treatment periods, needle was inserted into the trapezius and suboccipital muscles. After the treatment, the patient reported a 32-point change in the head disability index score. They suggested that improvement in neck pain and headaches after dry needling intervention could successfully improve clinical outcomes in a patient diagnosed with occipital neuralgia.

Moran et al. (2015) had made a comparative study on the effectiveness of dry needling and manual therapy [43]. Thirty-six participants were randomly allocated to one of three treatment groups like orthopaedic manual therapy (OMT), dry needle as well as stretching (DN-S) and soft tissue techniques (STT). All the groups received two treatment sessions with a time interval of 48 hours. Outcome measures included the intensity of neck pain measured with a visual analog scale, cervical range of motion (CROM), pressure pain threshold to measure mechanical hyperalgesia, and two self-reported questionnaires (neck disability index and catastrophic scale). The statistical analysis revealed significance improvement shown in all the groups. The DN-S as well as OMT group decrease neck disability. Only the OMT group indicated decrease in mechanical hyperalgesia and pain. The CROM increased in the OMT groups (flexion, lateral flexion and rotation) and DN-S (lateral flexion and rotation). On the other hand Meulemeester et al (2016) reported that dry needling and manual therapy are equally effective to manage myofascial pain around neck and shoulder [44]. In his randomized clinical trial, total fourty two subjets were recruited with pain around neck and shoulder joint. They were divided into two groups viz. dry needling and manual therapy respectively. After four session of intervention there was a significance improvement in all the parameters for both the groups.

2.10.4 Clinical Evidence for Manual Therapy on CGH

According to the Orthopaedic Manual Physical Therapy Description of Advanced Specialty Practice-2008, manual therapy is defined as a “clinical approach utilizing specific hands-on techniques, including but not limited to manipulation/

mobilization, used by the physical therapist to diagnose and treat soft tissues and joint structures for the purpose of modulating pain; increasing range of motion ; reducing or eliminating soft tissue inflammation; inducing relaxation; improving contractile and non-contractile tissue repair, extensibility, and/or stability; facilitating movement; and improving function [45].

In the given context, Penas and Courtney (2014) exposed some examples of manual therapies for the type of tension and cervicogenic headaches, based on a rationale of nociceptive pain, to modulate the hypersensitivity of the central nervous system: trigger point therapy, joint mobilization, joint manipulation, exercise and approaches to cognitive pain [46].

Castien et al. (2011) had studied the effectiveness of manual therapy for chronic tension type of headache [47]. The treatment comprised of a mix of activations of the cervical and thoracic spine, practices and postural adjustment particularly decided for the administration of cervicogenic cerebral pain. Lopez et al (2016) had studied the efficacy of the manual therapy in the treatment of the cervicogenic headache [48]. Mechanical motivations in manual treatment are accepted to start a course of neuro-physiological changes in the focal and fringe sensory systems, which thusly incites clinical changes. Similarly, Almeida et al (2014) had studied the beneficial effects of manual therapy on cervicogenic headache [49]. The change in the pain and in the neck disability list demonstrated that this treatment proposition could be an applicable part of managing this pathology.

Chaibi and Russell (2012) recommended that physiotherapy and manual therapy might be an effective treatment in the managing of CGH [50]. In their systematic review, it is found that manual therapy or physiotherapy is the only effective treatment for cervicogenic headache. Because of muscle delicacy and conceivably not yet recognized neighborhood factor in the cervical spine, it may be that manual treatments can diminish CGH, alongside blockage of the more prominent occipital nerve.

In 1980s Brian Mulligan introduced mobilizations with movement (MWMs) articular techniques. Natural apophyseal glides (NAGs) are accessory movements, gliding one spinal facet upon its neighbour. Sustained natural apophyseal glides (SNAGS) are similar accessory glides performed on an actively moving through the

previously painful or restricted range of movement. MWMs apply the principle of accessory glide plus active movement too, but they are applied to peripheral joints. A study conducted by Toby Hall (2007) to evaluate the effects of SNAGS technique to manage the CGH and the concluded that SNAGS can be applied for the management of CGH [51]. They concluded that C1-C2 self SNAGS presented a statistically significant improvement in headache severity index at week 4 and especially in the first year ($p < 0.05$). This improvement was more pronounced than the improvement observed for the control group at both 4 weeks and 1 year ($p < 0.05$). Another similar study conducted by Shin and Lee (2014) reported that the effect of SNAGs on pain and duration of headaches in women with CGH [52] . In this study, the patients were divided into two groups: the SNAG group ($n = 20$) and the control group ($n = 20$). The SNAG group, with a sliding facilitator, offers a complete range of painless movements. Visual Analog Scale (VAS), headache duration and Neck Disability Index (DLI) were evaluated by patients before and after the procedure. NDI in the SNAG group showed significantly greater improvement compared to the control group in which only the SNAGS placebo technique was applied. Furthermore, a significant improvement of the visual analogue scale in the SNAG group was observed compared to the control group ($P < 0.05$). Therefore, the SNAG technique can help middle-aged patients with cervicogenic headache.

2.10. 5 Combined Effects of Dry Needling and Manual Therapy in CGH

Many treatments have been proposed for CGH but only few of them have been tested in multimodal approach. There are many case reports suggested that multimodal physical therapy approach including dry needling are very effective to manage CGH. Issa and Huijibregts (2006) reported that chronic headaches are an important issue for the health of patients and are often a clinical mystery to health care workers who treat such patients [53]. They recommended that treatment combined myofascial trigger point using dry needling, orthopedic manual therapy, exercise therapy, and patient instruction was useful. There was a 31% change in the head disability index (HDI) passionate score, a 42% change in the practical score, and a 36% change in the aggregate score. Another case study conducted by Sillevis (2011) stated that dry needling combined with manual therapy is more suitable treatment for the management of CGH [54]. However there is a lack of evidence regarding the randomised control

trials and original research papers for using dry needling and manual therapy as combined modal.

2.10.6 Hindrance for CGH in Physiotherapeutic Approaches

Kumar and Fernandes (2017) explained about the obstructions to effective physiotherapy treatment in his paper entitled as "An evaluative commentary on the physical therapy intervention in a headache" [55]. The absence of mindfulness among health‐care experts with respect to the methods for treatment utilizing physiotherapy is a noteworthy hindrance. Patients need faster help with medicines, however uninformed with its different impacts. Some headaches can have serious underlying conditions, and early diagnosis is essential to prevent serious complications. On the other hand, some headaches respond only to a specific drug. Therefore, a correct diagnosis is essential for good treatment.

2.11 Research Gap Identified

The review of literature suggested that dry needling and manual therapy are both significantly helpful to improve CGH condition. However both the treatment technique does not stand alone for the maximum benefits. Since only few case studies have been performed as combination therapy, there is dearth in literature regarding the combined effects of dry needling and manual therapy on CGH.

2.12 Conceptual Framework for Dry Needling and Manual Therapy Combined Model

The following figure illustrates the conceptual framework for evaluating the effects of dry needling and manual therapy for the management of cervicogenic headache in reducing pain.

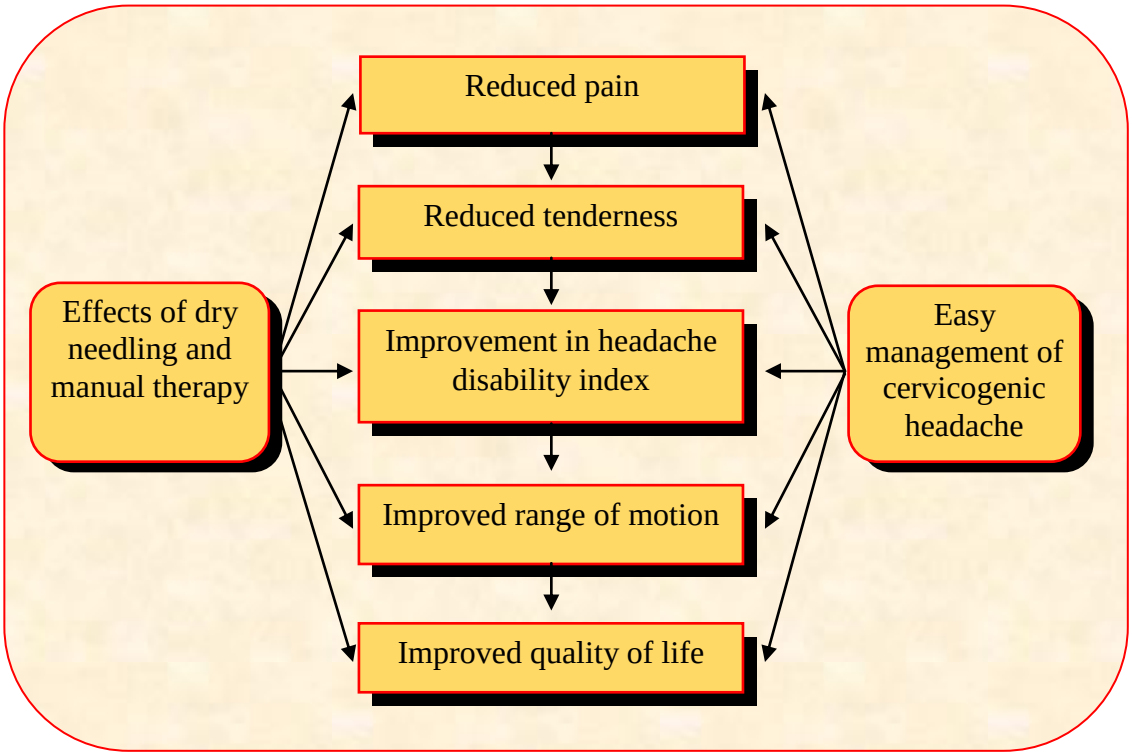


Figure2.1: The conceptual framework for evaluating the effects of dry needling and manual therapy for the management of cervicogenic headache

2.13 Need for the Study

This study examines about the dry needling and manual therapy for the management of patient with Cervicogenic Headache. As previous studies fails to investigate about the dry needling and manual therapy for the management of patient with Cervicogenic Headache, this study intends to discuss in detail about the proposed topic and also proposes the model. This study will help the future researchers to know about how dry needling and manual therapy helps in the management of patient with Cervicogenic Headache as combined modality. Analyzing the existing researches, this research aims to provide a clear overview about the dry needling and manual therapy for the management of patient with Cervicogenic Headache.

2.14 Objectives

1. To evaluate the effectiveness of dry needling in patient with cervicogenic headache on pain intensity, pressure pain threshold (PPT), range of motion, headache disability index and quality of life.
2. To evaluate the effectiveness of manual therapy in patient with cervicogenic headache on pain intensity, pressure pain threshold (PPT) range of motion, headache disability index and quality of life.
3. To evaluate the combined effectiveness of dry needling and manual therapy in patient with cervicogenic headache on pain intensity, pressure pain threshold (PPT), range of motion, headache disability index and quality of life.

2.15 Hypothesis

Null Hypothesis: There is no relationship between reduced pain and effects of dry needling and manual therapy for the management of cervicogenic headache in reducing pain, improving range of motion and quality of life.

Alternative Hypothesis: There is a relationship between reduced pain and effects of dry needling and manual therapy for the management of cervicogenic headache in reducing pain, improving range of motion and quality of life.

CHAPTER 3

MATERIALS AND METHODS

CHAPTER - 3

MATERIALS AND METHOD

This chapter provides information regarding the research design, sampling design, data collection procedure, statistical tools employed for analysis of data, etc

3.1 Adapted Research Paradigm

The present research work adopts positivistic paradigm in backing up the quantitative research. Here, the data is assembled through understanding and observation and it is totally measured by using the systems for quantitative techniques like the quantifiable examination, tests, and reviews and so on. The positivism help in promoting continuation reality of the world and its significance is based on the measurement of correlating factors associated in order to promote the insight on reality. More over positivism is recognized to be as quantitative stratagem and so it is promisingly suitable for the proposed study topic. The positivistic paradigm adopted in this research is depicted through pictorial form as represented below in Figure 3.1.

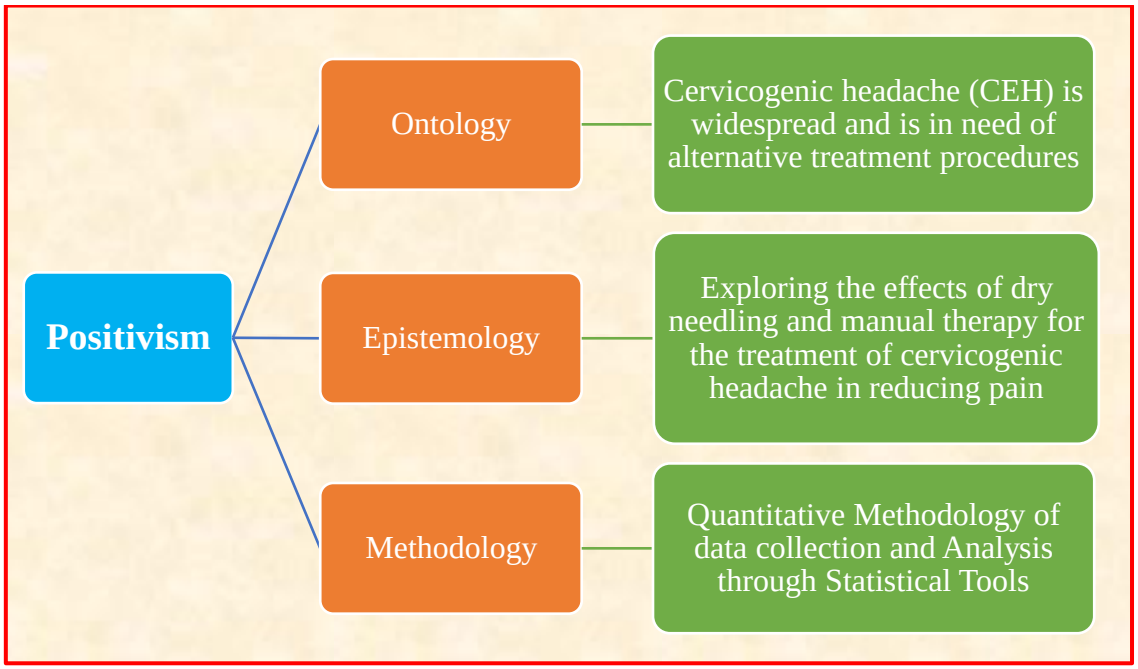


Figure 3.1.: Justification of the use of positivistic paradigm in investigating the effects of dry needling and manual therapy for the treatment of cervicogenic headache in reducing pain.

3.2 Research Approach

This research work is amended with deductive approach for the verbalization of hypothesis and provision of verdicts accordingly.

3.2.1 Research Design

This study comprises of interventional experimental design under the randomized controlled trial.

3.2.2 Sampling Design

A simple random sampling method was adopted for collection of samples.

3.2.3 Sampling Size and Recruitment Source

A total of 150 participants, 50 in each group were recruited in the study from the Out Patient Department (OPD), Department of Physiotherapy, Lovely Professional University, Punjab, India. The sample size was calculated based on the formula for comparison of mean for three groups using pain as the outcome variable.

$$N = \frac{2x\,(Z\,(1-\alpha/2)*3 + Z\,(1-\beta/)^2\,\sigma^2}{đ^2}$$

Z (1-α/2)- type 1 error=1.96

Z (1-α/2 x3= 2.4 for three groups in the study

Z (1- β) - type 2 error= 0.80

σ – Pooled standard deviation=18.02 and

đ- Absolute error or precision/Minimal Clinical Relevant Difference= 3 (from previous study).

Using the above formula a sample size of 38 was obtained in each group. Considering drop outs we calculated a total sample size of 150 (50 each group)

3.2.4. Participants Selection Criteria

The inclusion and exclusion criteria are mentioned as below

a. Inclusion Criteria

Based on the following conditions the individuals are included in the study:

- Both male and female with the age group of 20-50 years.
- Persons fulfilling the diagnostic criteria given by IHS (international headache society):

- Positive FRT (flexion-rotation test) and restricted ROM.

b. Exclusion Criteria

Following participants were excluded from the study:

- Cervical spine injury, fracture or surgery.
- Congenital spinal deformity.
- The participants not meeting age criteria for inclusion.
- Cervical radiculopathy or presenting neurological deficit.
- Participants with history of recent trauma.
- Participants suffering from dizzy spells.
- Vertebral malignancy.
- Vertebral-basilar insufficiency.
- Bone infections.
- Any participants who were taking anti-inflammatory or muscle relaxant medication were excluded.
- Any participants who failed to comply with the consent form were excluded.

3.3 Participants Group

The subjects were randomly assigned into three groups by simple random sampling, such as group A, group B and group C and the treatment plan was allocated as follows:

- Group-A received Dry Needling (DN).
- Group-B received Manual Therapy.
- Group-C received Dry Needling combined with Manual Therapy.

All the participants of the respective groups received physiotherapy care and home exercises as per the routine care.

3.4. Study Procedure

The approval for the study was obtained from the institutional ethics committee (LPU/IEC/PTY/005) following which an informed consent was taken from participants. Following this a participant information sheet was given to all participants explaining the procedure and necessary information related to the study. Prior to the data collection all participants were sensitized with the treatment techniques, its benefits and

potential side effects following which participants were categorized into three groups for intervention based on the randomization process.

3.4.1 Treatment Groups

3.4.1.1 Dry Needling Technique

Acupuncture needle was used (15 mm for suboccipital muscle and 40 mm was used for trapezius muscle) by the qualified manual therapist. The therapist used hand gloves and the treatment area was cleaned by antiseptic liquid. The trigger point was identified with palpatory method. The participants were informed about pinprick sensation following insertion into the muscle. The treatment was applied weekly 2 sessions for four week.

3.4.1.2 Manual Therapy

In the manual therapy group, Mulligan technique at C1-C2 SNAGS were applied. The patient was in sitting position and therapist was in standing position at the side of the patient then asked the patient to move head into the painful direction. The patient head was stabilized by the forearm and the body of the therapist. Then placed first three fingers held around the base of the skull and the little finger layed over the spinous process of C2 vertebra. Now, with the lateral border of the thenar eminence of other hand, pressure was applied on the spinous process of C2 towards eyeball and the skull remained stable while giving glide. The glide was given for three times per second and repeated for 6-10 times as per the standard mulligan SNAG technique two sessions per week for four weeks.

3.4.1.3 Combined Therapy

In the combined group dry needling technique was done 4 session for initial two weeks along with mulligan (C1-C2 SNAGS) were applied as per above dosages and duration for the four weeks.

3.5. Outcome Measures

The subjective and objective measurements were taken before starting the treatment and post reading were taken four weeks later just after the intervention period.

A) Subjective Measures

Numerical Pain Rating Scale

The NPRS is considered to be a reliable and valid tool for assessing the pain in patients ranging from 0-10 with 0 as no pain and 10 as maximum pain.

Headache Disability Index

The Headache Disability Index is a valid and reliable twenty-five question disability inventory used to assess functional as well as emotional effects of everyday life. It assists with the evaluation of the effectiveness of the management strategy. Each question within the inventory required a 'yes' (4 points), 'sometimes' (2 points) and 'no' (0 points) response. A maximum score of 100 points was indicative of a severe self-perceived headache disability [56].

Quality of Life

SF-36 (The MOS 36-item short form health survey) form is used as a general quality of life scale. This form was developed by Ware and his co-workers and its Turkish validity and reliability adaptation was made by Kocyigit and his co-workers [57]. The form is composed of a total of 36 items that can be filled by the patient. These items include 8 different dimensions concerning health. Physical function (10 items), social function (2 items), physical problems-related role constraints (3 items), emotional problems-related role constraints (3 items), mental health (5 items), liveliness (4 items), pain (2 items) general health [general perspective (5 items) and alteration in health (1 item)]. Items are scored (0 = poorest health state, 100 = best health state) and are evaluated one by one. By subscales, it evaluates the health between 0-100; and 0 indicates poor health state, 100 indicates good health state.

B) Objective Measures

Cervical Range of Motion

A universal goniometer was used to check the cervical ROM. All the movements of cervical were done i.e. Flexion, Extension, Side flexion to right, Side flexion to left, Rotation to right, Rotation to left.

- **Flexion and Extension:** The patient was placed in sitting position. The fulcrum was placed on the external auditory meatus, the static arm of the goniometer

was parallel to the ground and the distal arm was parallel to the longitudinal axis of tongue depressor. Then asked the patient to do flexion and extension.

- **Side Flexion to Right and Left:** The patient was placed in sitting position. The fulcrum was placed over C7 spinous process, static arm was along with thoracic vertebrae and distal arm was along the dorsal midline of head. Then the patient was asked to do side flexion to right and left.
- **Rotation to Right and Left:** The patient was in sitting position. The fulcrum was placed over center of the cranial aspect of head, static arm was along with the ear level and the distal arm was along with the nose tip. Then the patient was asked to do rotation to right and left.

Pressure Point Threshold

Algometer Method: The Wagner FDX-25 Algometer was used to measure pressure pain threshold i.e. to detect minimal pressure that induced pain. The patient was in sitting position. Firstly, trigger points were identified in the occipital area. Minimal three trigger points were considered then algometer was placed on the identified trigger point at 90°. The pressure was applied in Kgf and participant tolerance to pain was noted. After the treatment protocol of 4 weeks, the algometer pressure reading was noted on the same trigger points and differences were checked.

3.6. Statistical Analysis and Interpretation

The data was analyzed for normality using the descriptive statistics. The statistical tools used in the study included Paired t-test and ANNOVA where the set statistical level of significance was $p < 0.05$.

CHAPTER 4

RESULTS

CHAPTER - 4

DATA ANALYSIS AND RESULTS

This chapter deals with the findings that were obtained during the clinical trial of the study. Before and after the intervention subjective and objective data were collected. The data included: Demographics, Subjective findings from the Numeric Pain Rain Scale (NPRS) , range of motion (ROM), Headache disability index (HDI) and quality of life (QoL) questionnaires and Objective data achieved from Universal goniometer and Algometer. Data was analysed by using SPSS version 16.0. Paired t-test was used for comparison of pre and post values within the group. One-way ANOVA and scheffe Post-hoc Test was used for between the group comparisons. Level of significance for this study was fixed at $p<0.05$.

4.1 Demographic Data

The sample group consisted of 135 participants, 40 participants represented Group A and received dry needling, 48 participants represented Group B received Manual Therapy and 47 participants represented Group C received dry needling as well as manual therapy. The participants were between 20 and 49 years of age with a mean age of 34.3 years. The participants in Group A had a mean age of 37±9 years, whereas those in Group B had a mean age of 36 ±7 years (Table 4.1). There was statistically no significant difference between age groups (p = 0.443). The number of female participants was higher for Group B and Group C.

Table: 4.1 Demographic Data

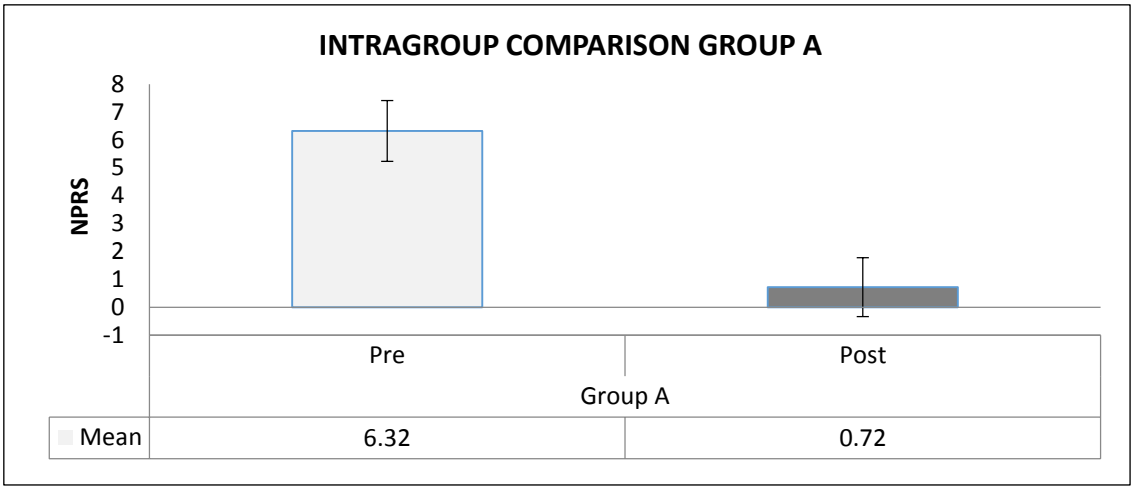
Group	Number	Age (Mean ± S.D)	Male	Women
Dry needling	40	37±9	12	38
Manual therapy	48	36±7	11	37
Manual therapy with Dry needling	47	36±8	09	38
Total	135	37±8	32	113

Table 4.2

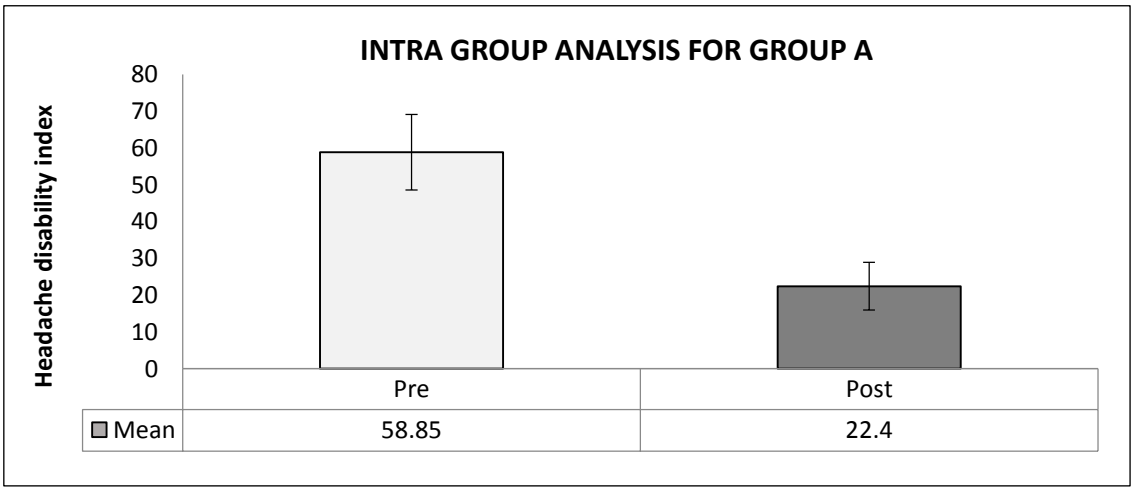
Comparison of pain (NPRS), disability (HDI) and quality of life (QoL), pressure point threshold and cervical range of motion pre and post treatment within Group A

Variables	Mean	Std. Deviation	Std. Error Mean	p value
NPRS-pre	6.32	1.09	.17	
NPRS-post	.72	.49	.07	<0.001
HDI- Pre	58.85	10.32	1.63	
HDI-Post	22.40	6.48	1.02	<0.001
Physical functioning - Pre	57.25	13.53	2.14	
Physical functioning - Post	75.62	10.13	1.60	<0.001
Role of limitation Physical health -Pre	35.00	14.76	2.33	
Role of limitation Physical health-Post	71.25	13.33	2.10	<0.001
Role of limitation emotional health-Pre	34.07	23.37	3.69	
Role of limitation emotional health-Post	68.47	21.36	3.37	<0.001
Energy - Pre	50.25	6.69	1.05	
Energy - Post	70.87	9.60	1.51	<0.001
Emotional well being - Pre	61.60	7.06	1.11	
Emotional well being - Post	71.50	9.02	1.42	<0.001
Social life - Pre	61.85	9.92	1.56	
Social life - post	73.62	10.26	1.62	<0.001
Body pain - Pre	44.27	9.48	1.50	
Body pain - Post	72.20	10.01	1.58	<0.001

