ijlpr 2023; doi 10.22376/ijlpr.2023.13.6.L158-L170

International Journal of Life science and Pharma Research

ISSN 2250-0480

Research Article

Muscle Energy Technique Effects On Pain, Cervical Range of Motion, and Functional Disability

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Abstract: An unfavorable sensory or emotional encounter connected to actual or potential tissue injury is referred to as neck pain, and it affects the region of the neck between the superior nuchal line and the first thoracic spinous process. Mechanical neck pain often commences insidiously and is of multifactorial etiology, causing disability and clinical symptoms. It is a comparative study where 30 male and female subjects were assessed and identified with Mechanical Neck Pain, recruited for the study, and randomly divided into two groups with 15 subjects in each group. Outcome measures were the Visual Analogue Scale (VAS), goniometer, and neck disability index (NDI). Pre-Test and Post-Test were carried out for both groups and analyzed using paired 't-tests and independent 't-tests in an IBM SPSS statistics 26 software. This study aimed to compare the effectiveness of muscle energy technique with conventional therapy vs. kinesio taping with conventional therapy in chronic mechanical neck pain, cervical range of motion, and functional disability of the neck. KT provides sensory feedback, tension, and afferent stimulation to reduce pain and improve ROM. It also helps in lymphatic and vascular flow and corrects misaligned structures. Muscle energy technique and Kinesio taping showed significant improvement in VAS, Goniometer, and NDI in mechanical neck pain patients, making them suitable for inclusion in mechanical neck pain treatment.

Keywords: Mechanical neck pain, Muscle energy technique, Kinesio taping, VAS, Neck Disability Index, cervical musculature

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Received On 8 August, 2022

Revised On 19 April, 2023

Accepted On 30 May, 2023

Published On 1 November, 2023

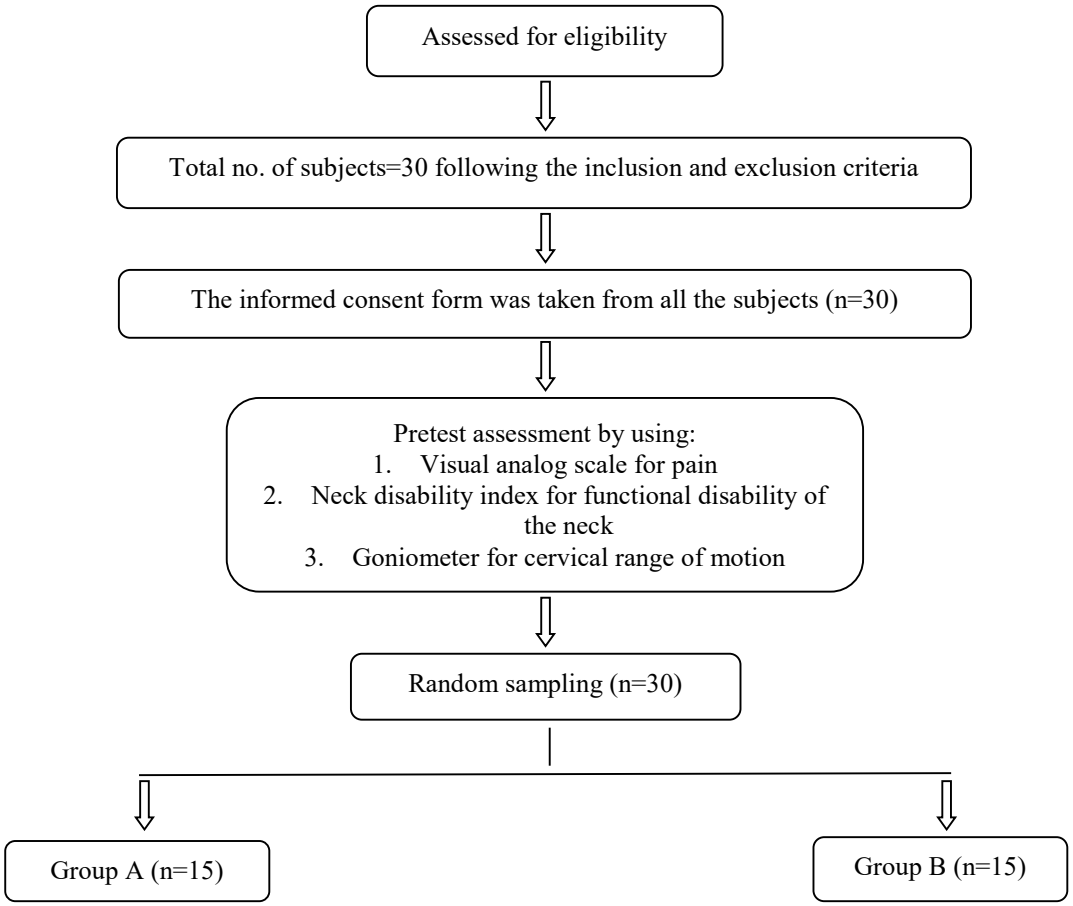
Funding This research did not receive any specific grant from any funding agencies in the public, commercial or not for profit sectors.