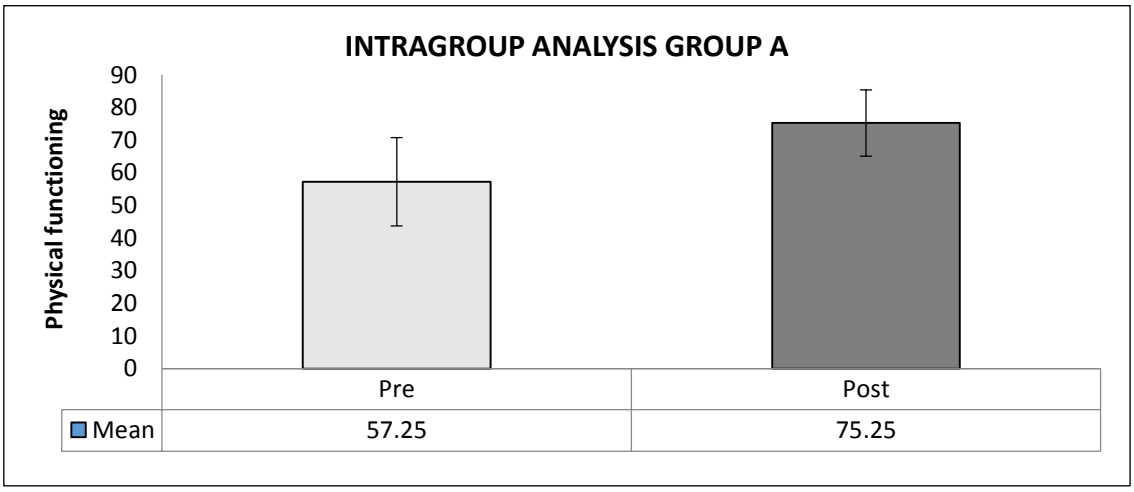
Variables	Mean	Std. Deviation	Std. Error Mean	p value
General Health - Pre	56.87	10.54	1.66	
General Health - Post	73.47	9.44	1.49	<0.001
Sub occipital area Pressure Point Threshold- Pre	2.7308	.60	.09	
Sub occipital area Pressure Point Threshold - Post	3.7700	.55	.08	<0.001
Trapezius muscle Pressure Point Threshold- Pre	3.4323	.63	.10	
Trapezius muscle Pressure Point Threshold- Post	4.5240	.87	.13	<0.001
Extension - Pre	44.25	5.94	.93	
Extension - Post	54.75	7.24	1.14	<0.001
Flexion - Pre	37.25	8.23	1.30	
Flexion - Post	45.25	6.88	1.08	<0.001
Side of flexion (Left) - Pre	30.12	5.71	.90	
Side of flexion (Left) - Post	36.87	6.06	.95	<0.001
Side of flexion (Right) - Pre	30.25	5.65	.89	
Side of flexion (Right) - Post	37.25	5.76	.91	<0.001
Rotation (Left) - Pre	51.50	7.77	1.22	
Rotation (Left) - Post	64.75	8.39	1.32	<0.001
Rotation (Right) - Pre	51.8750	8.89	1.40	
Rotation (Right) - Post	64.37	7.85	1.24	<0.001



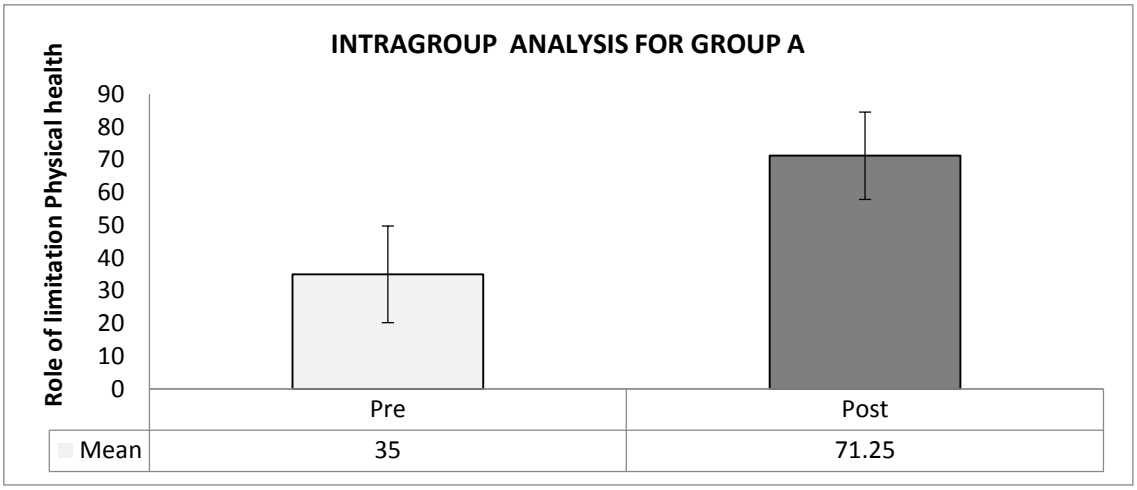
Graph 4.1: Pain (NPRS score) within the Group A.



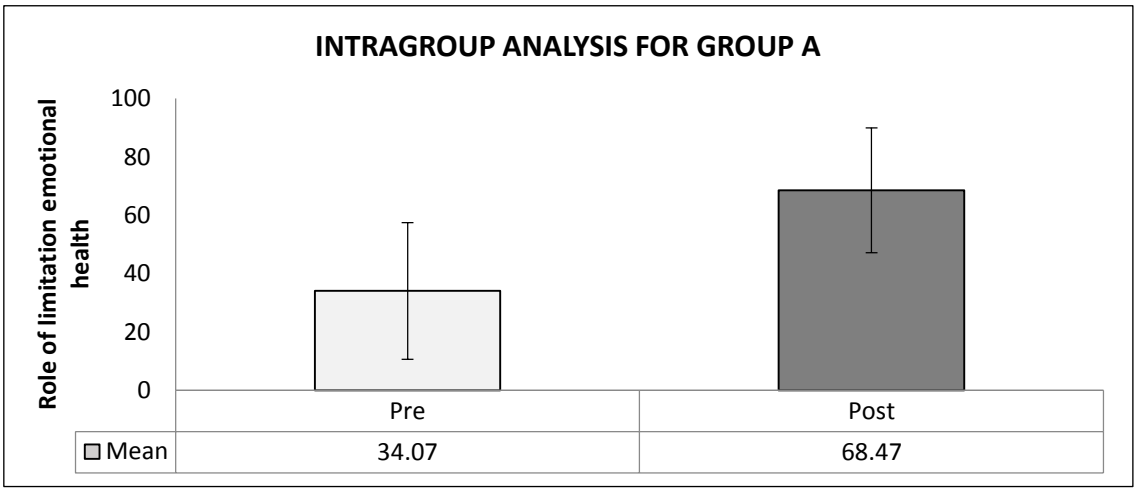
Graph 42: HDI within the Group A.



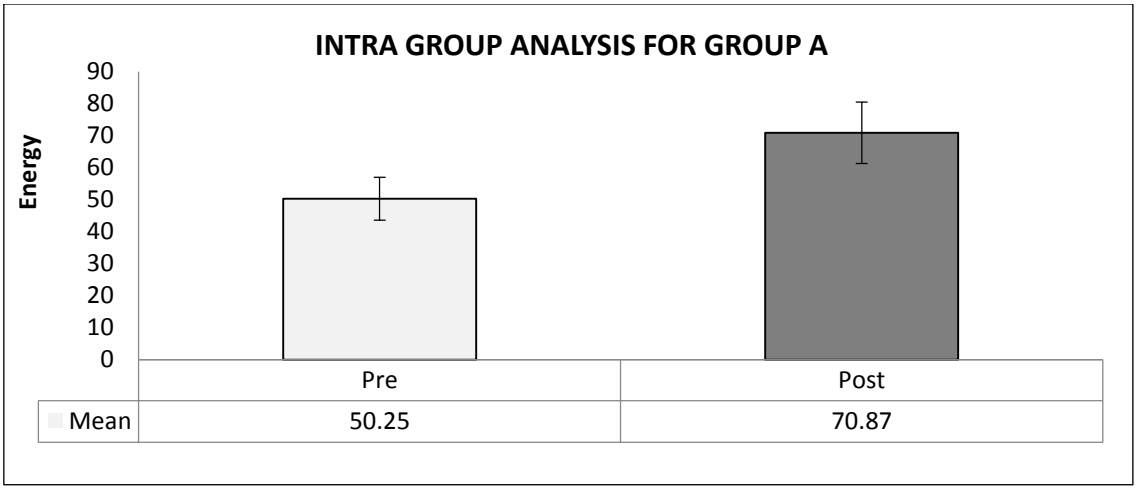
Graph 4.3: Quality of Life (Physical Functioning) within the Group A.



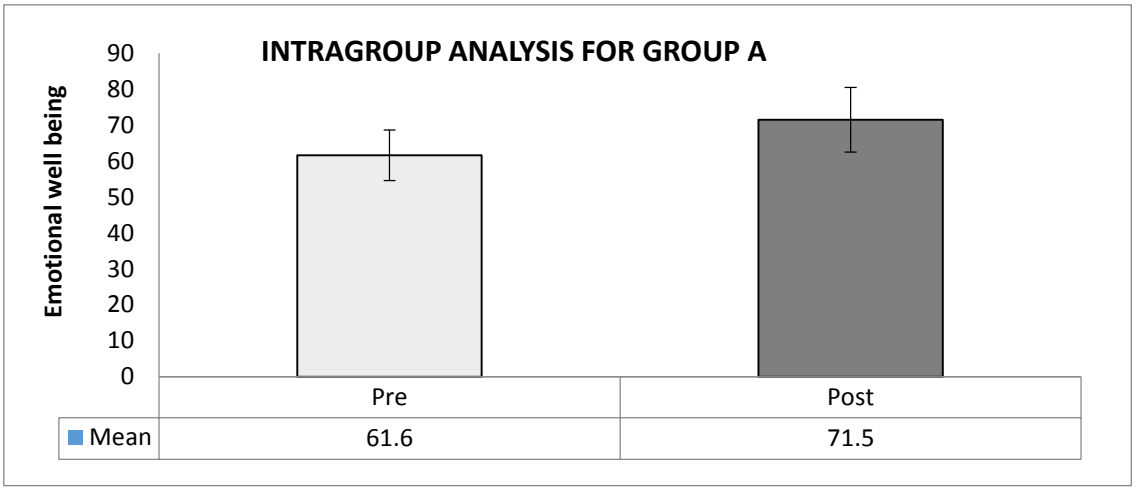
Graph 4.4: Quality of Life (Role of limitation Physical health) within the Group A.



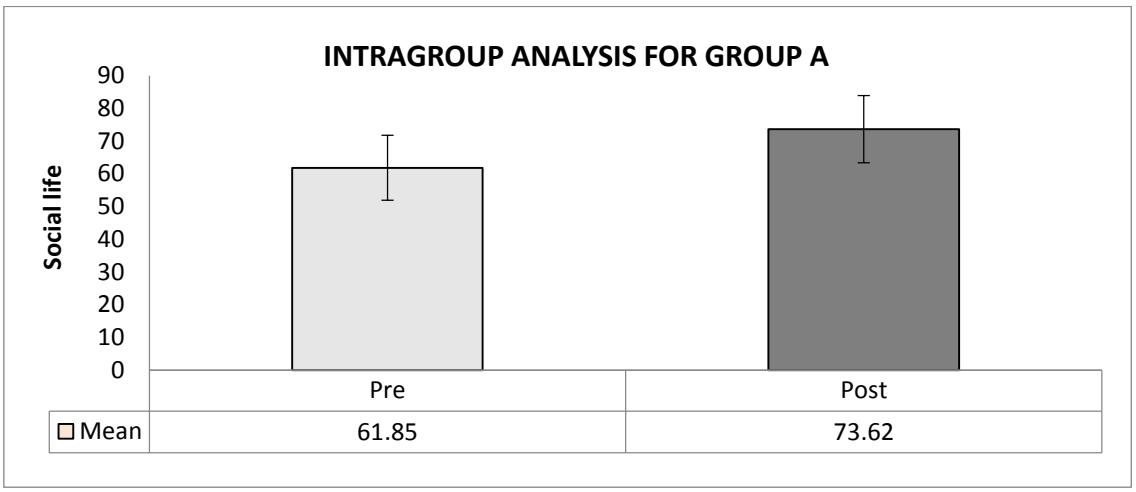
Graph 4.5: Quality of Life (Role of limitation emotional health) within the Group **A.**



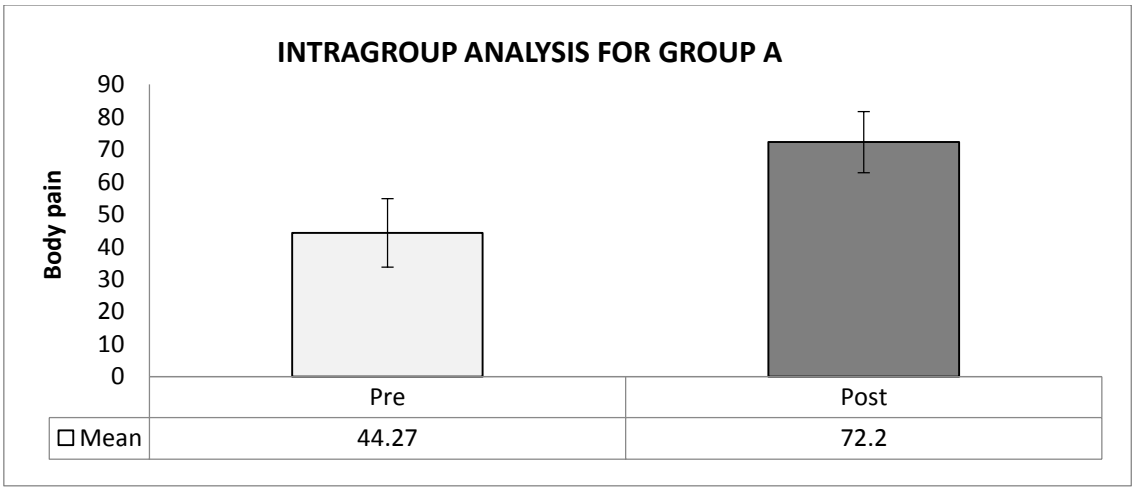
Graph 4.6: Quality of Life (Energy) within the Group A.



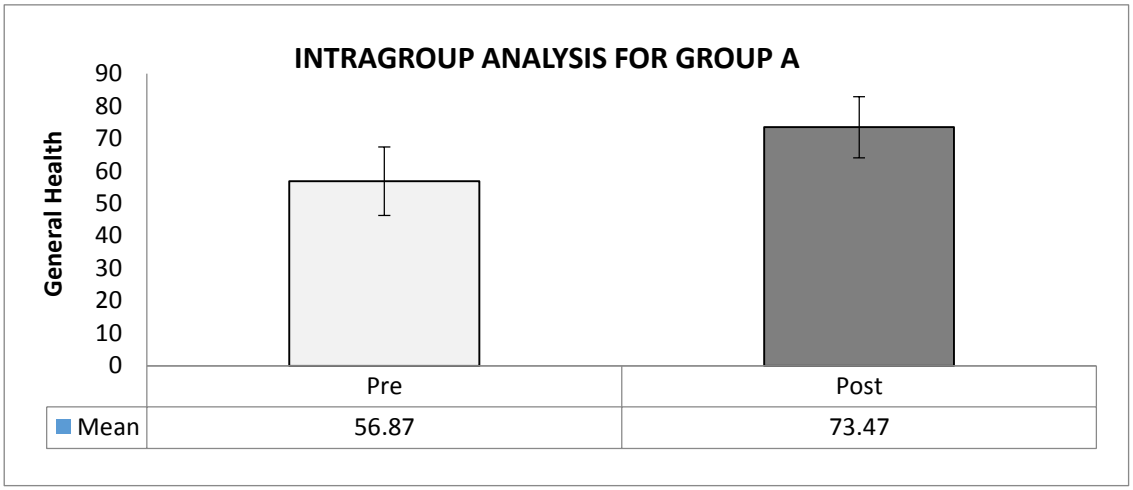
Graph 4.7: Quality of Life (Emotional well being) within the Group A



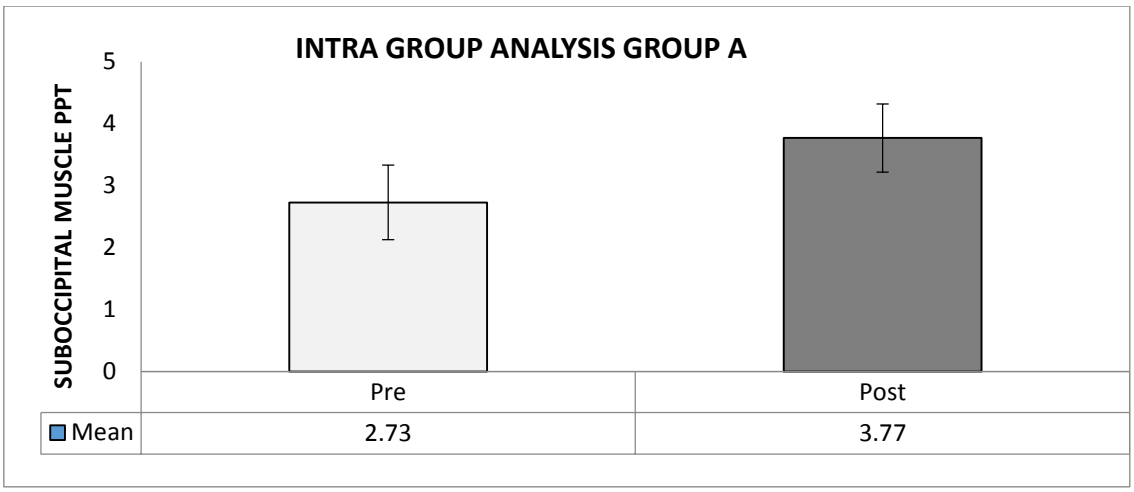
Graph 4.8: Quality of Life (Social life) within the Group A.



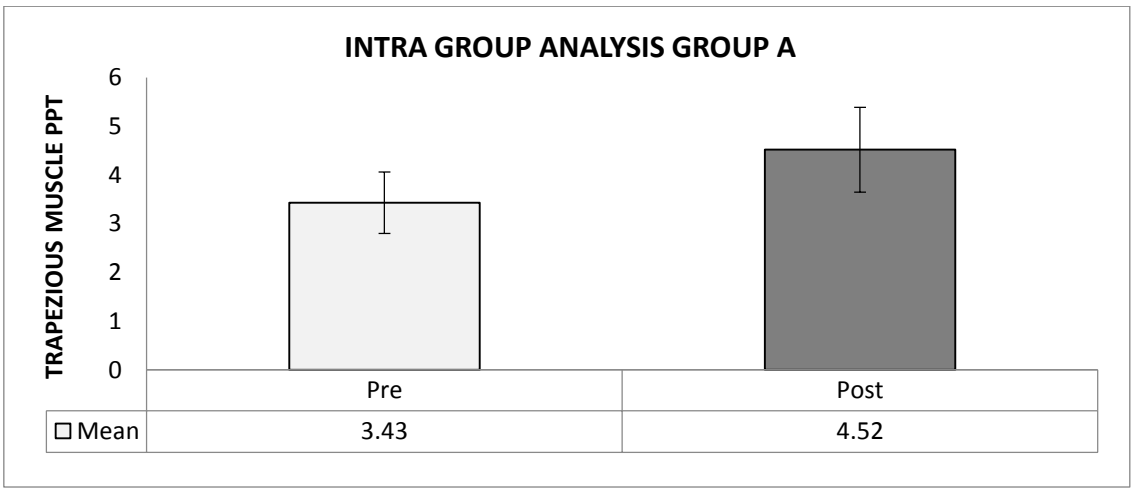
Graph 4.9: Quality of Life (Body pain) within the Group A.



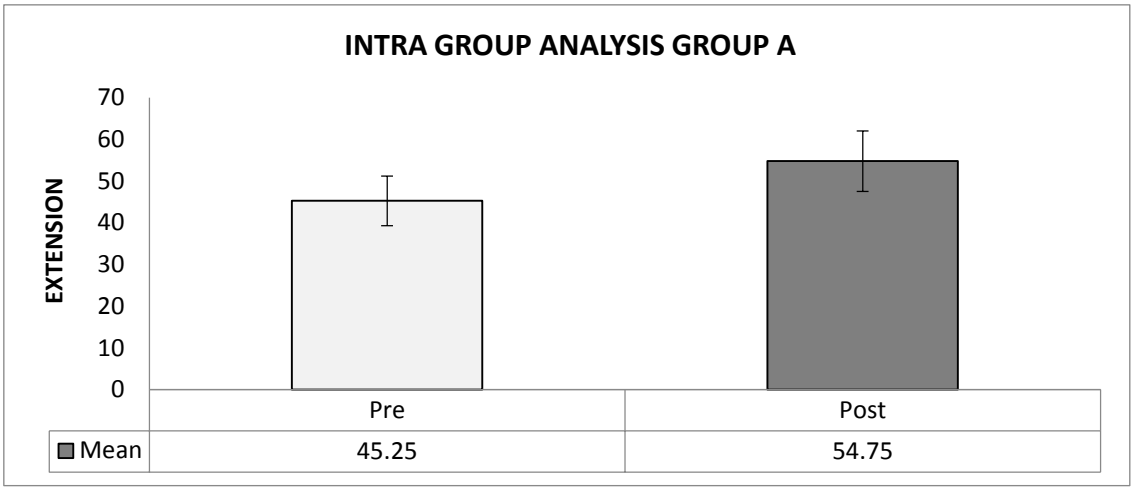
Graph 4.10: Quality of Life (General Health) within the Group A.



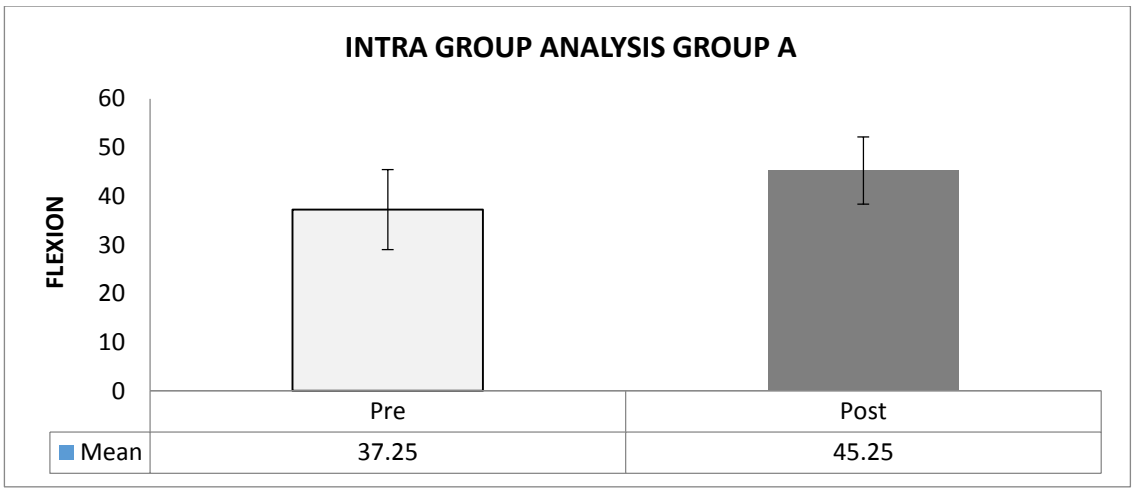
Graph 4.11: Pressure Point Thresholds (PPT) within Group A



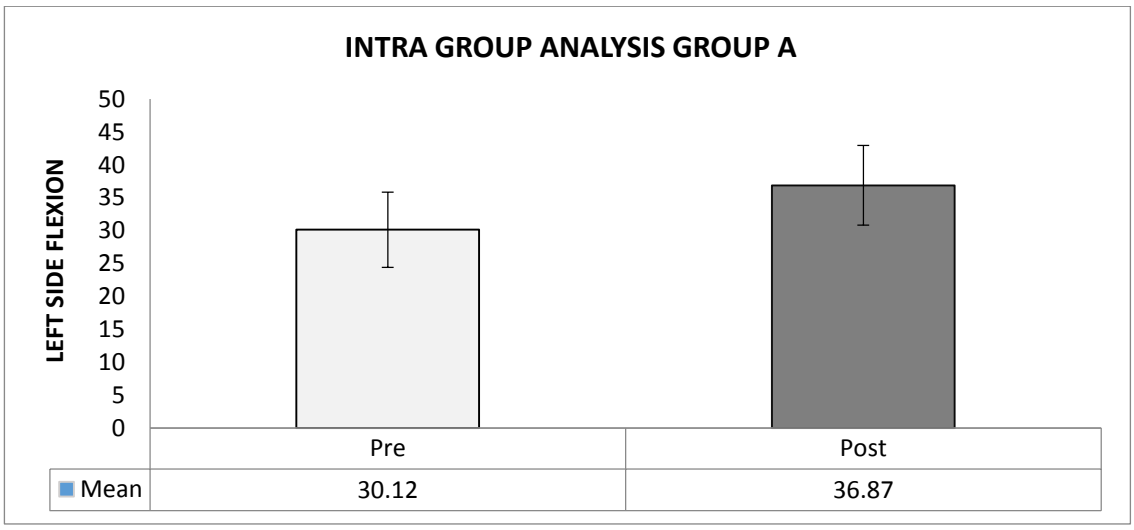
Graph 4.12: Pressure Point Thresholds (PPT) within Group A



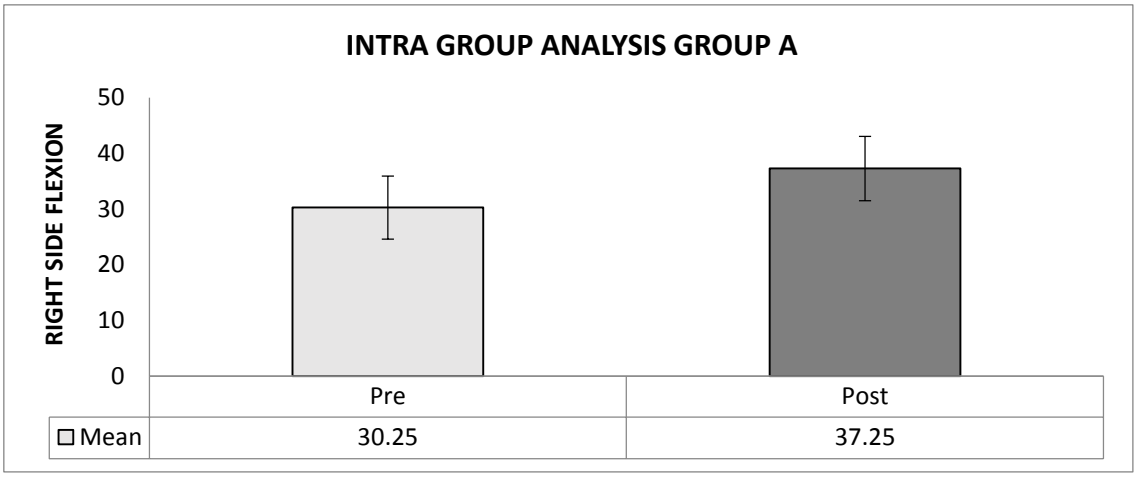
Graph 4.13: Range Of Motion (Extension) within Group A



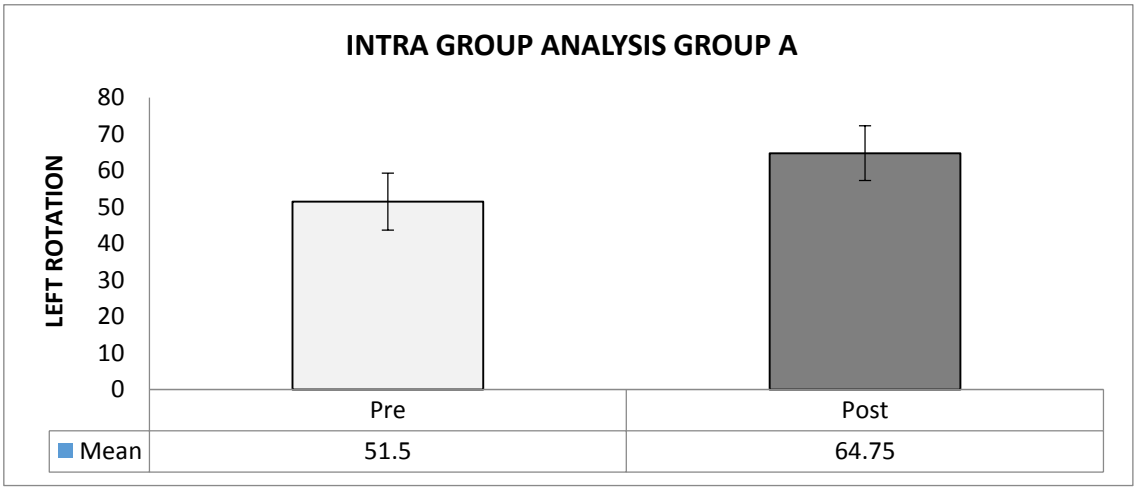
Graph 4.14: Range of Motion (Flexion) within the Group A



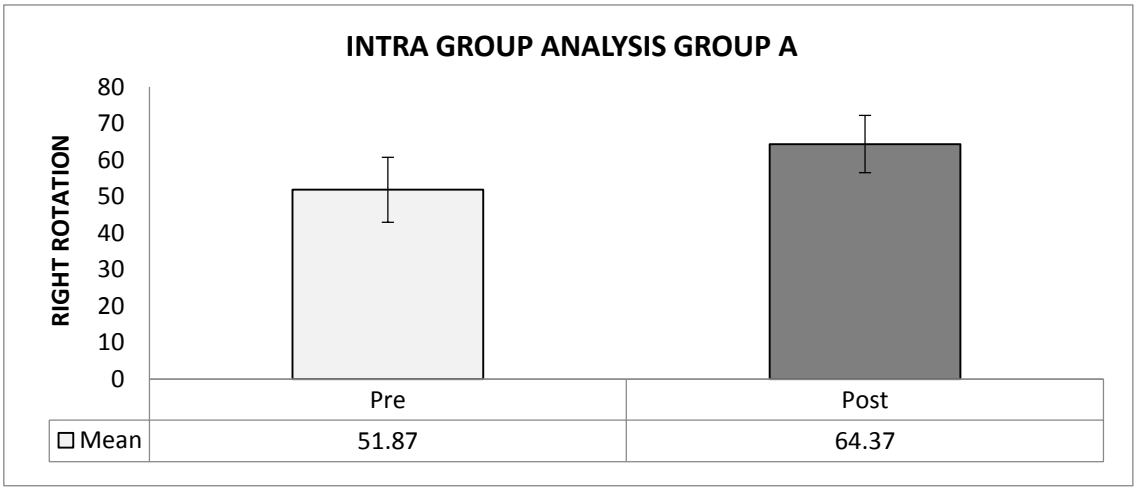
Graph 4.15: Range of Motion (Left flexion) within the Group A



Graph 4.16: Range of Motion (right flexion) within Group A



Graph 4.17: Range of Motion (left rotation) within Group A



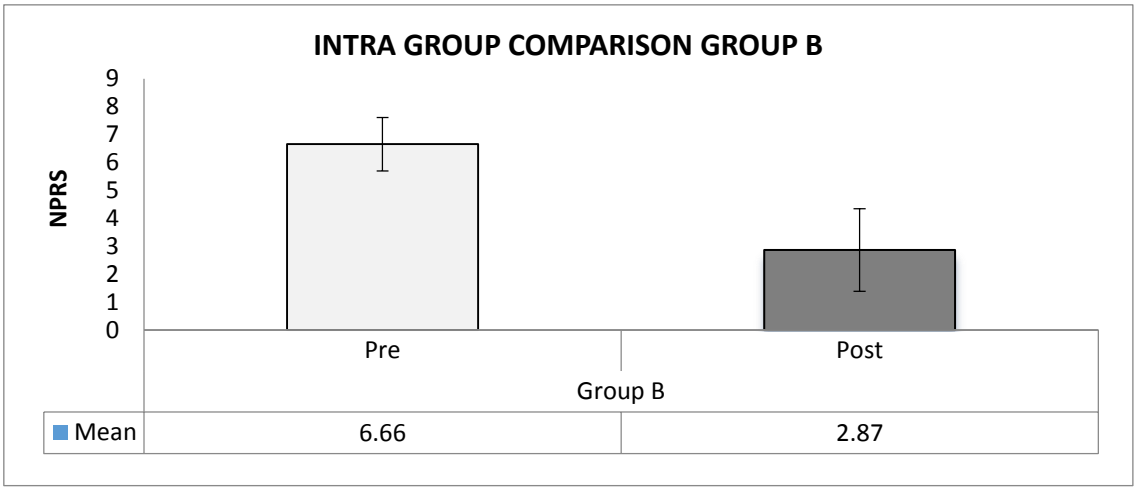
Graph 4.18: Range of Motion (right roatation) within Group A

Table 4.3

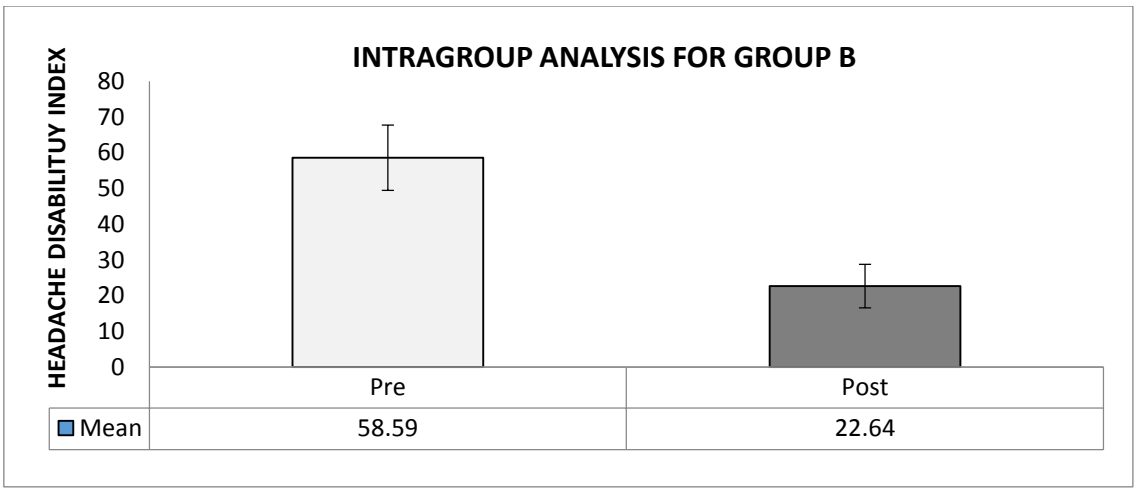
Comparison of pain (NPRS), disability (HDI) and quality of life (QoL) pressure point threshold and cervical range of motion pre and post treatment within Group B

Variables	Mean	Std. Deviation	Std. Error Mean	*p* values
NPRS (Numerical Rating Scale - Pre)	6.65	0.96	0.15	
NPRS (Numerical Rating Scale - Post)	2.86	1.18	0.19	**<0.001**
HDI-Headache Disability index-Pre	58.68	9.12	1.48	
HDI-Headache Disability index - Post	22.63	6.11	0.99	**<0.001**
Physical functioning - Pre	59.86	12.32	2.00	
Physical functioning - Post	74.73	8.45	1.37	**<0.001**
Role of limitation Physical health - Pre	36.84	19.04	3.08	
Role of limitation Physical health-Post	72.36	17.23	2.79	**<0.001**
Role of limitation emotional health-Pre	33.26	24.63	3.99	
Role of limitation emotional health- Post	70.28	23.05	3.73	**<0.001**
Energy - Pre	51.71	8.24	1.33	
Energy - Post	70.39	7.65	1.24	**<0.001**
Emotional well being - Pre	63.05	6.47	1.04	
Emotional well being - Post	71.78	8.90	1.44	**<0.001**
Social life - Pre	61.50	9.89	1.60	
Social life - post	73.76	11.64	1.88	**<0.001**

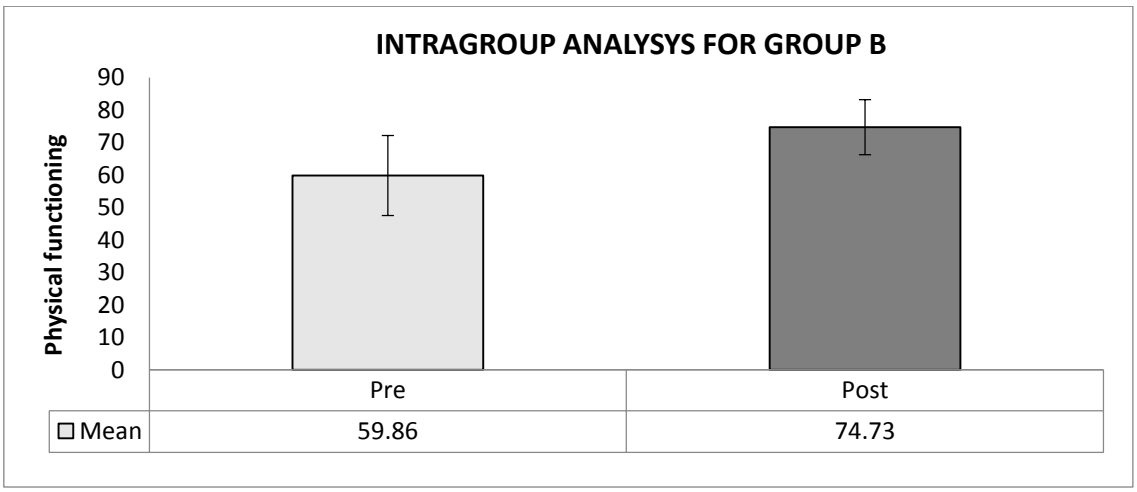
Variables	Mean	Std. Deviation	Std. Error Mean	*p* values
Body pain - Pre	44.31	8.89	1.44	
Body pain - Post	73.02	9.58	1.55	**<0.001**
General Health - Pre	54.86	7.75	1.25	
General Health - Post	74.47	9.35	1.51	**<0.001**
Sub occipital area Pressure Point Threshold- Pre	2.57	.603	0.09	
Sub occipital area Pressure Point Threshold - Post	3.00	0.75	0.12	**<0.001**
Trapezius muscle Pressure Point Threshold- Pre	3.40	0.69	0.11	
Trapezius muscle Pressure Point Threshold- Post	3.52	0.74	0.12	**<0.001**
Extension - Pre	44.73	6.96	1.13	
Extension - Post	53.94	5.08	0.82	**<0.001**
Flexion - Pre	35.52	7.51	1.21	
Flexion - Post	43.55	6.76	1.09	**<0.001**
Side of flexion (Left) - Pre	30.39	5.85	0.95	
Side of flexion (Left) - Post	37.36	5.29	0.85	**<0.001**
Side of flexion (Right) - Pre	29.07	6.24	1.01	
Side of flexion (Right) - Post	36.44	6.03	0.97	**<0.001**
Rotation (Left) - Pre	53.55	10.06	1.63	
Rotation (Left) - Post	66.18	9.89	1.60	**<0.001**
Rotation (Right) - Pre	52.10	9.90	1.60	
Rotation (Right) - Post	65.39	9.18	1.48	**<0.001**



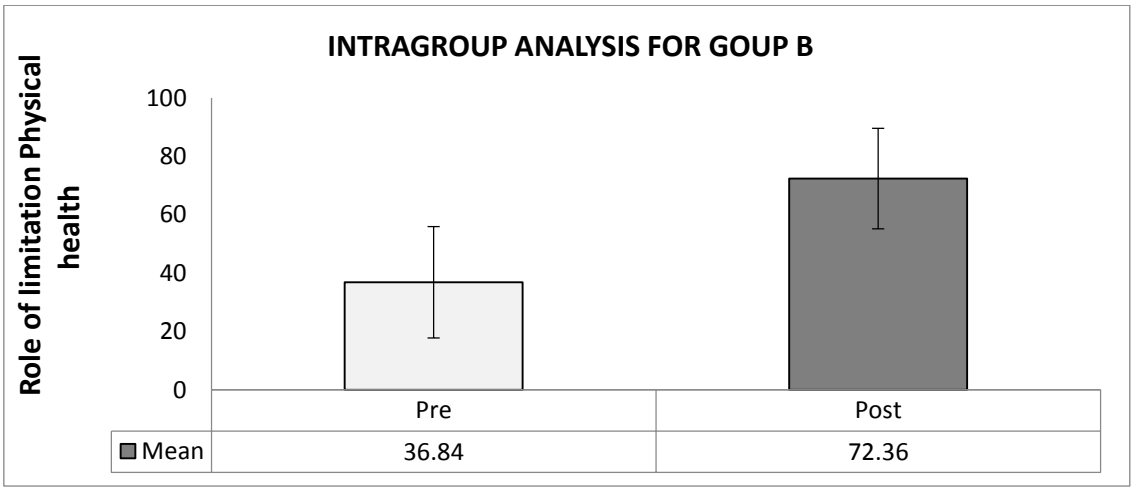
Graph 4.19: Pain (NPRS score) within the Group B



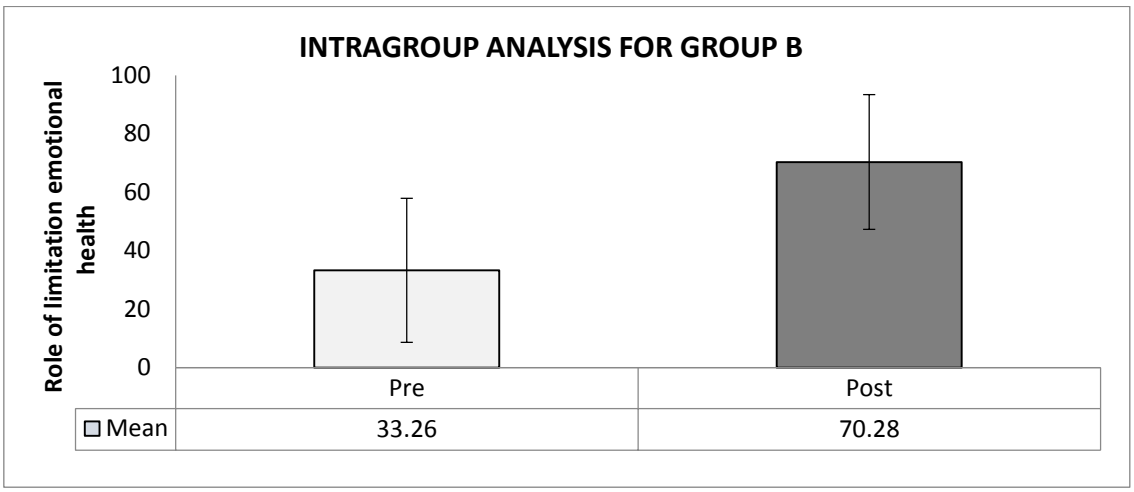
Graph 4.20: Headache Disability Index (HDI) within the Group B



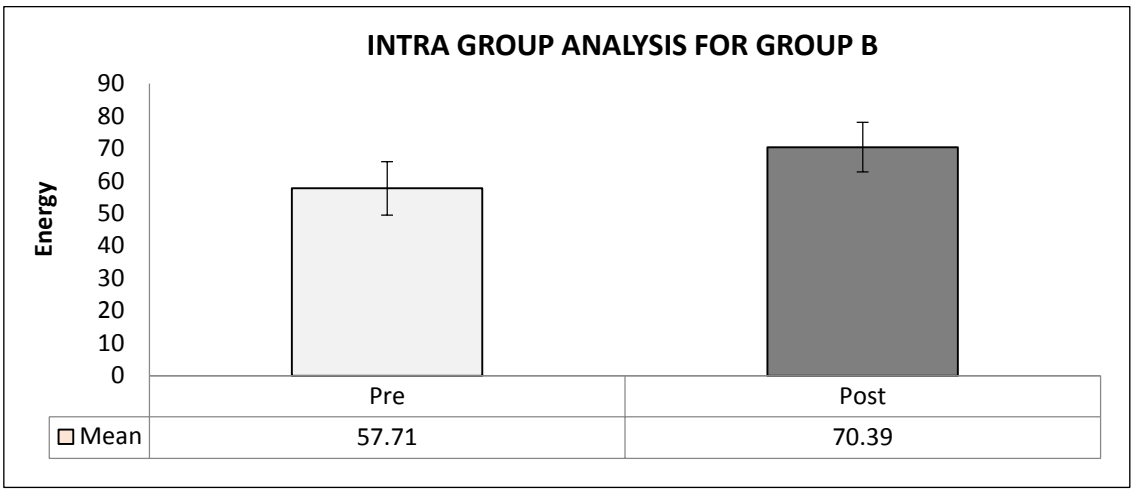
Graph 4.21: Quality of Life (Physical Functioning) within the Group B.



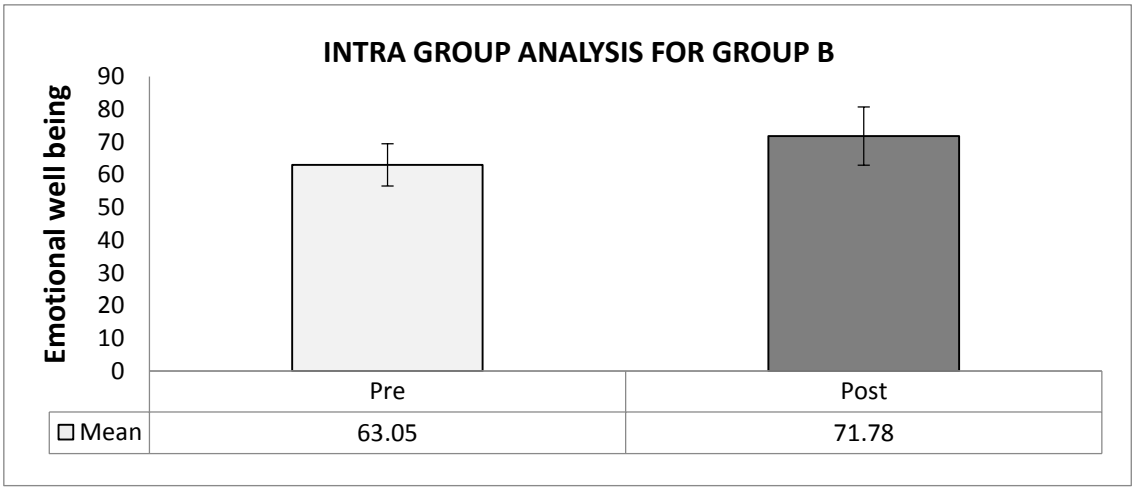
Graph 4.22: Quality of Life (Role of limitation physical health) within the Group B.



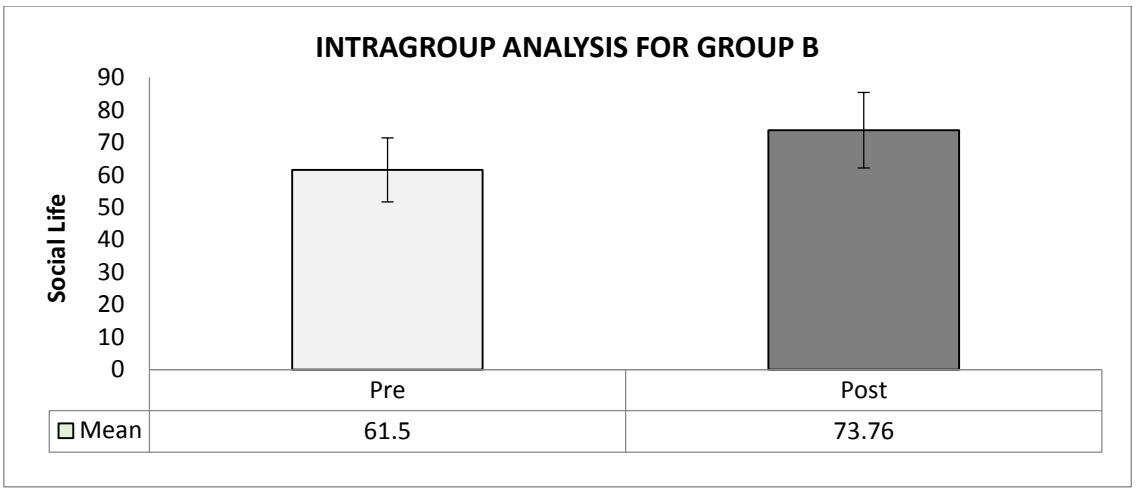
Graph 4.23: Quality of Life (Role of limitation emotional health) within the Group B



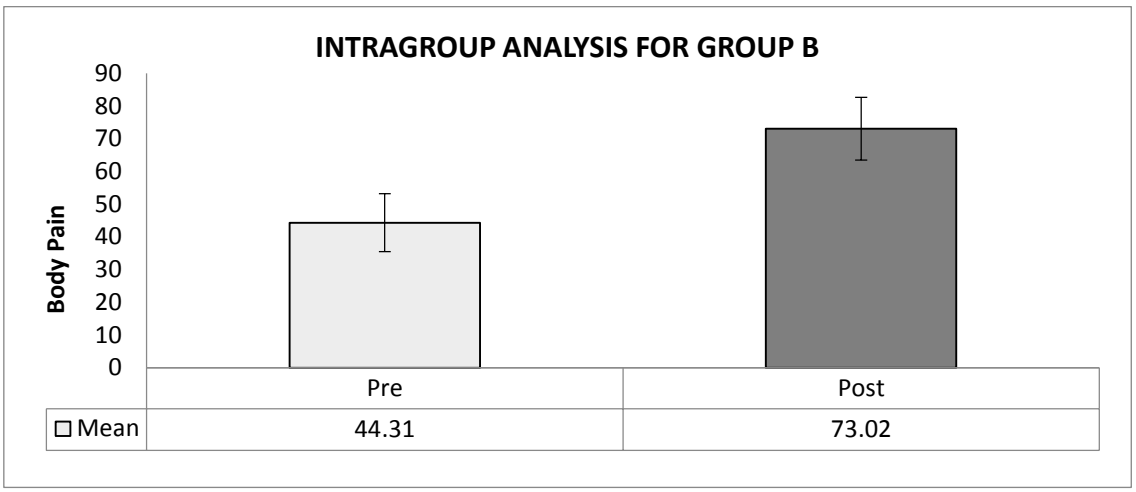
Graph 4.24: Quality of Life (Energy) within the Group B.



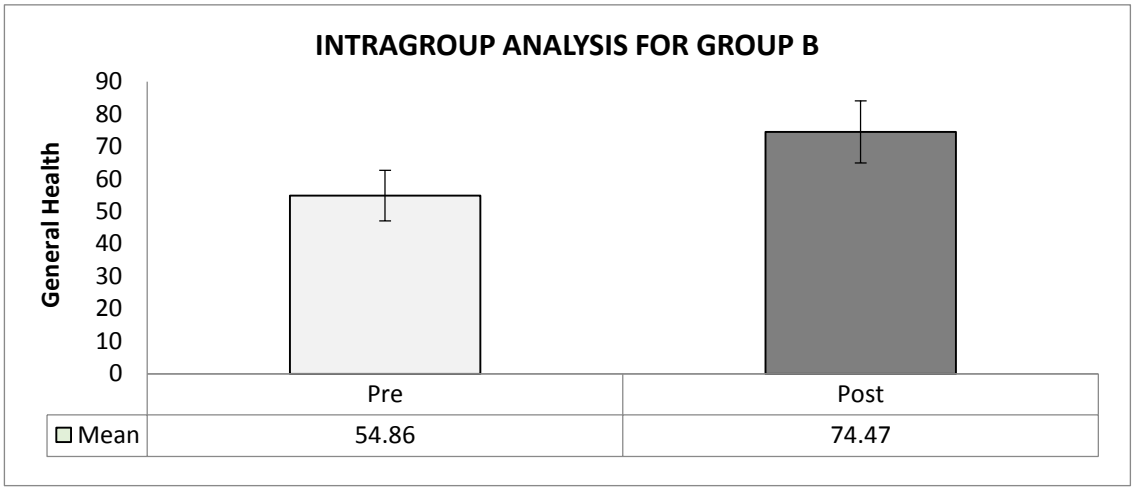
Graph 4.25: Quality of Life (Emotional well being) within the Group B



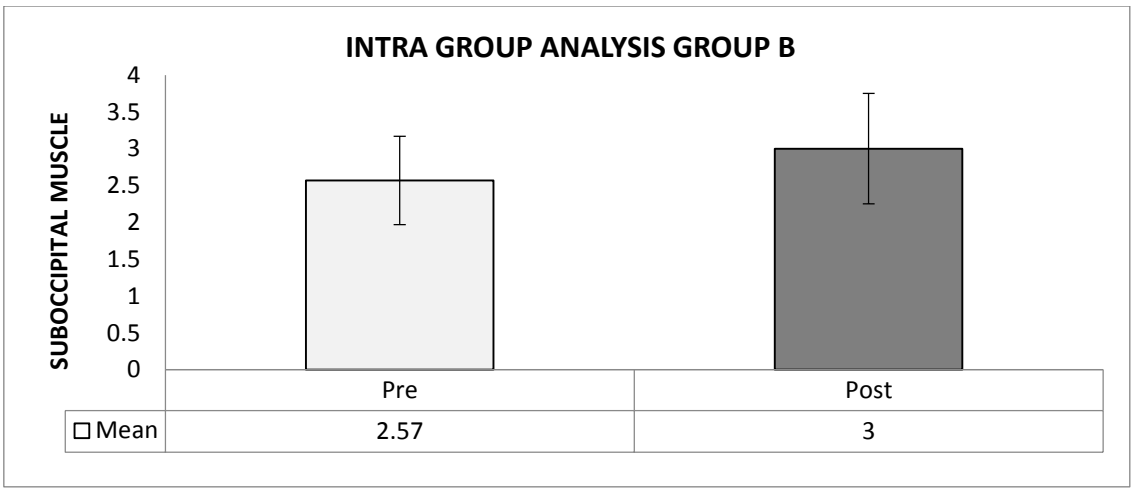
Graph 4.26: Quality of Life (Social life) within the Group B



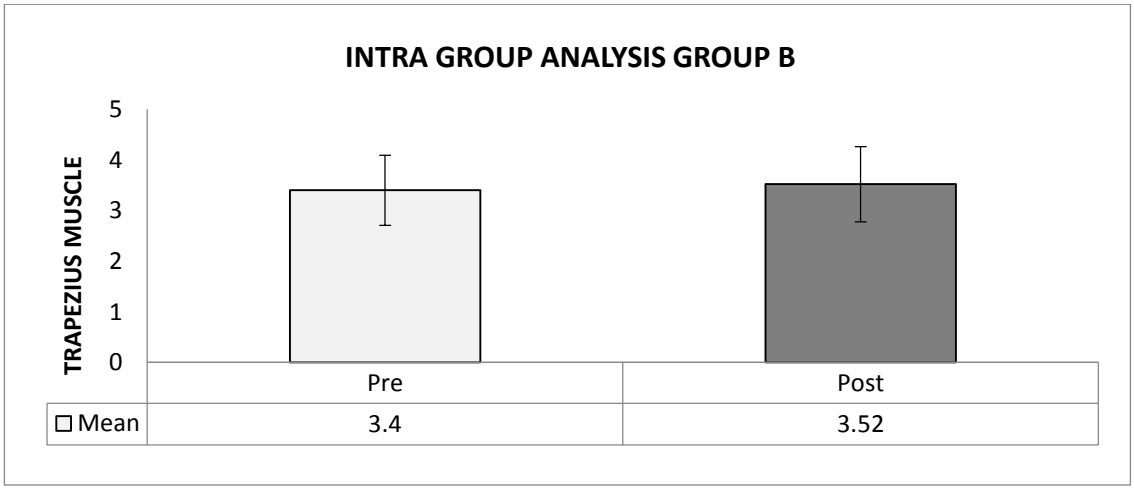
Graph 4.27: Quality of Life (Body pain) within the Group B.



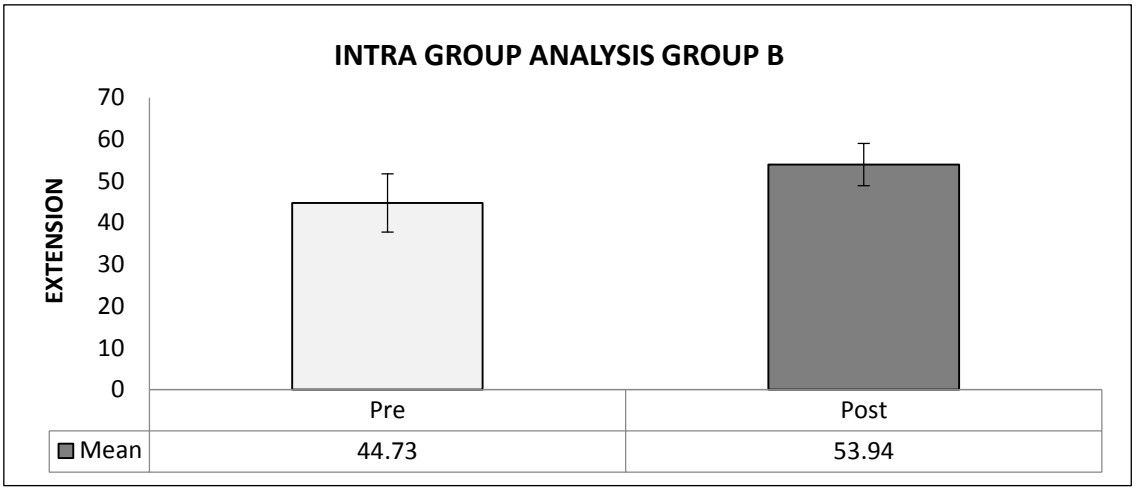
Graph 4.28: Quality of Life (General health) within the Group B.



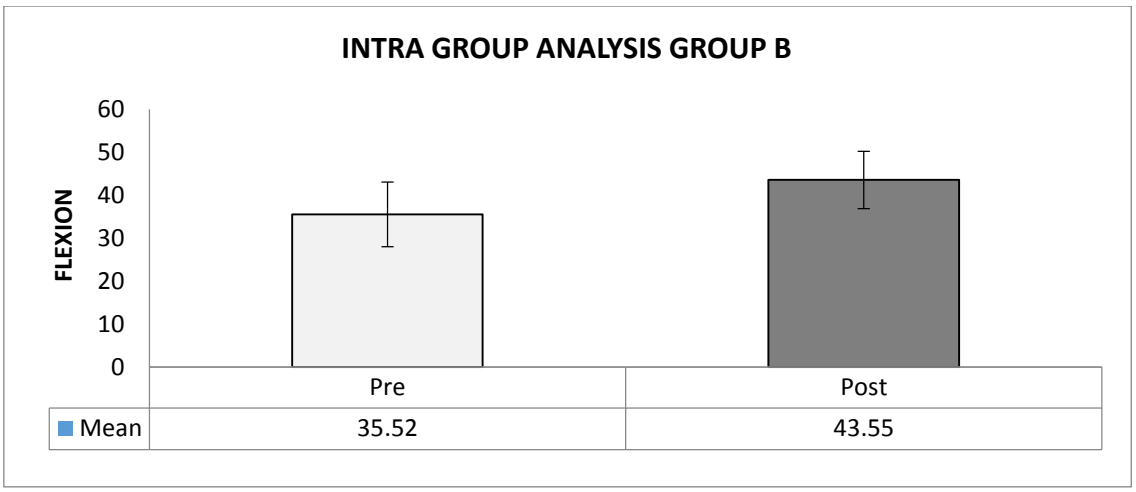
Graph 4.29: Sub-occipital muscle Pressure Point Threshold within Group B



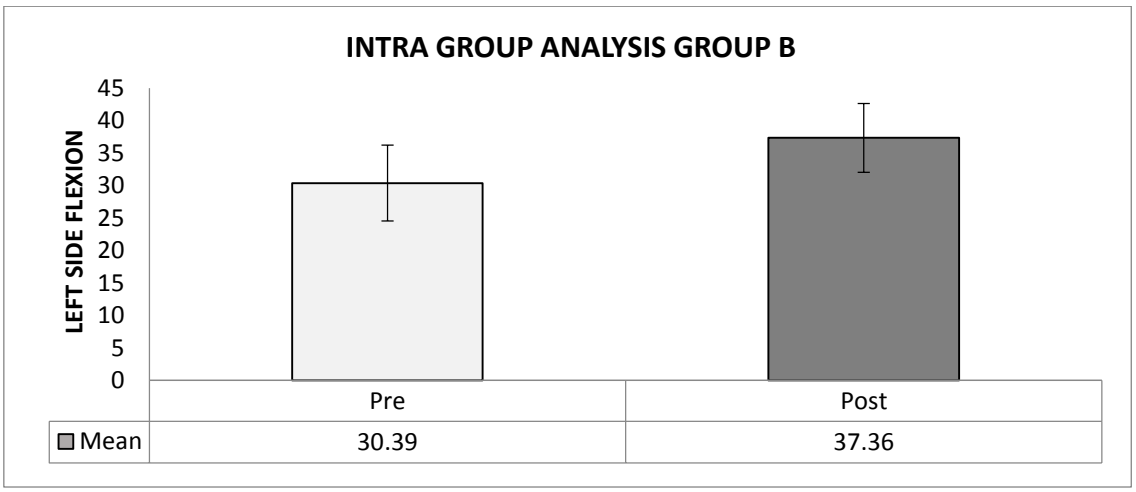
Graph 4.30: Trapezius muscle Pressure Point Threshold within Group B



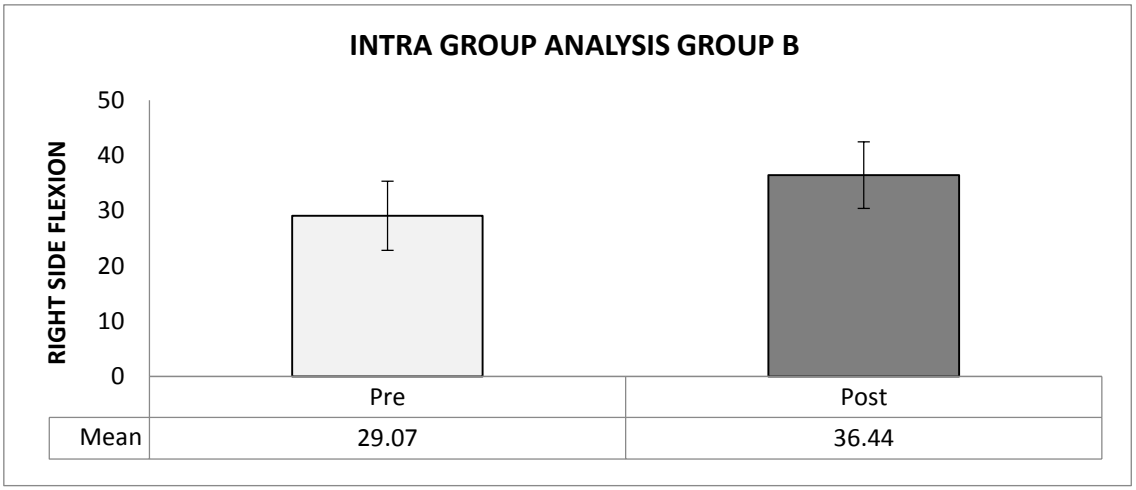
Graph 4.31: Range of Motion (extension) within Group B



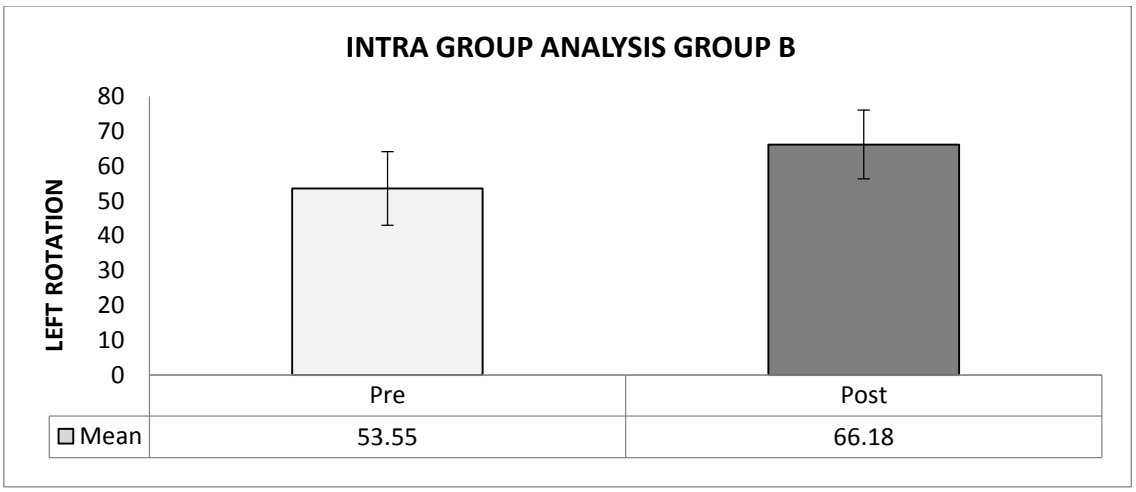
Graph 4.32: Range of Motion(flexion) within Group B



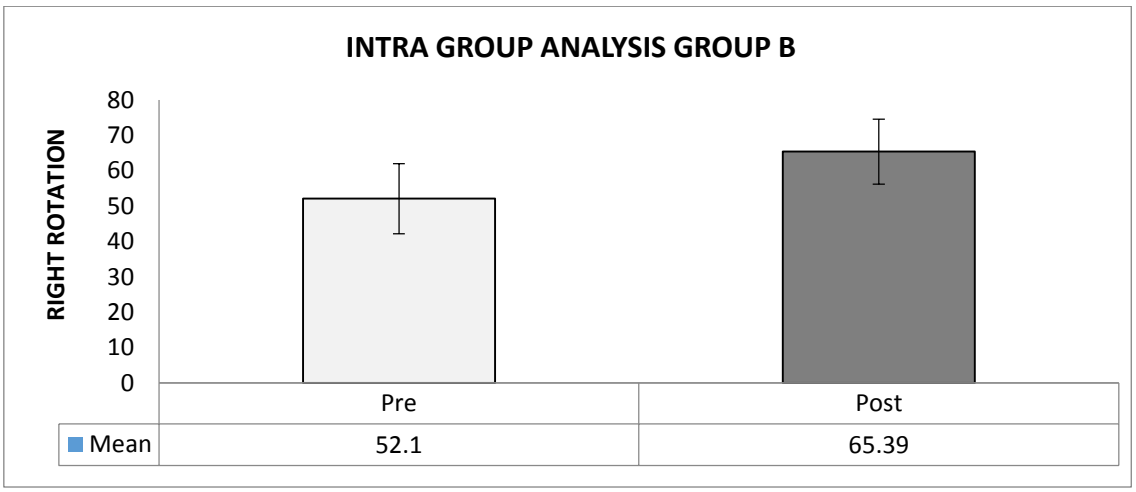
Graph 4.33: Range of Motion (left flexion) within Group B



Graph 4.34: Range of Motion (right side flexion) within Group B



Graph 4.35: Range of Motion (left rotation) within Group B



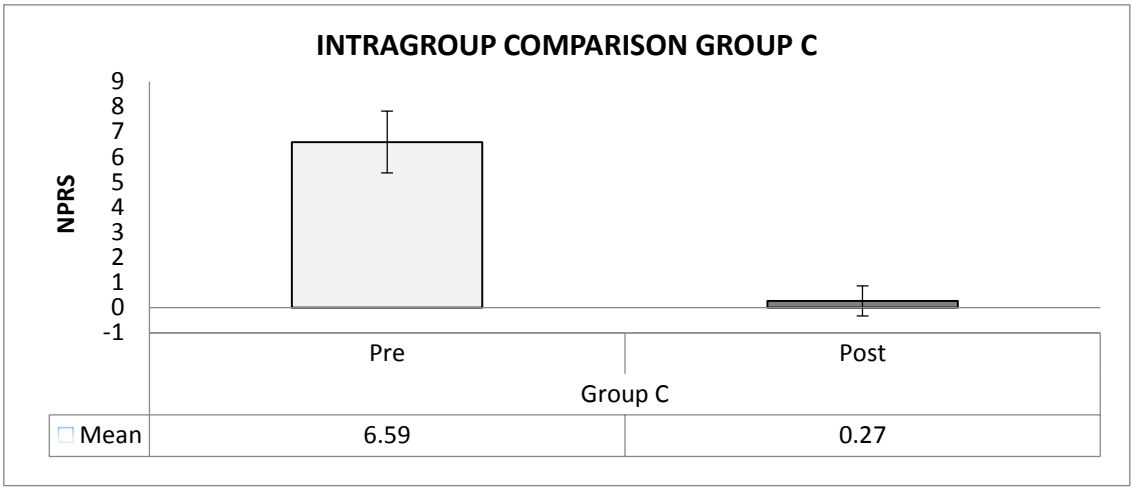
Graph 4.36: Range of Motion (right rotation) within Group B

Table 4.4

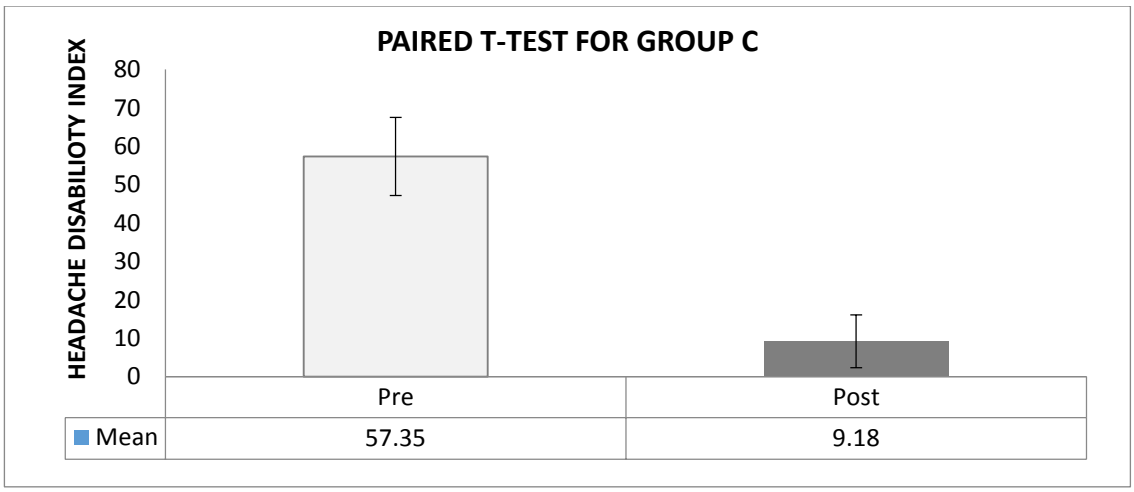
Comparison of pain (NPRS), disability (HDI) and quality of life (QoL), Pressure point threshold and cervical range of motion pre and post treatment within Group C

Variables	Mean	Std. Deviation	Std. Error Mean	*p* values
NPRS (Numerical Rating Scale) - Pre	6.59	1.23	0.20	
NPRS (Numerical Rating Scale) - Post	0.16	0.37	0.06	<0.001
HDI-Headache Disability index– Pre	57.35	10.18	2.05	
HDI-Headache Disability index – Post	9.18	6.88	1.13	<0.001
Physical functioning – Pre	58.91	9.86	1.62	
Physical functioning - Post	87.83	6.82	1.12	<0.001
Role of limitation Physical health – Pre	35.81	16.18	2.66	
Role of limitation Physical health – Post	86.48	13.93	2.29	<0.001
Role of limitation emotional health – Pre	32.37	25.56	4.20	
Role of limitation emotional health–Post	83.94	16.72	2.74	<0.001
Energy – Pre	50.27	8.97	1.47	
Energy – Post	84.45	8.56	1.40	<0.001
Emotional well being – Pre	60.97	7.95	1.30	
Emotional well being - Post	83.62	5.88	0.96	<0.001
Social life – Pre	60.89	8.23	1.35	
Social life – post	83.94	10.56	1.73	<0.001

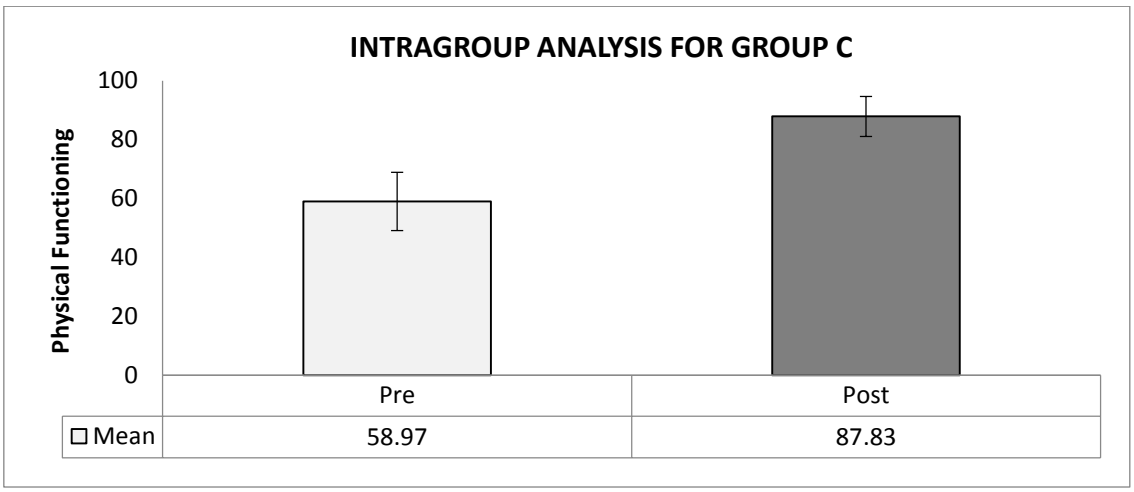
Variables	Mean	Std. Deviation	Std. Error Mean	*p* values
Body pain – Pre	43.59	12.06	1.98	
Body pain – Post	83.32	12.58	2.06	<0.001
General Health – Pre	55.81	8.54	1.40	
General Health – Post	86.62	9.72	1.59	<0.001
Sub occipital area Pressure Point Threshold- Pre	2.57	0.69	0.11	
Sub occipital area Pressure Point Threshold – Post	3.76	0.71	0.11	<0.001
Trapezius muscle Pressure Point Threshold- Pre	3.38	0.64	0.10	
Trapezius muscle Pressure Point Threshold- Post	4.93	1.44	.236	<0.001
Extension – Pre	45.40	7.67	1.26	
Extension – Post	62.56	6.52	1.07	<0.001
Flexion – Pre	38.37	7.91	1.30	
Flexion – Post	50.40	4.62	0.75	<0.001
Lateral flexion (Left) – Pre	31.08	5.15	0.84	
Lateral flexion (Left) – Post	43.37	2.37	0.39	<0.001
Lateral flexion (Right) - Pre	29.86	6.71	1.10	
Lateral flexion (Right) - Post	43.51	3.88	.63	<0.001
Rotation (Left) – Pre	52.43	8.70	1.43	
Rotation (Left) – Post	74.32	5.91	0.97	<0.001
Rotation (Right) – Pre	52.70	9.39	1.54	
Rotation (Right) – Post	75.40	5.57	0.91	<0.001



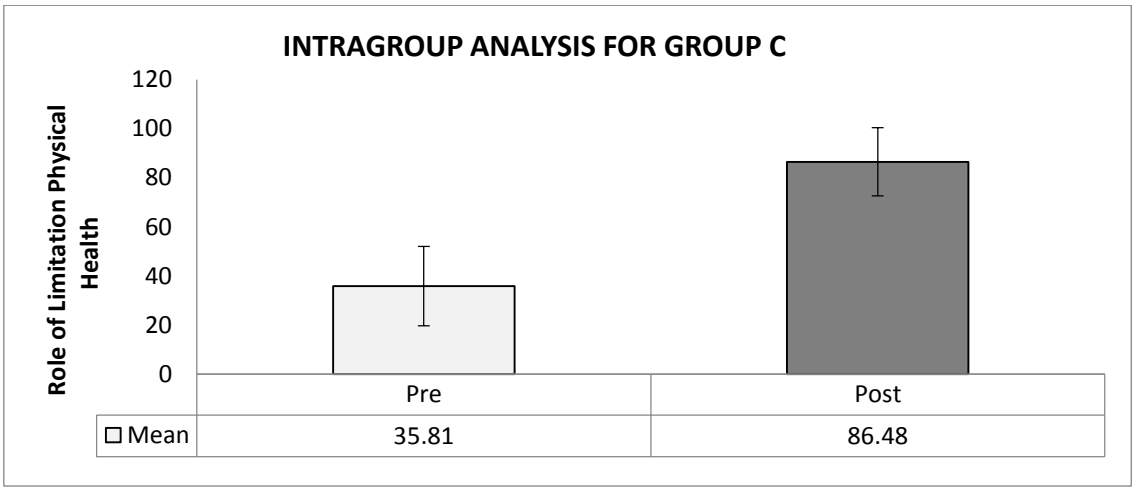
Graph 4.37: Pain (NPRS score) within the Group C.



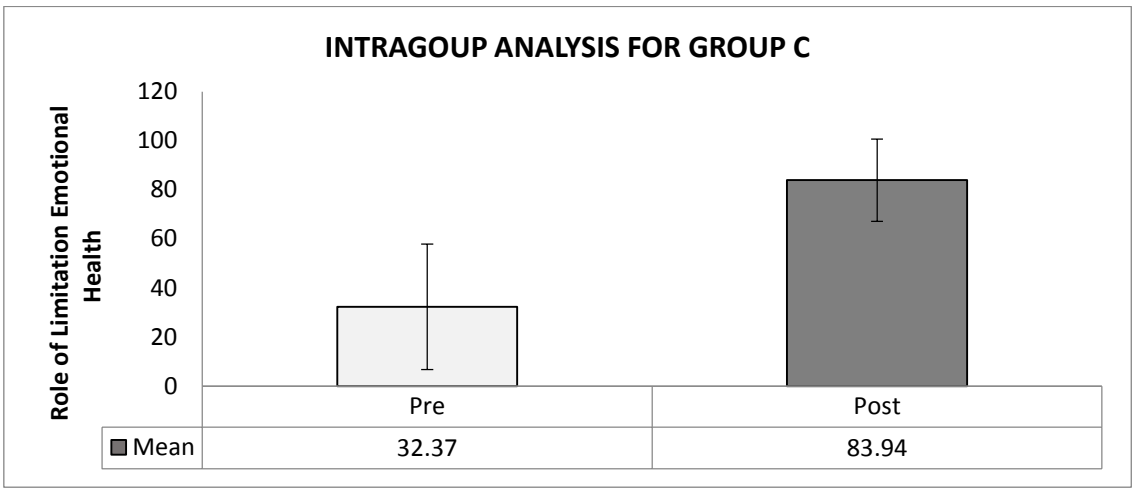
Graph: 4.38: Headache Disability Index (HDI) within the Group C.



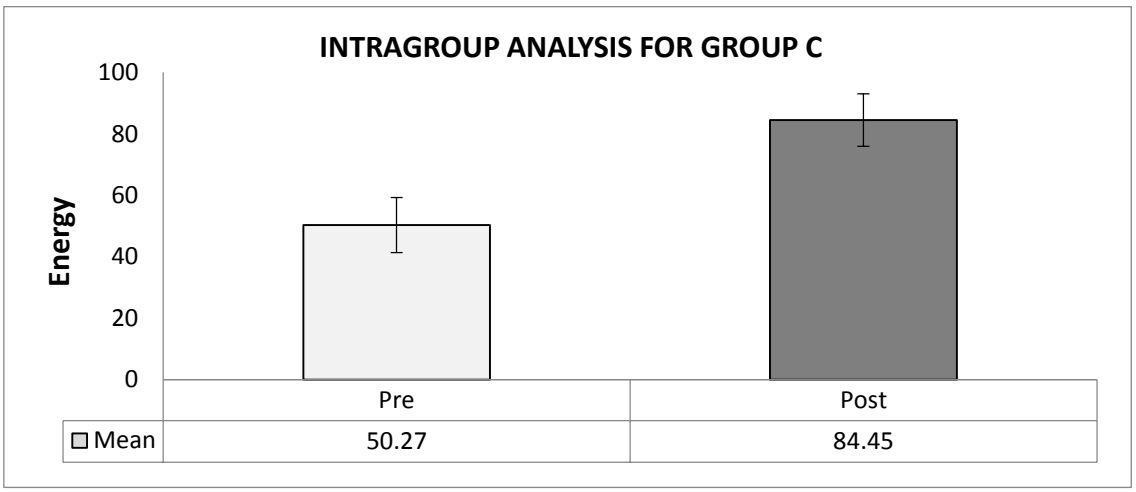
Graph 4.39: Quality of Life (Physical Fuctioning) within the Group C.



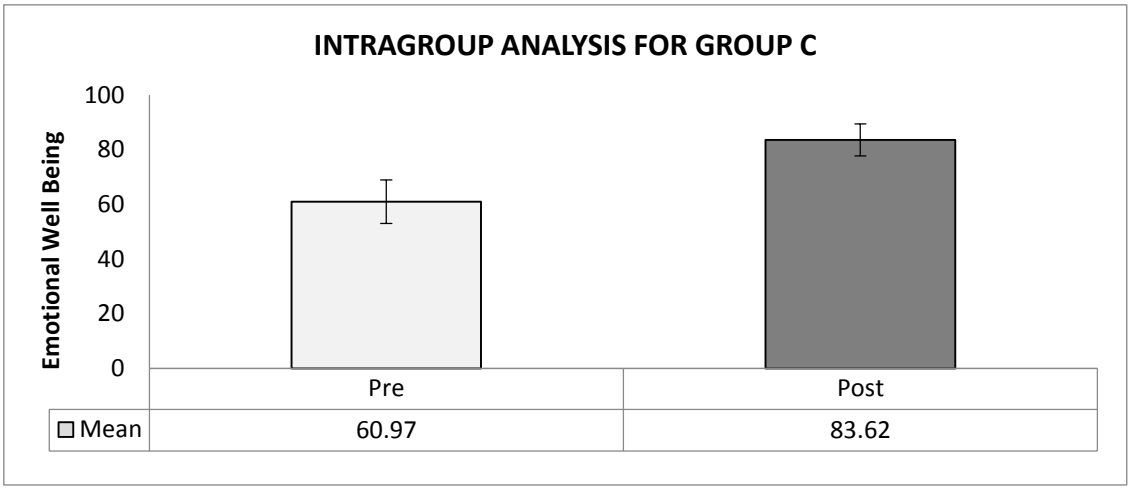
Graph 4.40: Quality of Life (Role of Limitation Physical Health) within the Group C.



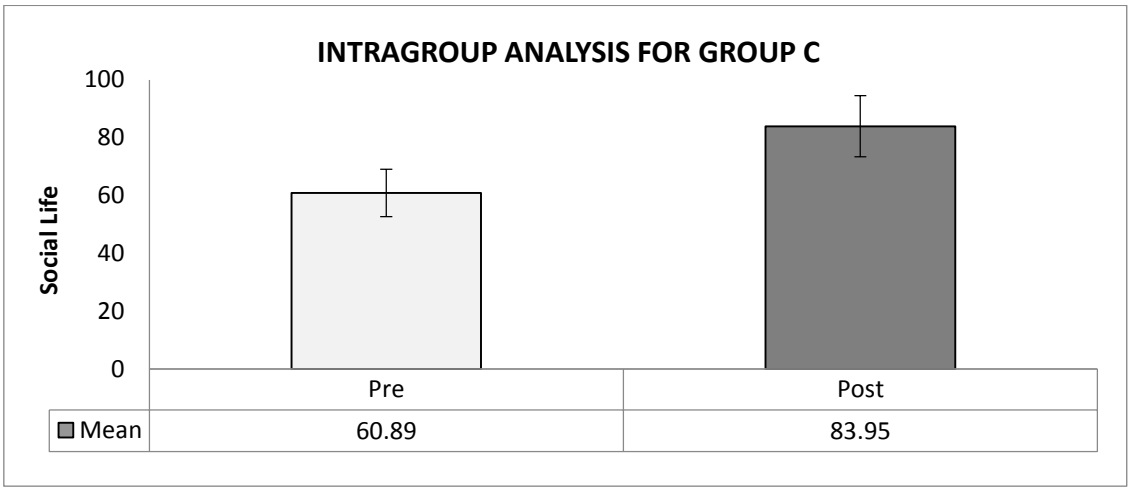
Graph 4.41: Quality of Life (Role of Limitation Emotional Health) within the Group C.



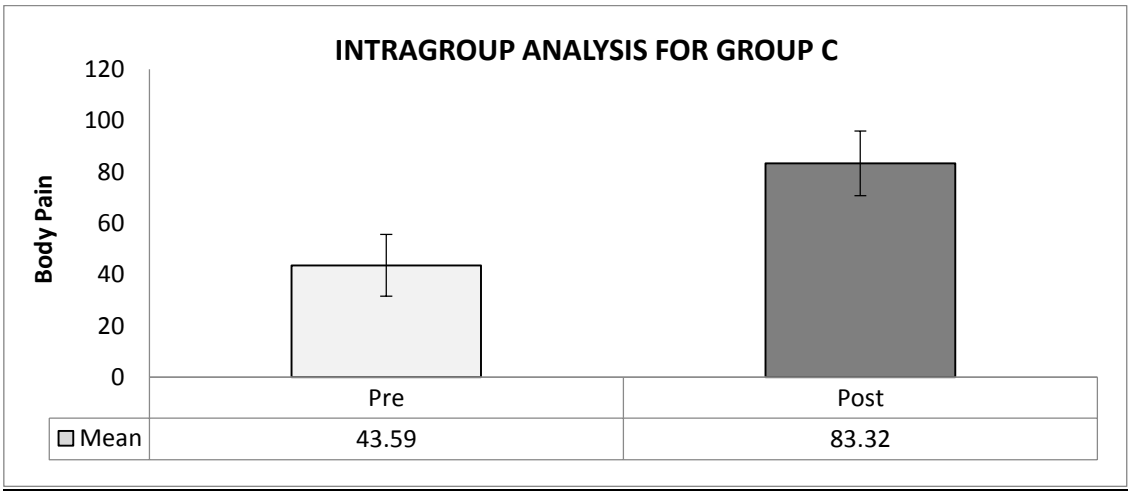
Graph 4.42: Quality of Life (Energy) within the Group C.



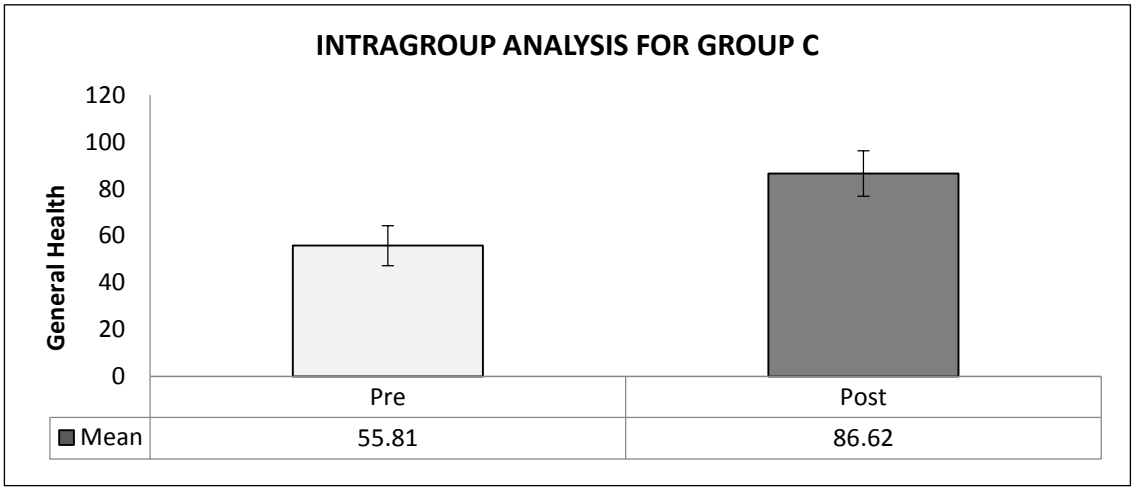
Graph 4.43: Quality of Life (Emotional well being) within the Group C.



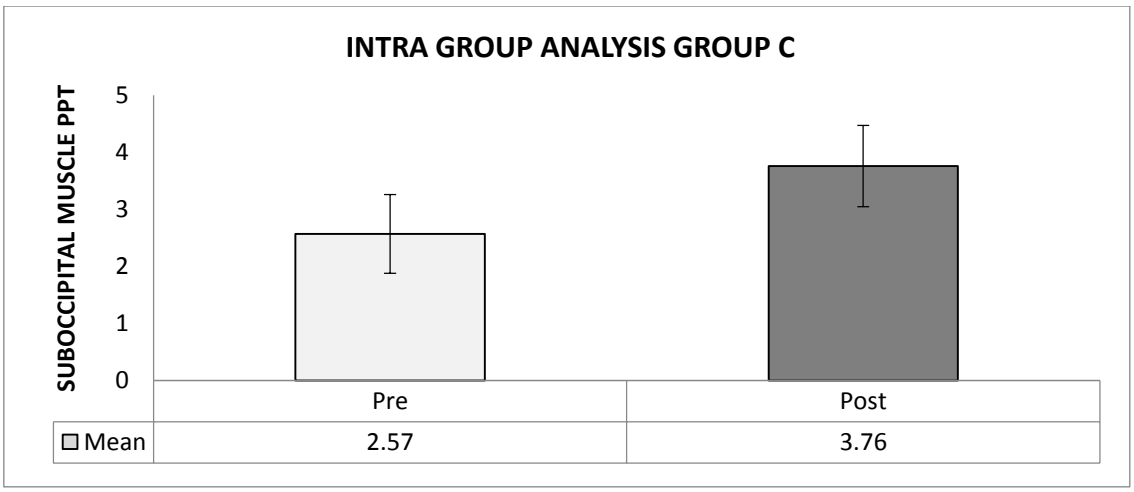
Graph 4.44: Quality of Life (Social life) within the Group C.



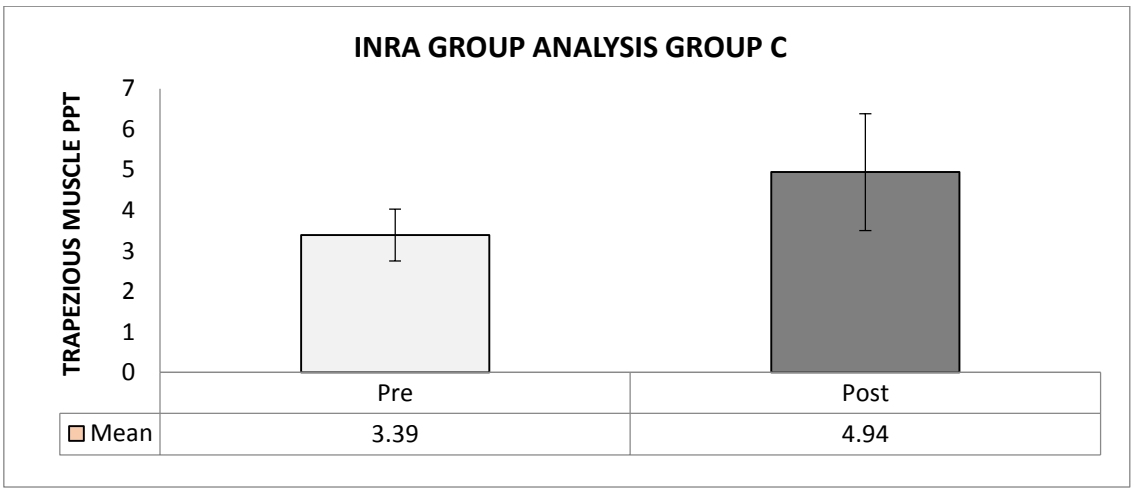
Graph 4.45: Quality of Life (Body Pain) within the Group C.



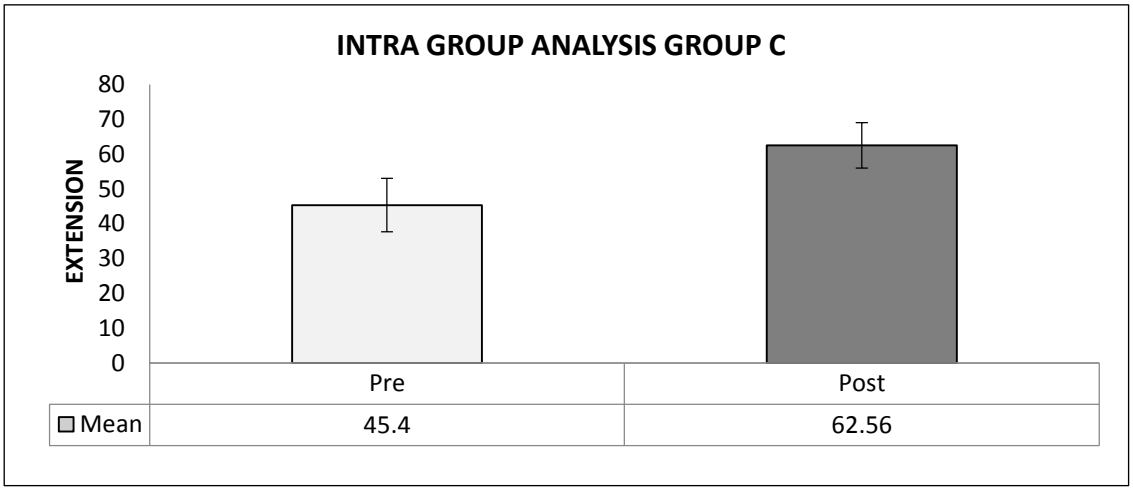
Graph 4.46: Quality of Life (General Health) within the Group C.



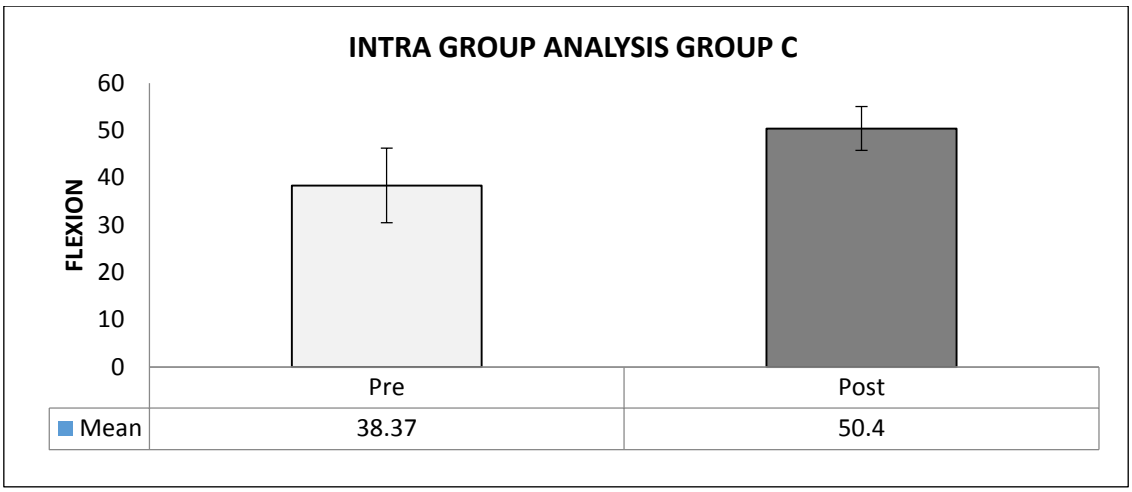
Graph 4.47: Sub-occipital muscle Pressure Point Threshold within Group C



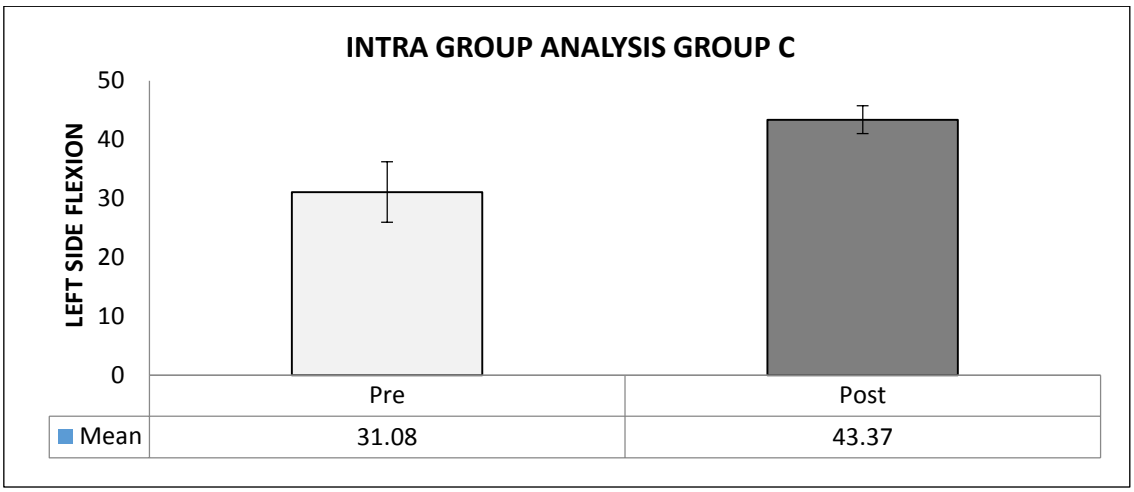
Graph 4.48: Trapezius muscle Pressure Point Threshold within Group C



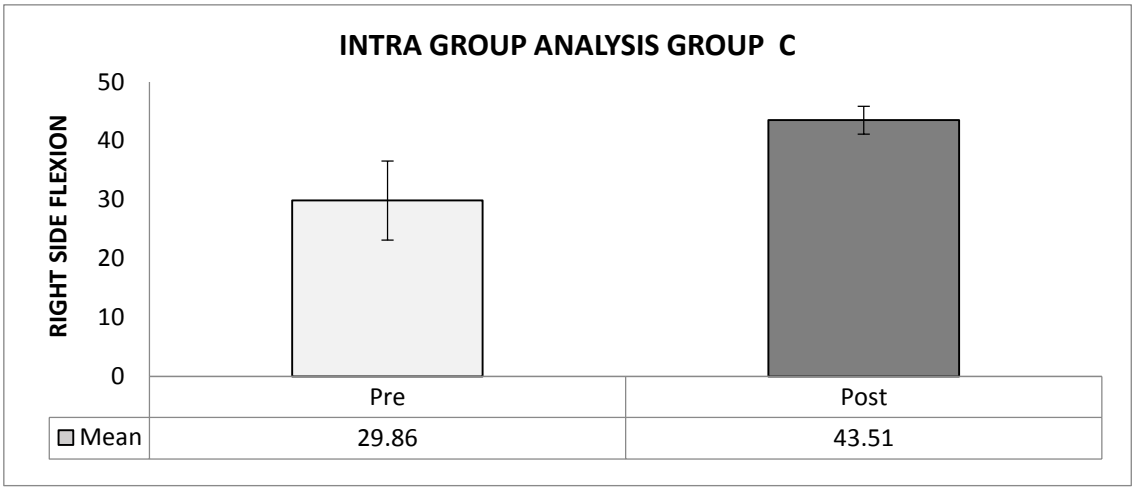
Graph 4.49: Range of Motion (Extension) within Group C



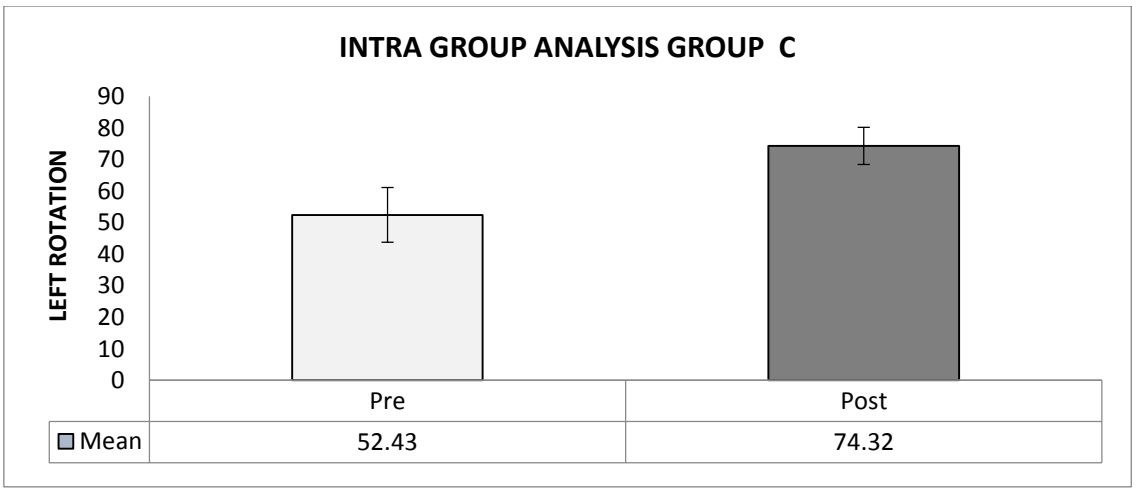
Graph 4.50: Range of Motion (flexion) within Group C



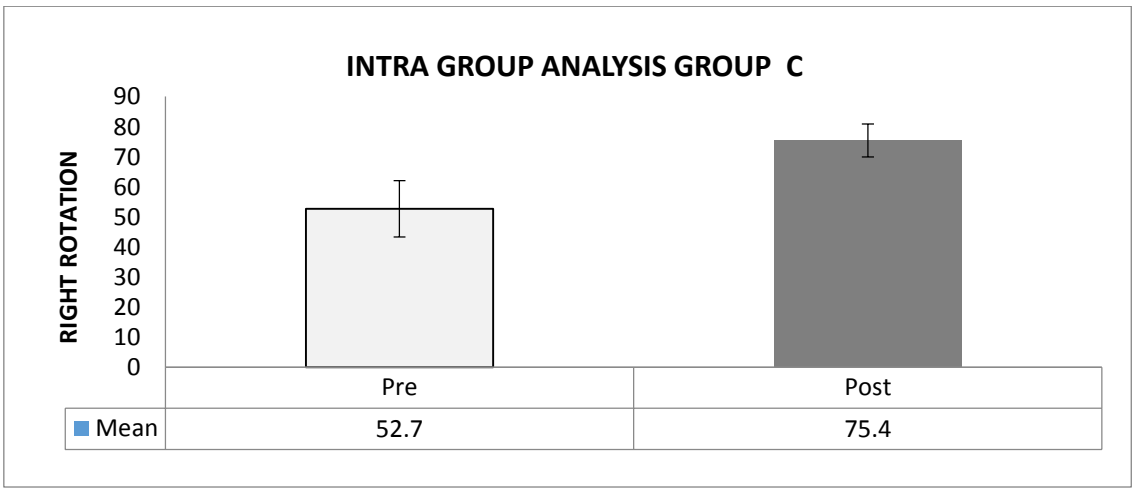
Graph 4.51: Range of Motion (left flexion) within Group C



Graph 4.52: Range of Motion (right flexion) within Group C



Graph 4.53: Range of Motion (left rotation) within Group C



Graph 4.54: Range of Motion (right rotation) within Group C

Table 4.5

Post-hoc analysis for pain (NPRS SCORE) between groups

Variables	Group A	Group B	Group C	*p*-value
	Mean ± 95% CI	Mean ± 95% CI	Mean ± 95% CI	
Pain (NPRS)	0.72±0.32	2.87±2.37	0.27±.18	.005(A-B) .001(B-C) .043(A-C)

Table 4.6

Post-hoc analysis for HDI score between groups

Variables	Group A	Group B	Group C	*p*-value
	Mean ± 95% CI	Mean ± 95% CI	Mean ± 95% CI	
Headache Disability Index	22.40±2.04	22.63±0.18	9.18±2.26	.988 (A-B) .001(B-C) .001(A-C)

Table 4.7

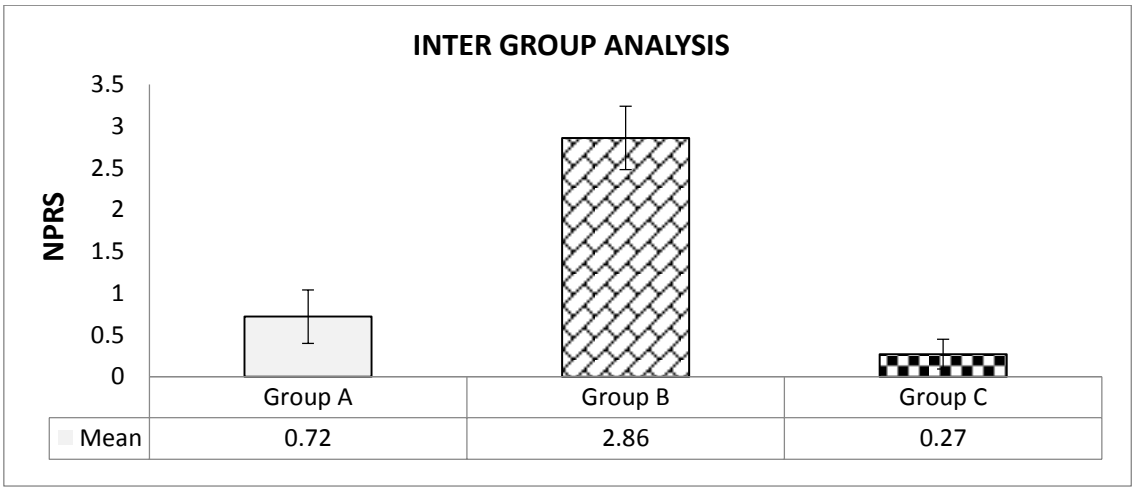
Post-hoc analysis for quality of life (QoL) between the groups

Variables(QoL)	Group A	Group B	Group C	P-value
	Mean ± 95% CI	Mean ± 95% CI	Mean ± 95% CI	
Physical Functioning	75.62±02.12	74.73±2.74	87.83±2.24	.902 (A-B) .001(B-C) .001(A-C)
Role Of Limitation Physical Health	71.25±4.20	72.36±3.58	86.48±4.58	.947 (A-B) .001(B-C) .001(A-C)
Role Of Limitation Emotional Health	68.47±6.74	70.28±7.46	83.94±5.48	.833 (A-B) .001(B-C) .001(A-C)
Energy	70.87±3.02	70.39±2.48	84.45±2.80	.970 (A-B) .001(B-C) .001(A-C)
Emotional Well Being	71.50±2.82	71.78±2.88	83.62±1.92	.988 (A-B) .001(B-C) .001(A-C)
Social Life	73.62±3.24	73.76±3.76	83.95±3.26	.998 (A-B) .001(B-C) .001(A-C)
Body Pain	72.20±3.16	73.02±3.10	83.32±4.12	.944 (A-B) .001(B-C) .001(A-C)
General Health	73.47±2.98	74.47±3.02	86.62±3.18	.898 (A-B) .001(B-C) .001(A-C)

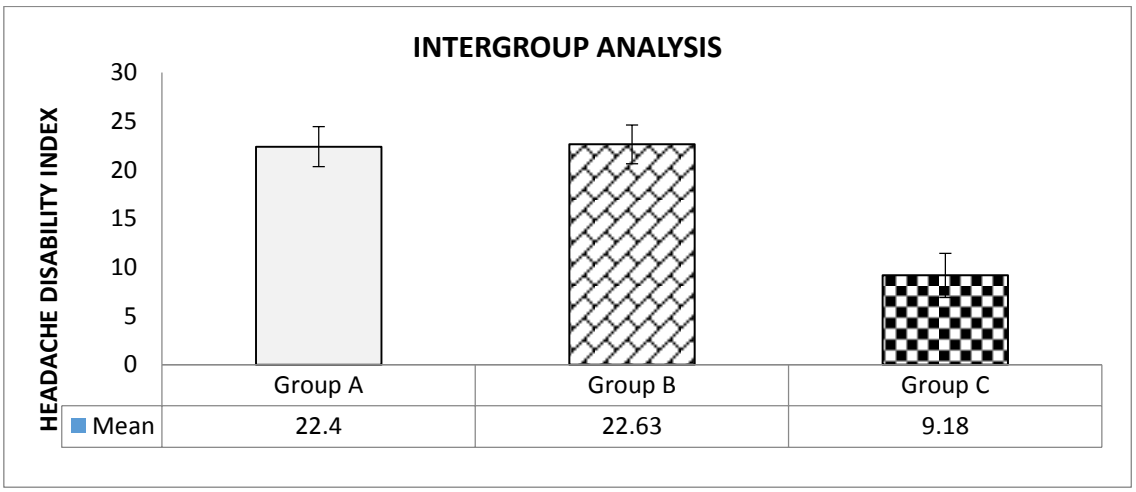
Table 4.8

Post-hoc analysis for Pressure Point Threshold (PPT) and Range of Motion between the groups

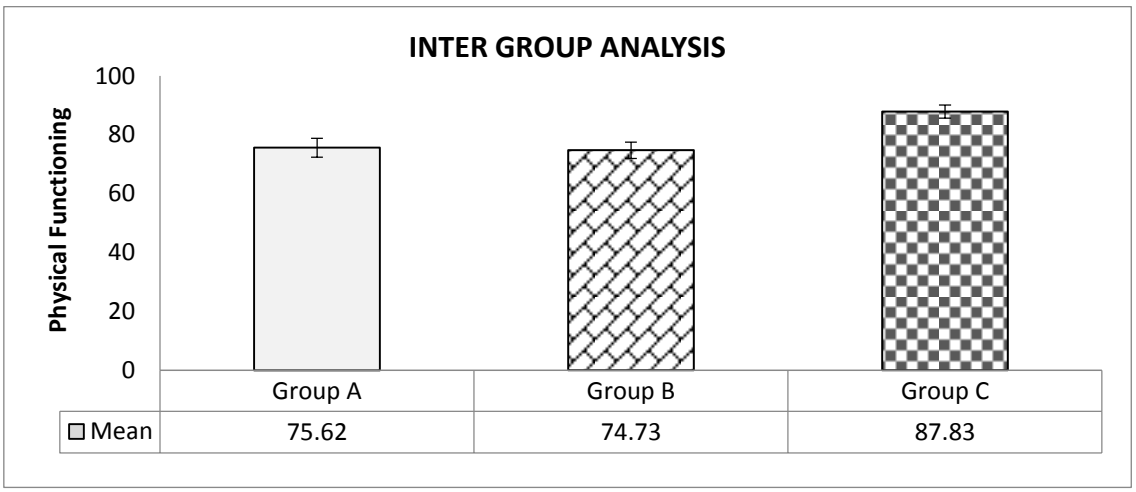
Variables(QoL)	Group A	Group B	Group C	*p*-value
	Mean ± 95% CI	Mean ± 95% CI	Mean ± 95% CI	
PPT-Sub-occipital Muscle	3.77±0.16	3.00±0.24	3.76±0.22	0.001(A-B)
				0.001(B-C)
				0.998(A-C)
PPT-Trpezius Muscle	4.52±0.26	3.52±0.24	4.94±.46	0.001(A-B)
				0.001(B-C)
				0.233(A-C)
Flexion (ROM)	45.25±2.16	43.55±2.18	50.40±1.50	0.749(A-B)
				.001(B-C)
				.001(A-C)
Extension (ROM)	54.75±2.28	53.94±.16	62.56±2.14	.905(A-B)
				.001(B-C)
				.001(A-C)
Left side flexion (ROM)	36.87±1.90	37.36±1.50	43.37±.78	.905(A-B)
				.001(B-C)
				.001(A-C)
Right side flexion ROM	37.25±.18	36.44±1.96	43.51±1.13	.942(A-B)
				.001(B-C)
				.001(A-C)
Left rotation (ROM)	64.75±2.64	66.18±3.12	74.32±1.96	.746(A-B)
				.001(B-C)
				.001(A-C)
Right rotation (ROM)	64.37±2.48	65.39±2.96	75.40±1.82	.843(A-B)
				.001(B-C)
				.001(A-C)



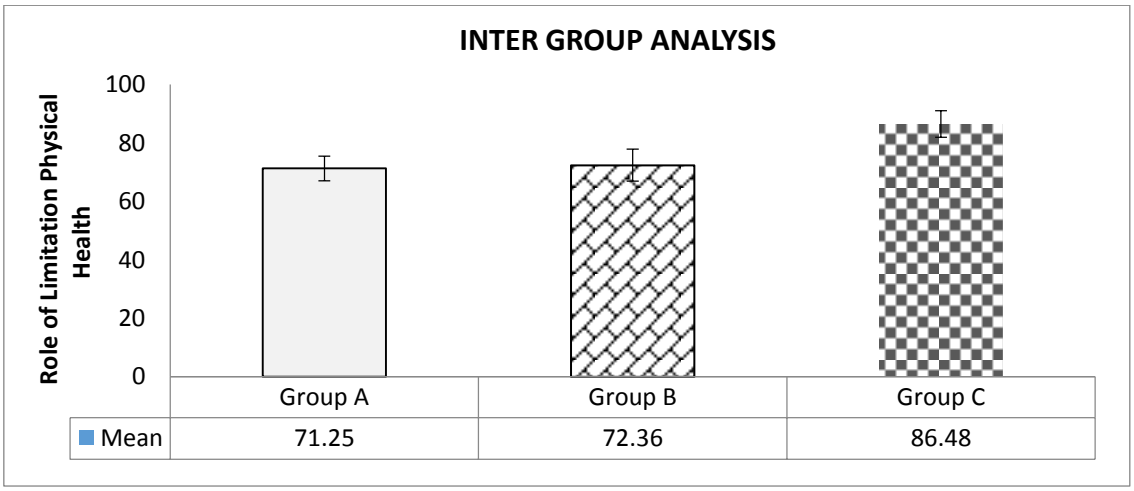
Graph 4.55: Comparison of pain (NPRS score) between groups.



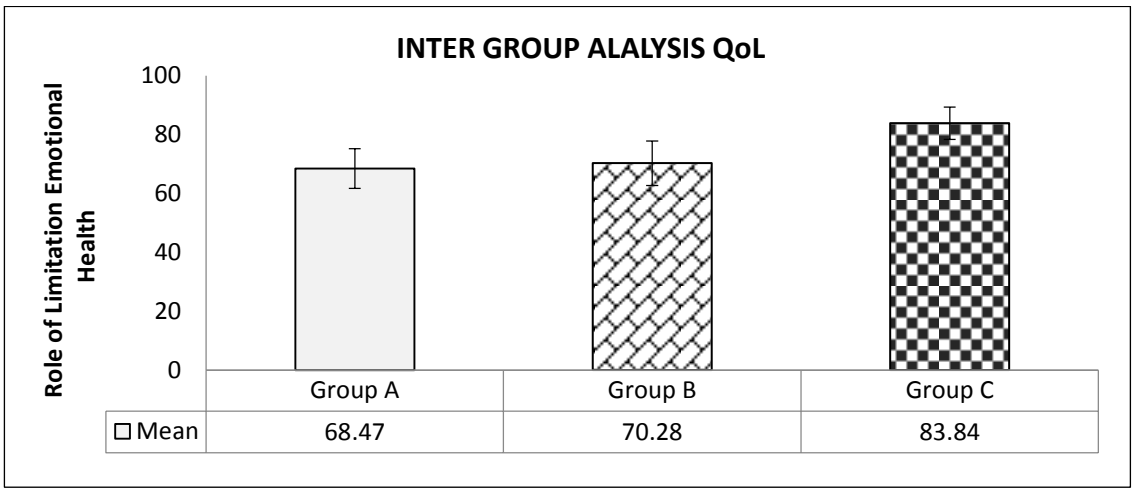
Graph 4.56: Comparison of HDI between Groups



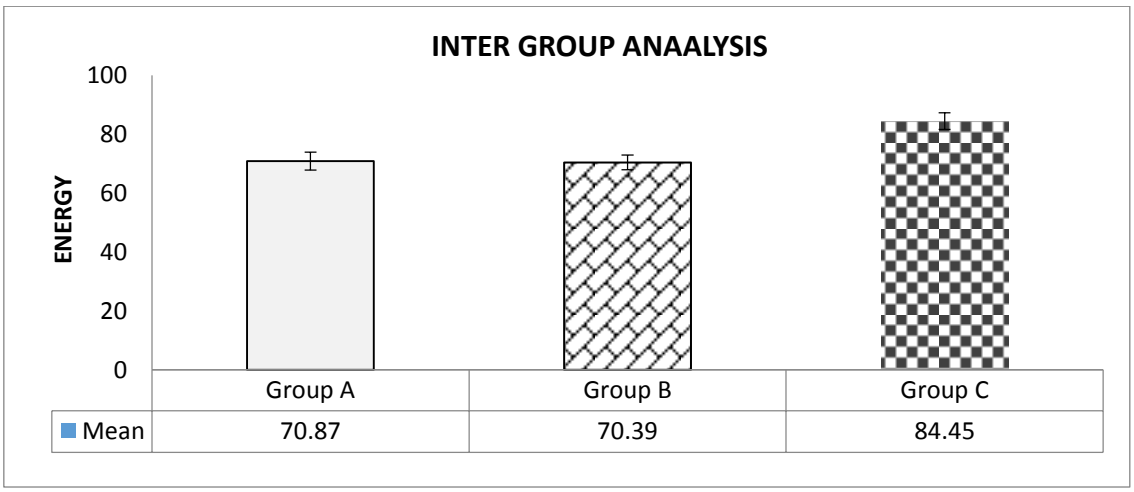
Graph 4.57: Comparison of Quality of Life (QoL) between Groups



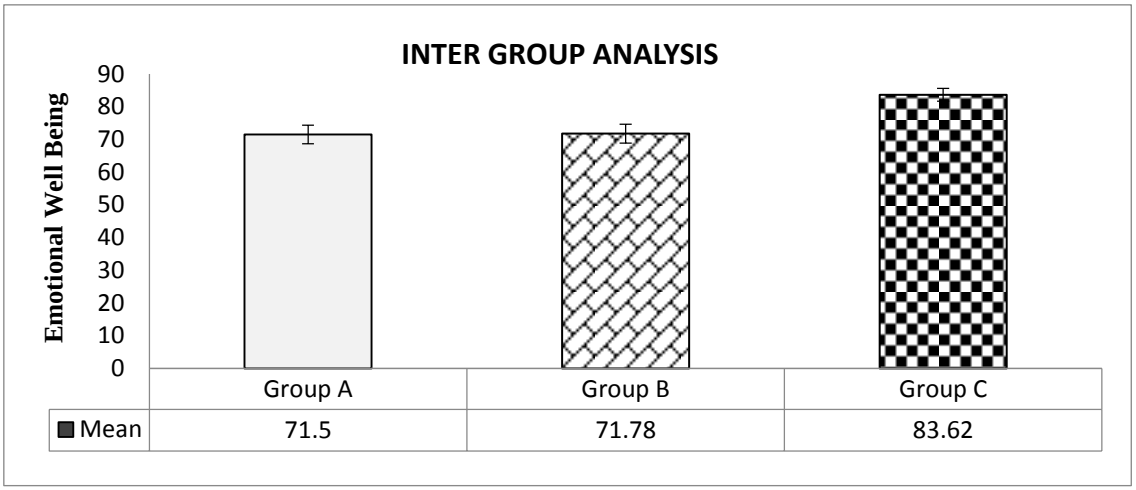
Graph 4.58: Comparison of Quality of Life (QoL) between Groups



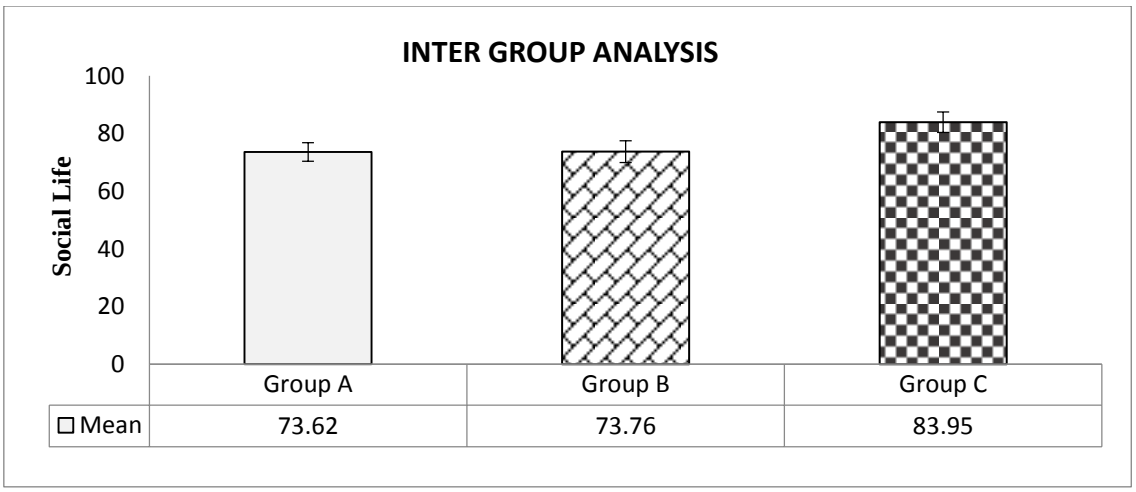
Graph 4.59: Comparison of Quality of Life (QoL) between Groups



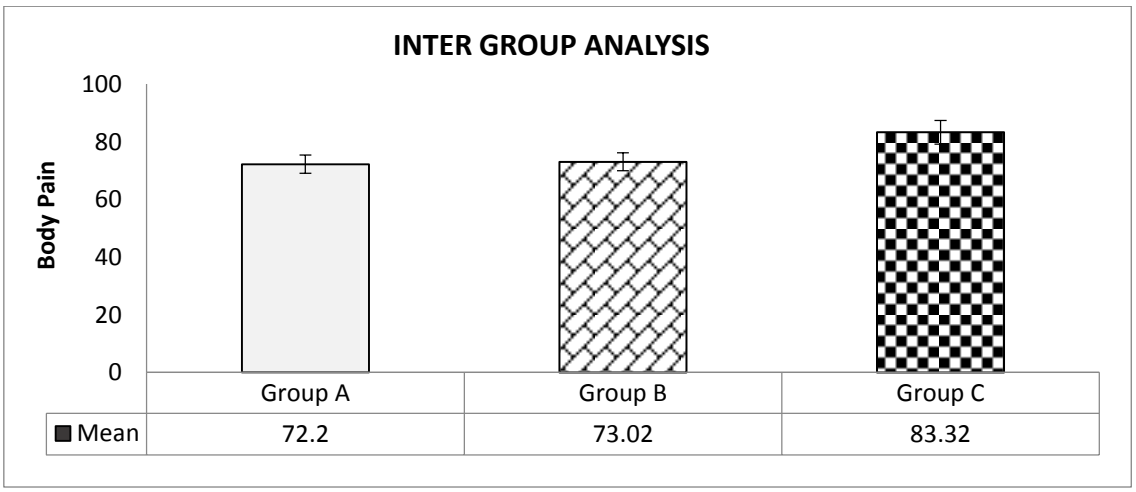
Graph 4.60: Comparison of Quality of Life (QoL) between Groups



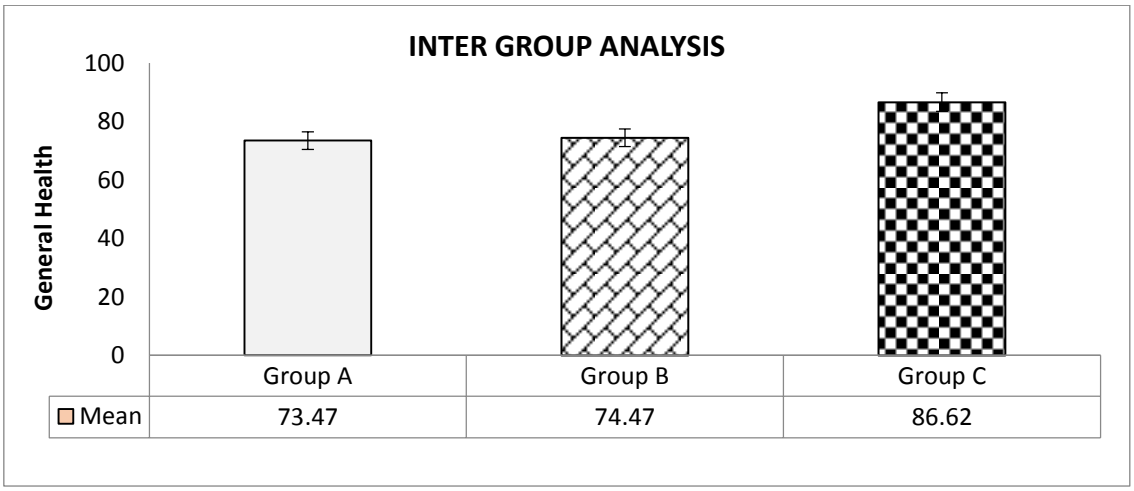
Graph 4.61: Comparison of Quality of Life (QoL) between Groups



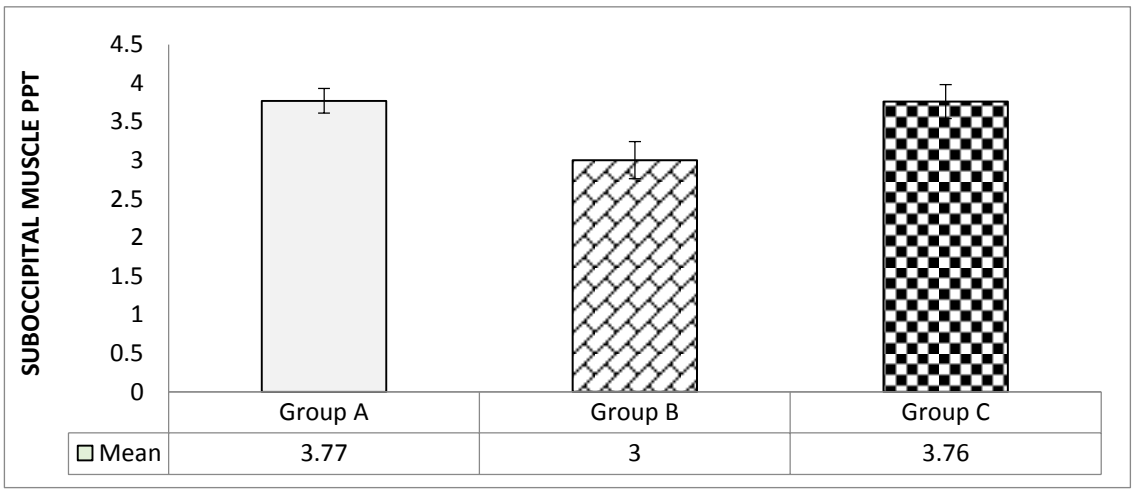
Graph 4.62: Comparison of Quality of Life (QoL) between Groups



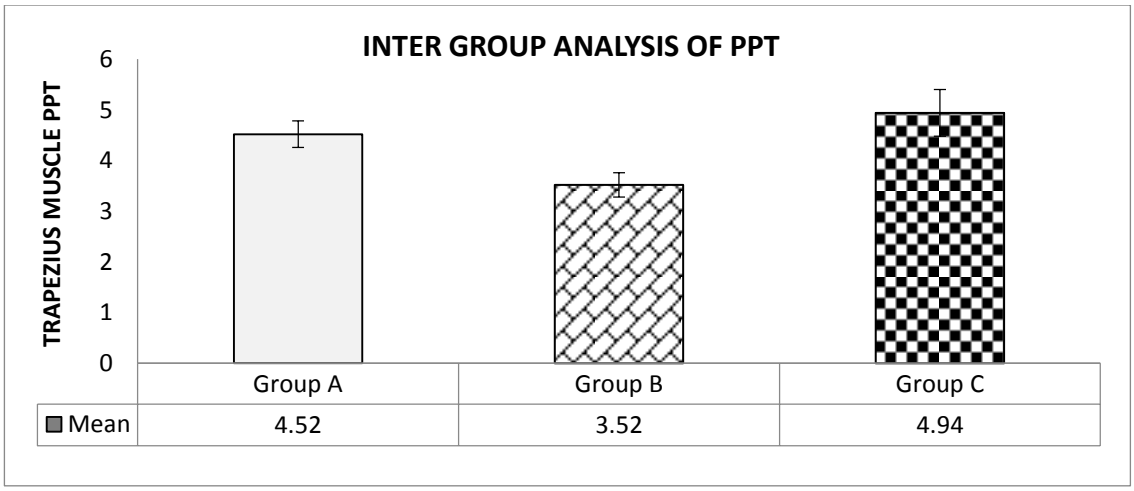
Graph 4.63: Comparison of Quality of Life (QoL) between Groups



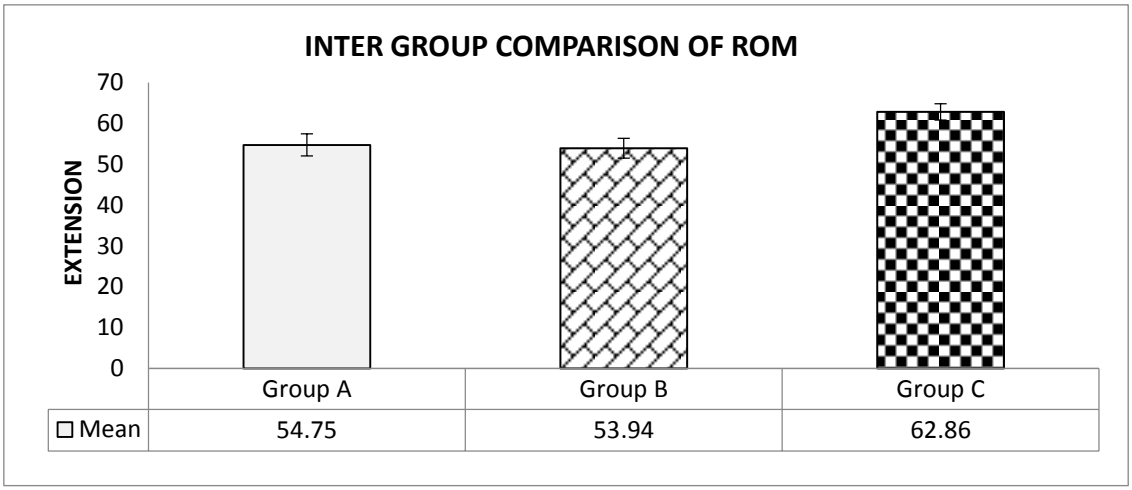
Graph 4.64: Comparison of Quality of Life (QoL) between Groups.



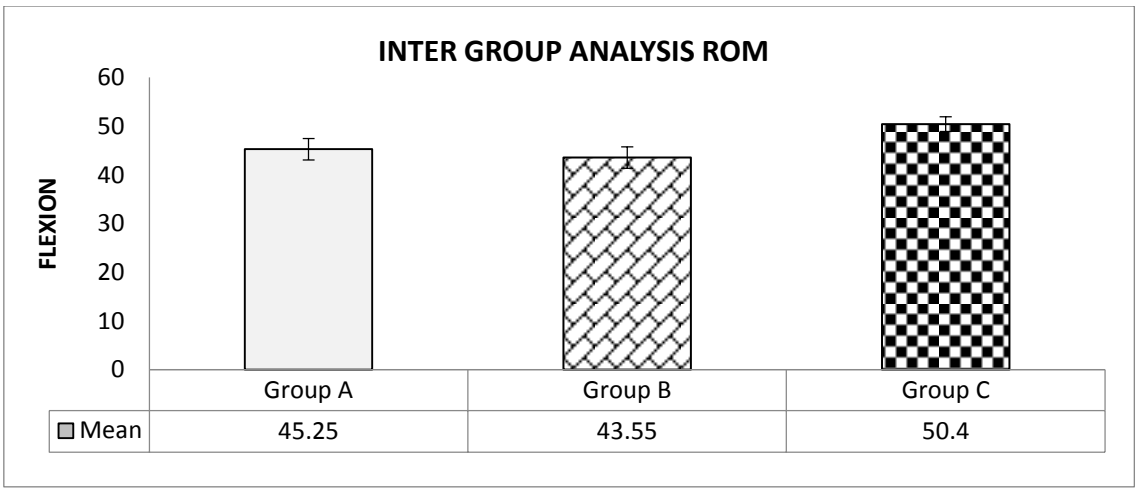
Graph 4.65: Comparison of PPT (Sub-occipital muscle) between Groups



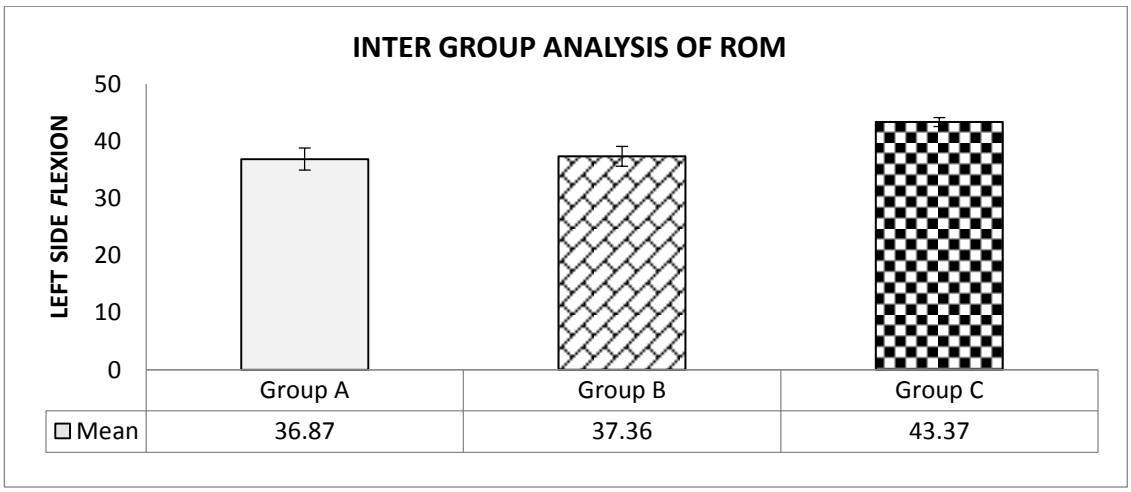
Graph 4.66: Comparison of PPT(Trapezius muscle) between Groups



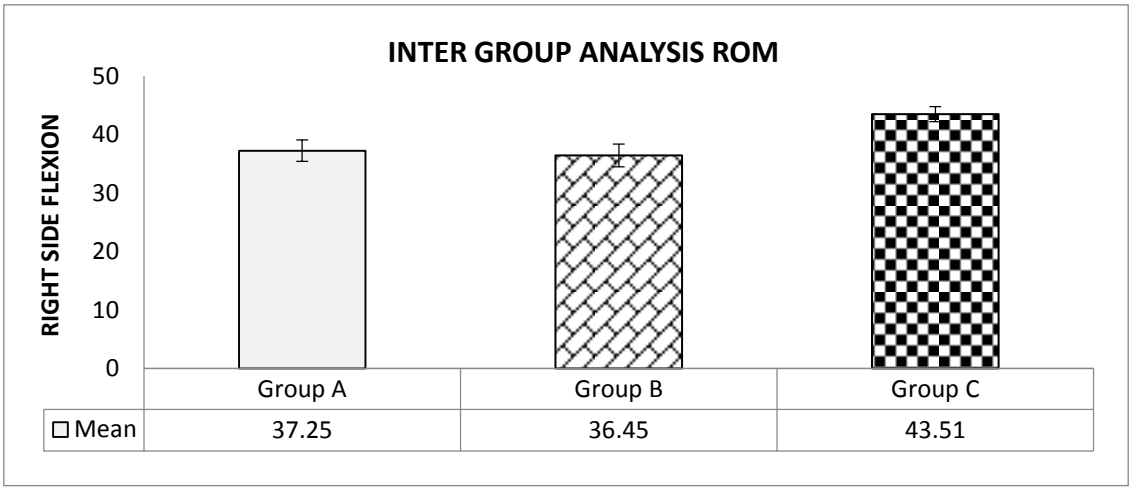
Graph 4.67: Range of Motion (extension) between groups.



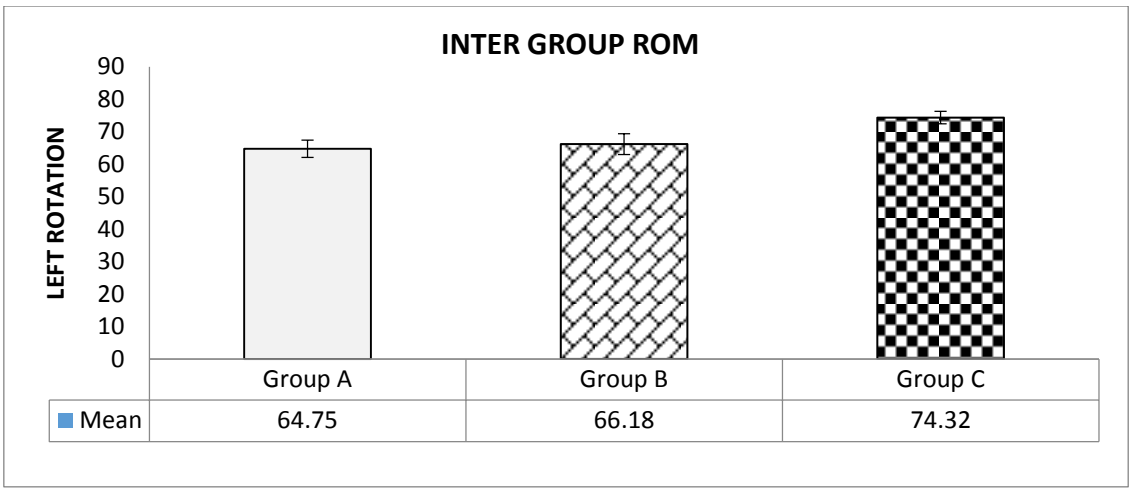
Graph 4.68: Range of Motion(flexion) between groups.



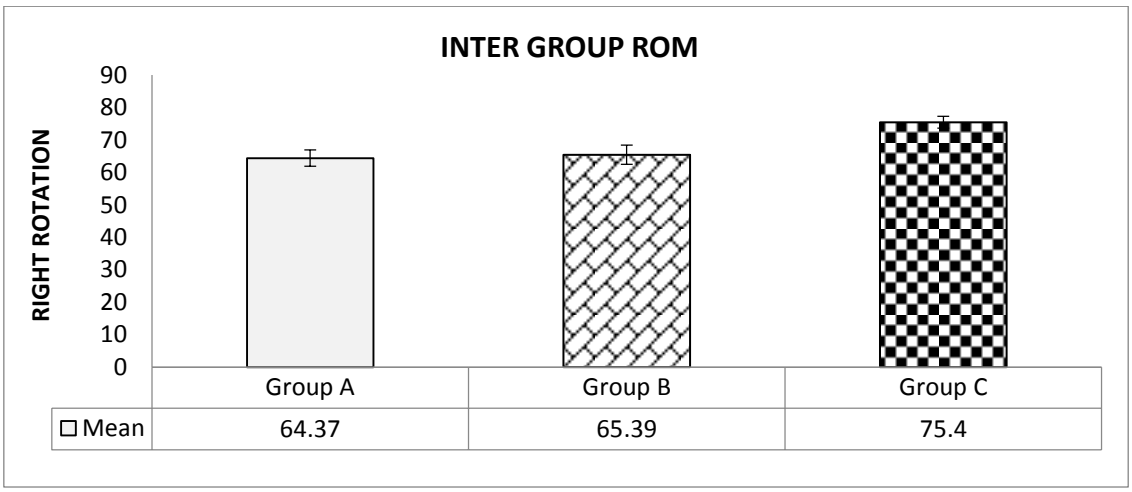
Graph 4.69: Range of Motion(left flexion) between groups.



Graph 4.70: Range of Motion (right flexion) between groups.



Graph 4.71: Range of Motion (left rotation) within the Groups



Graph 4.72: Range of Motion (right rotation) between groups.

CHAPTER 5

DISCUSSION

CHAPTER - 5
DISCUSSION

The discussion has been focused on data interpretation to justify how dry needling and manual therapy could be beneficial in treatment of CGH.

5.1 Demographic Data

5.1.1 Age Distribution

As per the inclusion criteria participants were recruited within an age limit of 20-50 years. The specific upper age limit was restricted at 50 years to avoid any degenerative change in the cervical spine. Studies have shown that joint degeneration increase with age [58]. Also the myofascial trigger point could be more common in the middle age than old age as well as very young age [59]. The participants were age matched between the groups (Table 1). The mean age of all patient was 37.11 where Group A mean age was 37.27 (maximum age was 48 and minimum age was 20 years) , Group B mean age was 36.84 (maximum age was 49 and minimum age was 21 years), and Group C mean was 36.49 (maximum age was 49 and minimum age was 20 years) .

5.1.2 Gender Distribution

A total of 135 subjects participated in this study into three groups. Group A consisting of 40 patients (38 female and 12 male), Group B consisted of 4 8patients (37 female and 11 male) and group C consisted 47 patients (38 female and 9 male). Thus a total 113 female and 32 male participated in the study. The justification for gender distribution was based from the previous findings. An epidemiological study showed that females were more prone for suffering cervicogenic headache [58].

5.2 Headache Disability Index

5.2.1 Intra-group Analysis

The headache disability index before intervention in Group A was 58.85 and after the intervention were 22.4 and its corresponding p value was <0.05 (Graph 4.2). Since the p value was less than 0.05, we can suggest that there was a statistically significant difference in headache disability index between the pre and post intervention (Table 4.2). Similarly the headache disability index before intervention in Group B was 58.68 and after the intervention were 25.20 and its corresponding p value

was <0.05 (Graph 4.20). Since the p value was less than 0.05, we can conclude that there is a significant difference in headache disability index between the pre and post intervention (Table 4.3). The profound change was found in group C (Table 4.4). The headache disability index before intervention in Group C was 57.35 and after the intervention were 9.19. The T value between the pre and post procedure in headache disability index was 26.44 and its corresponding p value was <0.001 (Table 4.4). Thus there was a significant difference in headache disability index between the pre and post intervention. It could found that all three groups revealed statistically significant improvement with regards to the pre –post treatment for HDI. However the maximum improvement was seen in group C.

5.2.2 Inter-group Analysis

The findings of the study suggested that there was no significance change in Group A and Group B (Table 4.6) but in Group C statistical significant improvement was found in Headache Disability compared to the other two groups. The F value for the mean difference in headache disability score – pre between three groups was 0.26 and its corresponding p value was 0.77>0.05. Since the p value was more than 0.05, we can conclude that there was no statistically significant difference in headache disability score – pre between the three groups.The F values for the mean difference in headache disability score – post between three groups was 52. 71 and its corresponding p value was <0.05. Since the p value was less than 0.05, we can conclude that there was a statistically significant difference in headache disability score – post treatment between the three groups.

5.2.3 Reasons for change in Head Disability Index:

The Headache Disability Index showed a significant reduction on headache at their daily life for Group A Group B as well as Group C. The results can be due to the fact that the mechanism of dry needling of MTrPs might decrease myofascial pain. The mechanism include its properties on the taut band, local hypoxia ischemia and central as well peripheral sensitization via neural mechanisms, increase in local tissue blood flow and oxygenation, change in the milieu of endogenous opioids, endorphins, cholinergic anti-inflammatory mediators and a modulatory effect on sensory neural impulses at the central nervous system level [59]. With manual therapy there is an increase in joint separation thus stretching of the peri-articular tissues occurs that excite

the joint nociceptors and mechanoreceptors in turn leading to a reduction in pain and muscle spasm. In this study we found that in Group C showed more improvement in terms of HDI. The findings of the study could be supported from results in the previous literature. A study compared three interventions (dry needling, manual therapy, and soft tissue techniques), determining that dry needling and manual therapy were better than soft tissue techniques in reducing pain according to the visual analog scale, but neither superior to the other [60]. The Neck Disability index showed a statistically significant change for the dry needling and manual therapy groups with a $p<0.001$ from baseline to follow-up, indicating a significant change in function. Another study conducted by Bond et, al. (2015) showed a 28-point change for HDI after four sessions of dry needling over two weeks in patients with occipital neuralgia [61]. Thus findings of the present study are in consensus with previous findings and support that manual therapy (C12-C2 SNAGS) and dry needling of the suboccipital and trapezious muscles could be clinically more beneficial on reducing the participant's disability in CGH patients.

5.3. Numerical Pain Rating Scale

The significant improvement of numerical pain rating scale was shown in all three groups where Group C showed most reduction. The mean pain reduction shown in GroupA was 5.6, in Group B was 3.53 and Group C was 6.43.

5.3.1 Intra-group Analysis

Group A, Group B and Group C, all three groups revealed a statistically significant improvement compared to the value of the numerical pain assessment scale before and after treatment ($p <0.05$, Table 4.2, Table 4.3 & Table 4.4 respectively).

5.3.2 Inter-group Analysis

The study found that there was a statistically significance change between the groups. The post hoc analysis suggested a maximum change between Group B and Group C (Table 4.5).The F value for the mean difference in Numerical rating scale – pre between three groups was 1.007 and its corresponding p value was 0.369. Since the p value was more than 0.05, we can conclude that there was no statistically significant difference in Numerical rating scale – pre between the three groups. The F value for the mean difference in Numerical rating scale – post between three groups was 74. 546 and its corresponding p value were 0.0001. Since the p value was less than 0.05, we can

conclude that there was a statistically significant difference in Numerical rating scale – post between the three groups.

5.3.3 Reasons for Change in NPRS

Pain reduction was seen in all the three groups where Group-C showed maximum reduction. This result could be because of intramuscular mechanical pressure which occurs after the insertion of needling. The mechanism behind this several study proved that Dry Needle may lead to increased blood flow and stimulates the nociceptive substances. The study conducted by Cagnie et al. (2012) suggested that blood supply and oxygenation of trepizius muscle increase followed dry needling [62]. The increase in oxygenation and blood flow could be an attributed to a physiological reason for improvement in pain perceived by the patients. Dry Needling has also been reported to stimulate A δ fibers and activate inhibitory pain gate mechanism which could be possible reason for reduction of pain [62]. In addition reactive hyperemia occurs after the needling insertion and reduces muscle spasm due to spinal reflex mechanism [63]. Findings of the study were supported by results from previous study. In the systematic review executed by Cagnie et al. (2015), both dry needling and ischemic pressure (a form of manual mobilization) established statistically significant differences in pain decrease from baseline, although there was not a statistically significant difference between interventions similar to findings from the present study [64]. Another study done by Llamas-Ramos et al. (2014) also revealed similar results, where both dry needling and manual therapy showed significant reduction in pain from baseline using the visual analog scale but not between each other [65]. The dry needling group had a decrease of 6.3 points whereas the manual therapy group had a decrease of 6.2 points. In contrast to this, our study found a 6 point decrease in manual therapy and 4 point decrease in dry needling. The difference could be attributed to baseline assessment, type of questionnaire used and sample difference. Also NPRS is a subjective measure which could lead to differential interpretation of findings. The study done by Llamas-Ramos et al. (2014) used the Spanish version of the 'Northwick Park Pain Questionnaire' was utilized to assess function. The dry needling group had an improvement of 13.7 points and the manual therapy group had an improvement of 12.8 points. Both results are statistically significant from baseline, but are not significant between each other. Therefore the result of the previous study support the finding of the present study with respect to pain.

5.4 Quality of Life

We assessed different domains of quality of life within and between the groups. For the matter of easy understanding the findings have been represent groups wise as follows:

5.4.1 Intra-group Analysis

Group A

The physical functioning before intervention in Group A was 57.25 and after the intervention were 75.62 with $p<0.05$ (Graph 4.3). Since the p value was less than 0.05, we can conclude that there was a significant difference in physical functioning between the pre and post intervention.

The role of limitation in physical health before intervention in Group A was 35.0 and after the intervention were 71.25 (Graph 4.4). Since the p value was less than 0.05, we can conclude that there was a significant difference role of limitation in physical health between the pre and post intervention (Table 4.2).

The role of limitation in emotional health before intervention in Group A was 34.07 and after the intervention were 68.47 (Graph 4.5). The T value between the pre and post procedure in role of limitation in emotional health was 18.176 and its corresponding p value was <0.001. Since the p value was less than 0.05, we can conclude that there was a significant difference role of limitation in emotional health between the pre and post intervention (Table 4.2).

The energy before intervention in Group A was 50.25 and after the intervention were 70.87 (Graph 4.6). The p value was <0.001. Since the p value was less than 0.05, we can conclude that there was significant difference energy between the pre and post intervention (Table 4.2).

The emotional well being before intervention in Group A was 61.6 and after the intervention were 71.5 (Graph 4.7). The T value between the pre and post procedure in emotional well being was 8.383 and its corresponding p value was <0.001. Since the p value was less than 0.05, we can conclude that there was a significant difference in emotional well being between the pre and post intervention (Table 4.2).

The social life before intervention in Group A was 61.85 and after the intervention were 73.62 (Graph 4.8). The p value was 0.000<0.05. Since the p value was less than 0.05, we can conclude that there was a significant difference in social life between the pre and post intervention.

The body pain before intervention in Group A was 44.27 and after the intervention were 72.2. The T value between the pre and post procedure in body pain was 13.39 and its corresponding p value was 0.000<0.05. Since the p value was less than 0.05, we can conclude that there is significant difference in body pain between the pre and post intervention (Table 4.2).

The general health before intervention in Group A was 56.87 and after the intervention were 73.47. The T value between the pre and post procedure in general health was 11.865 and its corresponding p value was 0.000<0.05. Since the p value was less than 0.05, we can conclude that there is significant difference in general health between the pre and post intervention (Table 4.2).

Group B

The physical functioning before intervention in Group B was 59.87 and after the intervention were 74.74 (Graph 4.21). The T value between the pre and post procedure in physical functioning was 10.681 and its corresponding p value was < 0.05. Since the p value was less than 0.05, we can conclude that there was a significant difference in physical functioning between the pre and post intervention (Table 4.3).

The role of limitation in physical health before intervention in Group B was 36.84 and after the intervention were 72.37 (Graph 4.22). The corresponding p value was < 0.05. Since the p value was less than 0.05, we can conclude that there is a significant difference role of limitation in physical health between the pre and post intervention (Table 4.3).

The role of limitation in emotional health before intervention in Group B was 33.26 and after the intervention were 70.29 (Graph 4.23). The corresponding p value was <0.05. Since the p value was less than 0.05, we can conclude that there was a significant difference role of limitation in emotional health between the pre and post intervention (Table 4.3).

The energy before intervention in Group B was 51.71 and after the intervention were 70.39 (Graph 4.24). The corresponding p value was <0.05. Since the p value was less than 0.05, we can conclude that there was significant difference energy between the pre and post intervention (Table 4.3).

The emotional well being before intervention in Group B was 63.05 and after the intervention were 71.79 (Graph 4.25). The T value between the pre and post procedure in emotional well being was 7.837 and its corresponding p value was <0.05. Since the p value was less than 0.05, we can conclude that there was significant difference in emotional well being between the pre and post intervention (Table 4.3).

The social life before intervention in Group B was 61.5 and after the intervention were 73.76 (Graph 2.26). The T value between the pre and post procedure in social life was 9.9 and its corresponding p value was <0.05. Since the p value was less than 0.05, we can conclude that there was a significant difference in social life between the pre and post intervention (Table 4.3).

The body pain before intervention in Group B was 44.31 and after the intervention were 73.02 (Graph 2.27). The T value between the pre and post procedure in body pain was 16.913 and its corresponding p value was <0.05. Since the p value was less than 0.05, we can conclude that there was a significant difference in body pain between the pre and post intervention (Table 4.3).

The general health before intervention in Group B was 54.87 and after the intervention were 74.47 (Graph 2.28). The T value between the pre and post procedure in general health was 12.857 and its corresponding p value was <0.05. Since the p value was less than 0.05, we can conclude that there was a significant difference in general health between the pre and post intervention (Table 4.3).

Group C

The physical functioning before intervention in Group C was 58.92 and after the intervention were 87.48 (Graph 4.39). The corresponding p value was <0.001. Since the p value was less than 0.05, we can conclude that there was a significant difference in physical functioning between the pre and post intervention (Table 4.4).

The role of limitation in physical health before intervention in Group C was 35.81 and after the intervention were 86.49 (Graph 4.40). The T value between the pre and post procedure in role of limitation in physical health was 22.333 and its corresponding p value was <0.001. Since the p value was less than 0.05, we can conclude that there was a significant difference role of limitation in physical health between the pre and post intervention (Table 4.4).

The role of limitation in emotional health before intervention in Group C was 32.38 and after the intervention were 83.94 (Graph 4.41). The T value between the pre and post procedure in role of limitation in emotional health was 16.757 and its corresponding p value was <0.001. Since the p value was less than 0.05, we can conclude that there was a significant difference role of limitation in emotional health between the pre and post intervention (Table 4.4).

The energy before intervention in Group C was 50.27 and after the intervention were 84.46 (Graph 4.42). The T value between the pre and post procedure in energy was 18.972 and its corresponding p value was <0.001. Since the p value was less than 0.05, we can conclude that there was significant difference energy between the pre and post intervention (Table 4.4).

The emotional well being before intervention in Group C was 60.97 and after the intervention were 83.62 (Graph 4.43). The T value between the pre and post procedure in emotional well being was 18.518 and its corresponding p value was <0.001. Since the p value was less than 0.05, we can conclude that there was a significant difference in emotional well being between the pre and post intervention (Table 4.4).

The social life before intervention in Group C was 60.89 and after the intervention were 83.94 (Graph 4.44). The T value between the pre and post procedure in social life was 9.89 and its corresponding p value was <0.001. Since the p value was less than 0.05, we can conclude that there was a significant difference in social life between the pre and post intervention (Table 4.4).

The body pain before intervention in Group C was 43.59 and after the intervention were 83.32 (Graph 4.45). The T value between the pre and post procedure

in body pain was 13.309 and its corresponding p value was <0.001. Since the p value was less than 0.05, we can conclude that there was a significant difference in body pain between the pre and post intervention (Table 4.4).

The general health before intervention in Group C was 55.81 and after the intervention were 86.62 (Graph 4.46). The T value between the pre and post procedure in general health was 17.298 and its corresponding p value was <0.001. Since the p value was less than 0.05, we can conclude that there was a significant difference in general health between the pre and post intervention (Table 4.4).

5.4.2 Inter-group Analysis

The F value for the mean difference in Physical functioning – pre between three groups was 0.26 and its corresponding p value was 0.473 (Graph 4.57). Since the p value was more than 0.05, we can conclude that there was no statistically significant difference in Physical functioning – pre between the three groups. However, the F value for the mean difference in Physical function – post between three groups was 27.06 and its corresponding p value was <0.001. Since the p value was less than 0.05, we can conclude that there was a statistically significant difference in Physical function – post between the three groups. From Table 4.7 it could be seen that the difference between Group A and Group B was not significant (p= 0.90) but statistically significant difference was found between Group B and Group C and Group A and Group C (p <0.001).

Similar findings were seen in role of limitation in emotional health post treatment (Graph 4.58). The difference in Group A and Group C as well as Group B and Group C was more profound that Group A and Group B (Table 4.27). The findings were consistent for all domains of quality of life assessed in the present study (Graph 4.59, 4.60, 4.61, 4.62, 4.63 and 4.64). Thus it could be suggested that dry needling and manual therapy alone did not show significant difference. However when given in combined a significant improvement could be expected.

5.4.3 Reasons for Changes in Quality of Life Domains:

The combined group showed significant improvement. Very little literature has been published on quality of life among CGH patients using physiotherapy outcomes. A recent study conducted by Georgoudis (2018) evaluated myofascial release and

microwave diathermy and acupuncture on quality of life and disability in patients with tension type headache [66]. The study concluded that the combination of physiotherapy with acupuncture is recommended both for the improvement of the physical and affective components of pain but also of the psychological status of the patients [66].

As per our best knowledge, there is no study published on cervicogenic headache in improving QoL while using dry needling and manual therapy. The findings of the study are favorable to support that Dry Needling and Manual Therapy could be clinically very useful as an adjunct therapy to improve QoL among patients with CGH.

5.5 Pressure Point Threshold

5.5.1 Intra Group Analysis

Group A

The sub occipital area pressure point threshold before intervention in Group A was 2.73 and after the intervention were 3.77 (Graph 4.11). Since the p value was less than 0.05, we can conclude that there was significant difference in sub occipital area pressure point threshold between the pre and post intervention. Similarly the pressure point threshold for trapezius muscle in Group A was 3.43 and 4.52 before and after treatment respectively (Graph 4.12). Since the p value was less than 0.05, we can conclude that there was significant difference in trapezius muscle pressure point threshold between the pre and post intervention.

Group B

The sub occipital area pressure point threshold before intervention in Group B was 2.57 and after the intervention was 3.0 (Graph 4.29). Since the p value was less than 0.05, we can conclude that there was a significant difference in sub occipital area pressure point threshold between the pre and post intervention. The trapezius muscle pressure point threshold before intervention in Group B was 3.41 and after the intervention were 3.52 (Graph 4.30). Since the p value was more than 0.05, we can conclude that there was no significant difference in trapezius muscle pressure point threshold between the pre and post intervention.

Group C

The sub occipital area pressure point threshold before intervention in Group C was 2.57 and after the intervention was 3.76 (Graph 4.47). Since the p value was less than 0.05, we can conclude that there was a significant difference in sub occipital area

pressure point threshold between the pre and post intervention. The trapezius muscle pressure point threshold before intervention in Group C was 3.39 and after the intervention was 4.94 (Graph 4.48). Since the p value was less than 0.05, we can conclude that there was a significant difference in trapezius muscle pressure point threshold between the pre and post intervention.

5.5.2 Inter Group Analysis

From Table 4.8 it could be suggested that there was a statistically significant difference for PPT between the groups. The post hoc analysis for PPT in suboccipital muscle suggested a mean score of 3.77±0.16, 3.00±0.24 and 3.76±0.22 for Group A, B, and C respectively. The corresponding p values were 0.001 (A-B), 0.001(B-C) and 0.998 (A-C) suggesting the results were significant between A to B and B to C compared to group A to C. Similar finding were seen for PPT in trepizius muscle (Table 4.8).

5.5.3 Reasons for Improvement in Pressure Point Threshold

The pressure point algometry was used as a means to evaluate myofascial trigger points with respect to the pressure point threshold [67]. The pressure pain threshold has been defined as "the minimum pressure value causing pain" [68]. A significant change was found in the present study within all groups but the maximum change was found in group C suggesting that dry needling combined with manual therapy was most effective in elevating the threshold value for Pain as also supported by clinical reduction in pain perception on NPRS. Pressure point was measured at the most paint full trigger point area at the suboccipital area, and over trapezious muscle. The improved in PPT could be seen as the manual therapy is delivered to the facet joint where capsule gets stretched and stimulates its mechanoreceptors causing presynaptic inhibition of nociceptive afferent activity thus resulting in pain reduction [69]. Kahkeshani and Ward (2012) stated that the anatomical link between the duramater and the musculoskeletal system has important consequences for the treatment of cervicogenic headaches thus providing a mechanical explanation for the efficacy of cervical massage and manipulative treatment for headaches [12].

The findings of the present was also supported by a study which concluded that dry needling produced significant improvement in pain pressure threshold (PPT) for subjects with myofascial trigger point in upper trapezious muscles [70]. Another

study conducted by Llamas-Ramos et al. (2014) suggested dry needling manual therapy and are similarly effective on PPT in patient with chronic mechanical neck pain [65]. Thus it could be suggested from the findings of the present study in consensus with previous findings that dry needling and manual therapy could be clinically used to improve PPT in CGH patients.

5.6 Range of Motion

5.6.1 Intra Group Analysis

Group A

The extension range of motion before intervention in Group A was 44.25 degrees and after the intervention were 54.75 degrees (Graph 4.13). The flexion range of motion before intervention in Group A was 37.25 degrees and after the intervention was 45.25 degrees (Graph 4.14). The side of flexion (Left) before intervention in Group A was 30.12 degrees and after the intervention was 36.87 degrees (Graph 4.15). The side of flexion (Right) before intervention in Group A was 36.87 degrees and after the intervention was 30.25 degrees (Graph 4.16). The rotation (Left) before intervention in Group A was 51.5 degrees and after the intervention was 64.75 degrees (Graph 4.17). The rotation range of motion (Right) before intervention in Group A was 51.87 degrees and after the intervention was 64.37 degrees (Graph 4.18). Since the p value was less than 0.05, we can conclude that there was a significant difference in cervical range of motion within Group A for pre and post intervention.

Group B

The flexion before intervention in Group B was 35.53 degrees and after the intervention was 43.55 degrees (Graph 4.31). The extension before intervention in Group B was 44.74 degrees and after the intervention was 53.95 degrees (Graph 4.32).The side of flexion (Left) before intervention in Group B was 30.39 degrees and after the intervention was 37.37 degrees (Graph 4.33). The side of flexion (Right) before intervention in Group B was 29.08 degrees and after the intervention was 36.45 degrees (Graph 4.34). The rotation (Left) before intervention in Group B was 53.55 degrees and after the intervention was 66.18 degrees (Graph 4.35). The rotation (Right) before intervention in Group B was 51.87 degrees and after the intervention was 64.37 degrees (Graph 4.36). Since the p value was less than 0.05, we can conclude that there was a significant difference in cervical range of motion for pre and post intervention within Group B.

Group C

The extension before intervention in Group C was 45.4 degrees and after the intervention was 62.57 degrees (Graph 4.49). The flexion before intervention in Group C was 38.37 degrees and after the intervention was 50.4 degrees (Graph 4.50). The side of flexion (Left) before intervention in Group C was 31.08 degrees and after the intervention was 43.38 degrees (Graph 4.51). The side of flexion (Right) before intervention in Group C was 29.86 degrees and after the intervention was 43.51 degrees (Graph 4.52). The rotation (Left) before intervention in Group C was 52.43 degrees and after the intervention was 74.32 degrees (Graph 4.53). The rotation (Right) before intervention in Group C was 52.7 degrees and after the intervention was 75.4 degrees (Graph 4.54). Since the p value was less than 0.05, we can conclude that there was a significant difference in cervical range of motion for pre and post intervention within Group C.

5.6.2 Inter Group Analysis

From Table 4.8 it could be seen that like PPT, range of motion revealed similar findings between the groups. However unlike PPT, the significant difference was found in group B to C and Group A to C in comparison to group A to C for flexion, extension, side flexion and rotation range in CROM. The findings suggest that though dry needling and manual therapy do not stand to be significant stand alone, in combination they can be very useful.

5.6.3 Reasons for Improvement in Cervical Range of Motion

There were significant differences within the groups. Group C showed the most clinically significant improvement in restricted cervical range of motion between the groups (Table 4.8). The findings of the study supported that dry needling and manual therapy have shown clinical significance in terms of improving the range of cervical movement. It can also be expected that when dry needling therapy in conjunction with manual therapy was administered, subjects revealed a much quicker improvement compared to manual therapy and dry needling therapy alone.

In support of the present study, a randomized clinical trial found similar outcomes cervical range of motion with all results being statistically significant [65]. Another study found that anesthetic injection and dry needling had similar effects on CROM at 4 weeks and 12 weeks after the intervention among myofascial pain

syndrome. Therefore it could be suggested that dry needling and manual therapy both have beneficial effects on CROM. However combined therapy could be more significant clinically.

5.7 Limitations and Future Scope

The study incorporated few limitations such as long term follow up of participants were not taken. Few more muscles could have been investigated with addition of control group. In future, various reasons for CGH could be identified and efficacy of dry needling and manual therapy could be assessed. Case control trial study could be done to establish the clinical implications for dry needling and manual therapy in cervicogenic headache.

5.8 Significance of the Study

A better understanding of the physical therapy management may be gained and this may lead to physical therapy profession playing a larger and prominent role in the management of CGH.

It will also lead to standardization of the treatment protocol and more effective management of the disorder.

Improved treatment of CGH will result in less absenteeism from the work thus reduce the economic impact of the disorder.

CHAPTER 6

CONCLUSION

CHAPTER - 6

CONCLUSION

The purpose of this study was to determine whether the combination of DN and MT was a more benign treatment protocol in subjects with cervicogenic headaches. The results were based on subjective data such as NPRS, Headache Disability Index and quality of life that measure the impact the participants' headaches have had on their daily lives. The objective data were based on the pressure point algometer which measured the pain threshold at the pressure of the sub-occipital muscle and the most sensitive trapezius as well as the range of movement of the cervical spine.

When the mean values of subjective data were compared (NPRS, headache disability index and quality of life), there was significant improvement in the entire domain. Therefore, indicating that manual therapy and dry needle both are beneficial for all participants, pain, disability and quality of life. However there was significant improvement found in group C which is combined group.

When the mean values of objective data (PPT and ROM) were compared an overall improvement was present. Thus indicating that manual therapy and dry needling both are beneficial for all participants pain, disability and quality of life. However there was more significant improvement found in group C which is combined group.

The findings of the study conclude that both dry needling and manual therapy are effective in improving pain, head disability index, quality of life, pain pressure thresholds and cervical range of motion in patient with cervicogenic headache. However the improvement could be maximized if a combined therapy was administered including both dry needling and manual therapy. Thus based on the findings the null hypothesis could be rejected. It could also be suggested that dry needling and manual therapy could be used as an effective treatment modality for CGH in regular clinical practice. The findings of the study are novel and first of its kind to find the effects on CGH.

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APPENDICES

APPENDIX-I

Ethics Committee Clearance Certificate

INSTITUTIONAL HUMAN ETHICAL COMMITTEE

Lovely School of Physiotherapy and Paramedical Sciences

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Ph: +91-1824-444515 E-mail: info@lpu.co.in

Chairperson: **Dr. H S Gill** **Deputy Chairman:** **Mr. S. Micheal Raj** **Members:** **Dr. Shivani Tandon** **Dr. Naresh Kundra** **Dr. N K Gupta** **Ms. Meenu Chopra** **Mr. Dharminder Singh Dhillon** **Dr. Sasmita Kar** **Sardar Nagina Singh** **Member Secretary:** **Ms. Rati**	LPU/IEC/PTY/005 Date: 16th November, 2016 To Mr. Ramesh Chandra Patra Ph.D. Scholar, Department of Physiotherapy, Lovely Professional University, Punjab. Dear Sir/Mam, The Ethical committee has studied the Research Proposal submitted by Mr/ Ms/ Mrs. Ramesh Chandra Patra Research Topic: **Dry Needling and Manual therapy for the Management of Cervicogenic Headache** It has been decided to afford **Ethical clearance** to this study. Thanking You. Your Sincerely, **Dr. H S Gill** (Chairperson) **Mr. S. Micheal Raj** (Deputy Chairman) **Ms. Rati** (Member Secretary)

APPENDIX -II

Information Sheet to Participants

"Dry Needling and Manual Therapy for the Management of Patient with Cervicogenic Headache"

Introduction

Greeting of the the day, my name is Ramesh ChanrdaPatra; I am a registered physiotherapist and currently a PhD scholar at the Lovely Professional University. I am conducting research on the presentation of patients with headaches. I would like to invite you to participate in the research study. Before agreeing to participate I would like you to read and understand the following explanation of the purpose of the study, the study procedures, benefits and risks. If you have any questions please do not hesitate to ask.

Purpose of study

The purpose of the study is to determine the efficiency of dry needling and manual therapy treatment in patients with cervicogenic headache.

Procedures

If you have agreed to participate in the study, you will be required to fill in a questionnairecontaining questions about your headaches. You will be evaluated by a registered physiotherapist and the whole procedure should not take more than an hour of your time.

Risks and Discomforts

This study has no risks. After the evaluation process you might experience some discomfort and tenderness on the neck muscles and these symptoms should not present for more than 24hrs.

Benefits and/Compensation

The benefits of this study will give us a better understanding for the management of cervicogenicheadache.You will not be paid to participate in the study. You will be reimbursed the travel expense to participate and catering on the day of testing will be provided as a token of my appreciation for your time. You will be offered a treatment session free of charge following the assessment.

Voluntary Participation

Participation in this study is voluntary. If you decide not to participate in this study, your decision will not involve a penalty and you are free to withdraw at any time. You have the right to decline to answer any questions that you are not comfortable with.

Confidentiality

Efforts will be made to ensure absolute confidentiality of your name and personal information.

Contacts and Questions

For further information and questions regarding the study please do not hesitate to contact me:

Ramesh Chandra Patra
Email: rameshbmc22@gmail.com
Tel: 9653174563

APPENDIX - III

Information Sheet to Participants (Hindi)

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APPENDIX - IV

ASSESSMENT FORM

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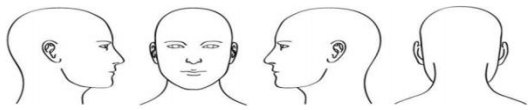
<tr><td>Name:
Age:
Gender:
Occupation:</td><td>SL no
Date
Phone no
Address:</td></tr>
<tr><td>1.Chief Complaint:

 
Body chart</td><td rowspan="2">2.History of Present Illness:</td></tr>
<tr><td>3.Pain Evaluation:
Site: Localized to neck / Generalized /
Referred to head
Side: Rt./Lt./Central/Other….
Onset: Sudden / Gradual / Insidious
Duration: _____
Type: Mild /Discomforting / Distressing/
Horrible/ Excruciating.
Pattern: Continuous/ Intermittent
Aggravating Factors:
Relieving Factors:
Intensity of Pain (10):
Associated Sign and Symptoms:
Sever/irritable:</td><td>4.Other complains:

5.Past Medical History:
General health status
Childhood illness
Adult illness
Psychiatric illness
Accidental/injury
Surgery
Hospitalization</td></tr>
<tr><td>6.General health status and life style:
Allergies
Immunization
Environmental hazards
Exercise and leisure sleep pattern</td><td>7. Drug History:

8. Personal History:</td></tr>
</table>

Diet Current medication Tobacco Alcohol	**9. Socioeconomic History:**
Orthopedic examination: **10. On Observation:** Posture (Any deformity of cervical spine): Present /absent. Head position: rotated/tilted Swelling Scar Discoloration Hairlines Bony and soft tissue contours Shoulder level Muscle spasm	**11. Joint tests** **Joint integrity tests** (distraction, anterior and posterior stability C0 C1, Sharp-Perser for C1 C2, lateral stability C1 C2 and alar stress tests) **Active Range of Motion:** Cervical Flexion: Cervical Extension: Cervical Rotation (Right): Cervical Rotation (Left): Cervical Side Bending(Right): Cervical Side Bending(Left):
12. Muscle test Muscle control: Muscle length: Isometric test :	**13. Neurological test** Integrity of the nervous system(D/M): Reflex testing: Mobility of the nervous system:
14. Orthopedic examination: Flexion Rotation Test: VBI Test: Compression Test: Distraction Test: Doorbell sign: Kemp test: Lhermitte's sign:	**15. Functional test:** **16.Palpation:** Tenderness(Site): Active trigger points:

O'Donoghue Maneuver: Adson's test: Sharp–Perser test: Deep Neck Flexors	
17. Diagnosis	

APPENDIX-V

Informed Consent

"Dry Needling and Manual Therapy for the Management of Patients with Cervicogenic Headache"

I confirm that I have read and understand the information sheet for the above study.

I have had opportunity to consider the information, ask question and have had these answered satisfactorily.

I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without any medical care or legal rights affected.

I understand that relevant sections of any of my medical notes and data collected during the study may be looked at by responsible regulatory authorities for the research purpose.

I agree and give my voluntary consent to take part in the research study.

Investigator : Ramesh Chandra Patra

Name of Subject:……

Date: ……. Date:……

Signature: ……. Signature: ……..

APPENDIX-VI

Informed Consent (Hindi)

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APPENDIX -VII

Trigger Point Dry Needling Consent Form

Trigger point dry needling (also known as intramuscular manual therapy/IMT) is an invasive procedure using a solid filament needle to penetrate the skin in order to reach a myofascial trigger point within a muscle (Trigger points: taut bands within a muscle that may cause local and referred pain as well as limit movement).

Dry needling is NOT acupuncture. It utilizes the anatomical landmarks of the body to locate and treat trigger points relieving a person's pain and improve overall function. Physical therapists who utilize dry needling as part of their physical therapy practice have received extensive training for the appropriate technique and use of dry needling in conjunction with other manual therapy techniques. They are not licensed acupuncturists, but rather can perform dry needling after appropriate training because it is within the scope of physical therapy practice.

Benefits

- Decreased pain both locally and into referral sites
- Improved muscled function (able to contract and relax appropriately)
- Improved ability to move and function for daily activities
- Decreased muscular tension and improved myofascial flexibility

Risks

- Muscle soreness or bruising at/near needling site; typically 1.5 hours to 2 days
- Minor bleeding from superficial vessels

Indicate below if you have any of the following conditions:

Yes	No	HIV or AIDS or Hepatitis	Yes	No	Unstable Blood Pressure
Yes	No	Current or Recent Infection	Yes	No	Pacemaker
Yes	No	Current use of Blood Thinning Medication	Yes	No	Cancer
Yes	No	Current use of Immunosuppressant Medication	Yes	No	Diabetes
Yes	No	Fear of needles	Yes	No	Currently Pregnant

Statement of Consent

I confirm that I have read and understand the above information, and I consent to having dry needling treatments.

Signature _____ Date _____

APPENDIX-VIII

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APPENDIX - IX

Proforma

"Dry Needling and Manual Therapy for the Management of Patient with CervicogenicHeadache"

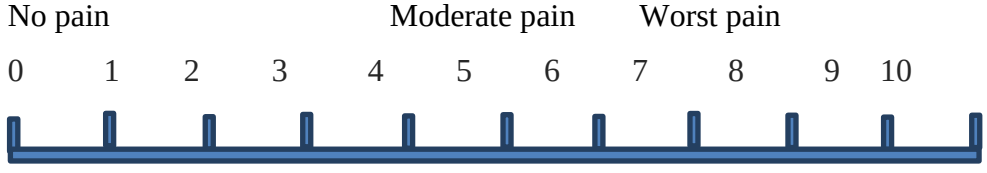
Name: Age: Gender: Occupation:	SL no Date Phone no Address:

Inclusion criteria:		**yes**	**no**
1.	The subjects between 20-50 years of age		
2.	Headache disability index more than 30%		
3.At least two of the	Headache has developed in temporal relation to the onset of the cervical disorder or appearance of the lesion		
	Headache has significantly improved or resolved in parallel with improvement in or resolution of the cervical disorder or lesion		
	CROM is reduced and headache is made significantly worse by provocative maneuvers		
	Headache is abolished following diagnostic blockade of a cervical structure or its nerve supply		

ASSESSMENT TOOLS

1. NPRS

Instruct the patient to choose a number from 0 to 10 that best describes their current pain. 0 would mean 'No pain' and 10 would mean 'Worst possible pain'.



Pre test Post test

2. Headache disability index:

Pre test	Post Test

3. PPT(pain Pressure threshold):

	Pre test	Post Test
1		
2		

4. Quality of life:

Scale	Pre test	Post Test
1. Physical functioning		
2. Role limitations due to physical health		
3. Role limitations due to emotional problems		
4. Energy/ fatigue		
5. Emotional well being		
6. Social functioning		
7. Pain		
8. General health		

5. Cervical Range Motion Evaluation Chart

CROM (IN DEGREES)		Pre test reading	Post test reading
	Extension		
	Flexion		
	Left flexion		
	Right flexion		
	Left Rotation		
	Right rotation		

Signature of investigator…….Signature of subject……..

APPENDIX-X

Headache Disability Index

INSTRUCTIONS: Please CIRCLE the correct response:

1. I have headache:[1] 1 per month [2] more than 1 but less than 4 per month[3] more than one per week

2. My headache is: [1] mild [2] moderate [3] severe

INSTRUCTTONS: (Please read carefully): The purpose of the scale is to identify difficulties that you may be experiencing because of your headache. Please check off "YES," "SOMETlMES", or "NO" to each item. Answer each question as it pertains to your headache only.

		Yes	Sometime	No
F1	Because of my headache I feel handicapped.			
F2.	Because of my headaches I feel restricted in performing my routine daily activities.			
E3.	No one understands the effect my headaches have on my life.			
F4.	I restrict my recreational activities (e.g. sports, hobbies) because of my headaches.			
E5.	My headaches make me angry.			
E6.	Sometimes I feel that I am going to lose control because of my headaches.			
F7.	Because of my headaches, I am less likely to socialize.			
E8	My sp ouse (significant other), or family and friends have no idea what I am going through because of my headaches.			
E9.	My headaches are so bad that I feel I am going to go insane.			
EIO.	My outlook on the world is affected by my headaches.			
Ell.	I am afraid to go outside when r feel that a headache is starting.			
E12	I feel desperate because of my headaches.			

		Yes	Sometime	No
F13	I am concerned that I am paying penalties at work or at home because of my headaches.			
E14	My headaches place stress on my relationships with family or friends,			
F15	I avoid being around people when I have a headache.			
F16.	I believe my headaches are making it difficult for me to achieve my goals in life.			
F17.	I am unable to think clearly because of my headaches.			
F18.	I get tense (o.g. muscle tension) because of rny headaches.			
F19.	I do not enjoy social gatherings because of my headaches.			
E20.	I feel irritable because of my headaches.			
F21.	I avoid traveling because of my headaches.			
E22.	My headaches make me feel confused.			
E23.	My headaches make me feel frustrated			
F24.	I find it difficult to read because of my headaches.			
F25.	I find it difficult to focus my anent ion away from my headaches and on other things,			

APPENDIX-XI

Quality of Life Questionnaire

SF-36

Date: / /2014 Patient's Name……..

INSTRUCTIONS: Please answer every question. Some questions may look like others, but each one is different. Please take the time to read and answer each question carefully by circling the number that best represents your response.

1. In general, would you say your health is?

Excellent (1)	Very Good (2)	Good (3)	Fair (4)	Poor (5)

2. Compared to one year ago, how would you rate your health in general now?

Much better now than one year ago (1)	Somewhat better now than one year ago (2)	About the same as one year ago (3)	Somewhat worse now than one year ago (4)	Much worse now than one year ago (5)

The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much: (circle one number on each line)(Circle One Number on Each Line)

		Yes, Limited a	Yes, Limited a	No, Not limited at
3.	**Vigorous activities**, such as running, lifting heavy objects, participating in strenuous sports	[1]	[2]	[3]
4.	**Moderate activities**, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	[1]	[2]	[3]
5.	Lifting or carrying groceries	[1]	[2]	[3]
6.	Climbing **several** flights of stairs	[1]	[2]	[3]
7.	Climbing **one** flight of stairs	[1]	[2]	[3]
8.	Bending, kneeling, or stooping	[1]	[2]	[3]
9.	Walking **more than a mile**	[1]	[2]	[3]
10.	Walking **several blocks**	[1]	[2]	[3]
11.	Walking **one block**	[1]	[2]	[3]
12.	Bathing or dressing yourself	[1]	[2]	[3]

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of your physical health**?
(Circle One Number on Each Line)

		Yes(0)	**No**(100)
13.	Cut down the amount of time you spent on work or other activities	1	2
14.	**Accomplished less** than you would like	1	2
15.	Were limited in the **kind** of work or other activities	1	2
16.	Had **difficulty** performing the work or other activities (for example, it took extra effort)	1	2

During the **past 4 weeks,** have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)?
(Circle One Number on Each Line)

		Yes(0)	**No**(100)
17.	Cut down the **amount of time** you spent on work or other activities	1	2
18.	**Accomplished less** than you would like	1	2
19.	Didn't do work or other activities as **carefully** as usual	1	2

20. During the **past 4 weeks,** to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?
(Circle One Number)

Not at all(100)	1
Slightly(75)	2
Moderately(50)	3
Quite a bit(25)	4
Extremely(0)	5

21. How much **bodily** pain have you had during the **past 4 weeks**? **Circle One Number)**

None(100)	1
Very mild(80)	2
Mild(60)	3
Moderate(40)	4
Severe(20)	5
Very severe(0)	6

22. During the **past 4 weeks,** how much did **pain** interfere with your normal work (including both work outside the home and housework)?

(Circle One Number)

Not at all(100)	1
A little bit(75)	2
Moderately(50)	3
Quite a bit(25)	4
Extremely(0)	5

These questions are about how you feel and how things have been with you **during the past 4 weeks**. For each question, please give the one answer that comes closest to the way you have been feeling.

How much of the time during the **past 4 weeks**.

Circle One Number on Each Line)

		All of the Time(100)	Most of the Time(80)	A Good Bit of the Time(60)	Some of the Time(40)	A Little of the Time (20)	None of the Time (0)
23.	Did you feel full of pep?	1	2	3	4	5	6
26.	Have you felt calm and peaceful?	1	2	3	4	5	6
27.	Did you have a lot of energy?	1	2	3	4	5	6
30.	Have you been a happy person?	1	2	3	4	5	6
		(0)	**(20)**	**(40)**	**(60)**	**(80)**	**(100)**
24.	Have you been a very nervous person?	1	2	3	4	5	6
25.	Have you felt so down in the dumps that nothing could cheer you up?	1	2	3	4	5	6
28.	Have you felt downhearted and blue?	1	2	3	4	5	6
29.	Did you feel worn out?	1	2	3	4	5	6
31.	Did you feel tired?	1	2	3	4	5	6

32. During the **past 4 weeks,** how much of the time has your **physical health or emotional problems** interfered with your social activities (like visiting with friends, relatives, etc.)?
Circle One Number)

All of the time(0)	1
Most of the time(25)	2
Some of the time(50)	3
A little of the time(75)	4
None of the time(100)	5

How TRUE or FALSE is **<u>each</u>** of the following statements for you.
(Circle One Number on Each Line)

		Definitely True(0)	Mostly True(25)	Don't Know(50)	Mostly False(75)	Definitely False(100)
33.	I seem to get sick a little easier than other people	1	2	3	4	5
35.	I expect my health to get worse	1	2	3	4	5
		(100)	(75)	(50)	(25)	(0)
34.	I am as healthy as anybody I know	1	2	3	4	5
36.	My health is excellent	1	2	3	4	5

APPENDIX –XII

Trail Resistration

Acknowledgement Number	REF/2019/05/025803
Last Modified On:	28/05/2019
Post Graduate Thesis	Yes
Type of Trial	Interventional
Type of Study	Physiotherapy (Not Including YOGA)
Study Design	Randomized, Parallel Group Trial
Public Title of Study	A clinical trial to study the effects of dry Needling and manual Therapy for the Management of Patients with Cervicogenic Headache.
Scientific Title of Study Clarification(s) with Reply Modification(s)	Dry Needling and Manual Therapy for the Management o Cervicogenic Headache.
Trial Acronym	
Secondary IDs if Any	**Secondary ID** / **Identifier**: NIL / NIL
Details of Principal Investigator or overall Trial Coordinator (multi-center study) Clarification(s) with Reply	**Name**: Ramesh Chandra Patra **Designation**: Ph.D Scholar **Affliation**: Lovely Professional University **Address**: Lovely Professional University.School Of Physiotherapy and paramedical science, Physiotherapy Department, Block no-3A, Room No-105 Same Kapurthala PUNJAB 144411 India **Phone**: 9653174563

APPENDIX- XIII

ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Vol 11, Issue 1, 2018

Online - 2455-3891
Print - 0974-2441

Research Article

EFFECTIVENESS OF C1-C2 SUSTAINED NATURAL APOPHYSEAL GLIDE COMBINED WITH DRY NEEDLING ON PRESSURE POINT THRESHOLD AND HEADACHE DISABILITY IN CERVICOGENIC HEADACHE

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Received: 02 September 2017, Revised and Accepted: 07 October 2017

ABSTRACT

Objective: The main objective of this study was to evaluate the effectiveness of dry needling and mulligan C1-C2 sustained natural apophyseal glides (SNAGs) in increasing pressure point threshold and reducing headache disability in patients with CGH.

Methods: This study was conducted on 150 patients. They were divided into three groups for the purpose of the study. Group A was referred to as the dry needling group. They were subjected to dry needling for treating the pain. Group B was the manual therapy group. The patients in this group were subjected to C1-C2 SNAGs. Group C was the combined group. Patients belonging to this group were given C1-C2 SNAGs along with dry needling.

Results: Statistical analysis paired t-test was used for comparison of the mean within every group where it showed significant improvement in all the parameter ($p<0.05$).

Conclusion: There was a consistent reduction in tenderness and improvement in disability of the patients belonging to all groups. However, Group C, where the patients were subjected to combined treatment, showed better results. Results of this study indicate that dry needling along with mulligan C1-C2 SNAGs is more beneficial in patients suffering from cervicogenic headaches.

Keywords: Cervicogenic headaches, Dry needling, C1-C2 sustained natural apophyseal glides, Pressure point threshold, Headache disability.

 DOI: http://dx.doi.org/10.22159/ajpcr.2018.v11i1.22349

APPENDIX- XIV

Volume 07, Issue 03, March 2019 UGC Journal No.: 64650

Efficacy of Myofascial Release Technique in Cervicogenic Headache

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ABSTRACT

INTRODUCTION: *Cervicogenic Headache has been reported to range from 15% to 20% among all other types of headaches. Based on recent findings, it can be expected that Myofascial Release (MFR) can help to reduce the tenderness and postural deviation in patients with cervicogenic headache.*

OBJECTIVE: *The objective of the study was to investigate the effect of MFR on tenderness and postural instability in the patients with cervicogenic headache.*

METHODS: *In this experimental study 20 patients with cervicogenic headache were treated with MFR. Treatment was given 4 days per week for 4 weeks, 20 minutes per session. Algometer was used to assess PPT and Wintrack was used to assess postural instability before and after the treatment protocol.*

RESULTS: *Statistical analysis was done using SPSS 16 version. Paired t test was used to compare the data before and after treatment. MFR lead to a significant improvement in PPT (from 4.8 to 8.2) $p<0.05$.Postural deviation in theantero -posterior direction with eyes open was significantly reduced (from 3.09 to 1.82) $p<0.05$butno significant improvement was noticed in latero- lateral direction ($p>0.05$).Also in eyes closed both the directions of postural deviation did not show any significant reduction.*

CONCLUSION:*Based on these findings, MFR can be recommended as an effective clinical method to reduce tenderness in patients with cervicogenic headache.*

Keywords: Cervicogenic headache, Pressure pain threshold, postural instability.

APPENDIX- XV

Volume 2, Issue 7, July– 2017 International Journal of Innovative Science and Research Technology
ISSN No: - 2456 – 2165

Effectiveness of Dry Needling on Pain and Range of Motion in Patients with Cervicogenic Headache

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Abstract—Cervicogenic headache is one of the most common musculoskeletal conditions in physical therapy practice. Almost 2-4% of the global population suffer from Cervicogenic headache . Mobilization and manipulation is the common intervention for the management of Cervicogenic headache . Although it is a musculoskeletal disorder but very little importance given on muscular system. Total 75 patients participated in this study and were divided into two groups first group-manual therapy group who were given C1-C2 SNAGs and second group-who were given a combination of dry needling and C1-C2 SNAGs. The parameters used for measurement were numeric pain rating scale(NPRS) and range of motion(ROM) measurement using universal goniometry.

system although some study suggested that multimodal treatment is more beneficial in neck disorder.[8,9] CGH is musculoskeletal condition. No study has been done manual therapy in combined with manual therapy.

II. METHODOLOGY

The study was conducted at Lovely Professional University Phagwara, Punjab. Total 94 subjects was assessed for the study. Both males and females at the age limit of 20-50 years were participated in this study those who fulfill the inclusion criteria which is published by IHS[1]. Ethical permission was taken from the university human ethical committee board. All the subjects were divided into two groups by simple

APPENDIX- XVI

World Academy of Science, Engineering and Technology
International Journal of Biomedical and Biological Engineering Vol:4, No:8, 2017

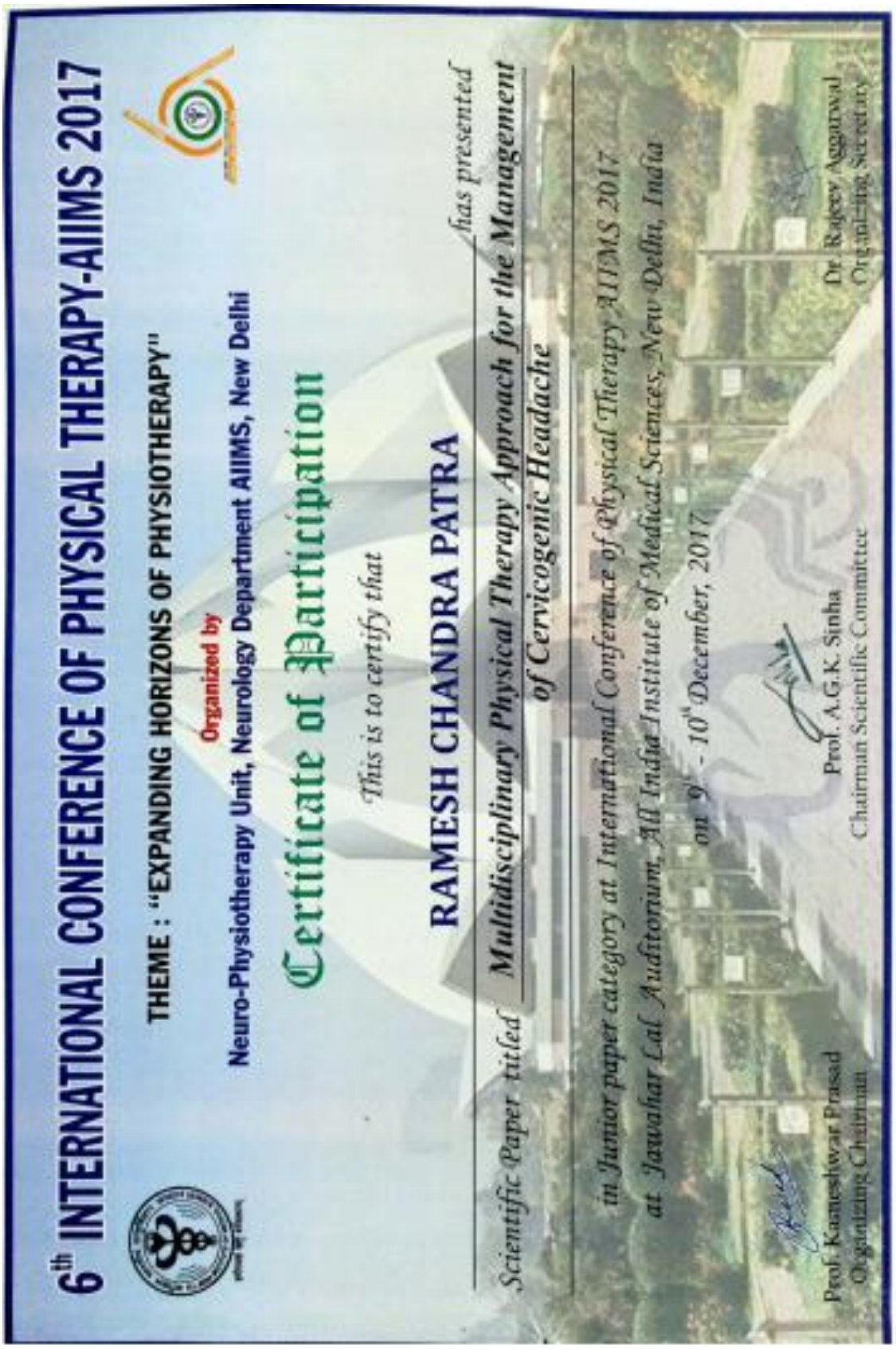
Effectiveness of Dry Needling on Pain and Pressure Point Threshold in Cervicogenic Headache

Authors : Ramesh Chandra Patra, Ajay P. Gautam, Patitapaban Mohanty

Abstract : Headache disorders are one of the 10 most disabling conditions for men and women. Headache that originated from upper cervical spine and refereed to the one side of the head and/or face is known as cervicogenic headache (CH) which constitute15% to 20% among all the headaches. In our best knowledge manual therapy is often advocated for managing CH, but very little focus given on muscle system although it is a musculoskeletal disorder. In this study, 75 patients with CH were selected and divided into two groups Group A: Manual therapy and Group B: dry needling along with manual therapy group. Assessment was done using NPRS (0-10) for pain, wide spread pressure pain threshold using an algometer at the beginning and end of the study. There is a consistent reduction in pain and tenderness in both the group but significant improvement was shown in combined group. Outcome of the study has explored that the effectiveness of dry needling along with Mulligan is more beneficial in patients with cervicogenic headaches.

Keywords : cervicogenic headaches, dry needling, NPRS, pressure point threshold
Conference Title : ICCMMM 2017 : 19th International Conference on Computational and Mathematical Methods in Medicine
Conference Location : Bangkok, Thailand
Conference Dates : August 30-31, 2017

APPENDIX- XVII



APPENDIX- XVIII

International Conference on Multidisciplinary Research in Science, Engineering, Management, Education & Humanities

Certificate

This certificate acknowledges and honours

Prof./ Dr./ Mr./ Ms. Patra Ramesh Chandra

for participating & presenting his/her paper on

Efficacy of Myofascial Release Technique in Cervicogenic Headache

in

International Conference on Multidisciplinary Research in Science, Engineering, Management, Education & Humanities

Held on 6th -7th April 2019 at

(P.G. Department of Mathematics)

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HOD Rajinder Pal Kaur

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