Citation Ayang Kino, Abhijit Dutta, Pompy Mahato and Abhijit Kalita , Muscle Energy Technique Effects On Pain, Cervical Range of Motion, and Functional Disability.(2023).Int. J. Life Sci. Pharma Res.13(6), L158-L170 http://dx.doi.org/10.22376/ijlpr.2023.13.6.L158-L170

1. INTRODUCTION

Neck pain is "an unpleasant sensory and emotional experience associated with actual or potential tissue damage" in the neck area between the superior nuchal line and the first thoracic spinous process level [1-3]. Neck pain can be categorized in many ways based on: 1. Duration: Acute= <6 weeks, Sub acute= equals to or < 3 months, Chronic = >3 months 2. Severity: Mild, Moderate, and Severe[3]. Etiology/Structure Type: Mechanical and Neuropathic[4,5] Mechanical neck pain is caused by various factors, such as poor posture, anxiety, depression, neck strain, and sporting or occupational activities.[7,8]. According to Panjabi et al. [9], the neck musculature contributes 80% to the mechanical stability of the cervical spine. In comparison, the osteoligamentous system contributes the remaining 20% to the mechanical stability of the cervical spine. It is hypothesized that when muscle performance is impaired, the balance between the stabilizers on the posterior aspect of the neck will be disturbed, resulting in loss of proper alignment and posture, which further likely contributes to cervical impairment [10]. The most common muscles to be impaired in the cervical region are the upper trapezius, levator scapulae, cervical erector spinae, scalene, and sternocleidomastoid muscles[11]. Neck pain is the 4th leading cause of disability, ranking after Back pain, Depression, and Arthralgia, according to the Global Burden of Disease 2010 study[12]. The prevalence of Neck pain in the general population ranges from 16.7% to 75.1%, with a mean of 37.2% and a lifetime prevalence of 48.5%[2,13]. Chronic neck pain is estimated to affect 10%-20% of the population annually, with a global prevalence of 4.9%[22]. Since 1990, in India, neck pain has increased by 19.1% by an average of 0.8% a year. Neck pain prevalence is higher in females than males, i.e.41.7 vs. 34.4%, and is most prevalent in middle age [2,15,16]. Neck pain is multifactorial, with physical and psychosocial factors contributing to its cause.[17-21]. Mechanical neck pain results from hypertonic posterior cervical muscles that may occur due to sustained partial neck flexion when reading, writing, operating a computer terminal for prolonged periods, sewing, holding a stooped posture, or by gross trauma [22]. It is common in individuals who perform manual activities above shoulder level, use vibrating tools, and remain sitting or standing with a bent neck for a prolonged period[23]. In sports , neck pain is common that involve maintaining flexed postures for a prolonged time and are at higher risk [24]. Physical intervention includes physical modalities, exercises, manual therapy, and posture correction.[25,-,27]. Muscle Energy Technique (MET) is an active muscle-based manual therapy that involves the voluntary contraction of the patient's muscle energy in the form of gentle isometric contraction in a precisely controlled direction against the counterforce the therapist applies. MET is based on the principle of autogenic and reciprocal inhibition. The benefits of using MET are: relieves pain, stretches tight muscles and fascia, reduces muscle tonus, improves local circulation, strengthens weak musculature, induces muscle relaxation, and mobilizes joint restrictions. MET helps achieve tonus release of a muscle before stretching via isometric contraction of the affected muscle by producing post-isometrics relaxation [11,28-30]. PIR is a muscle energy technique used to relax and lengthen shortened or hypertonic muscles, leading to muscle imbalances and restricting the range of motion.[11,31]. Kinesio tape is a passive intervention method used for the conservative management of musculoskeletal disorders. It is stretchable and can be stretched up to 120-140% of its original length, making it wearable for multiple days.[32-38]. Kinesio tape can correct muscle function, improve blood flow, reduce pain, correct misaligned joints, and induce muscle relaxation to provide support and stability.[32,35,39,40].

2. MATERIALS AND METHODS



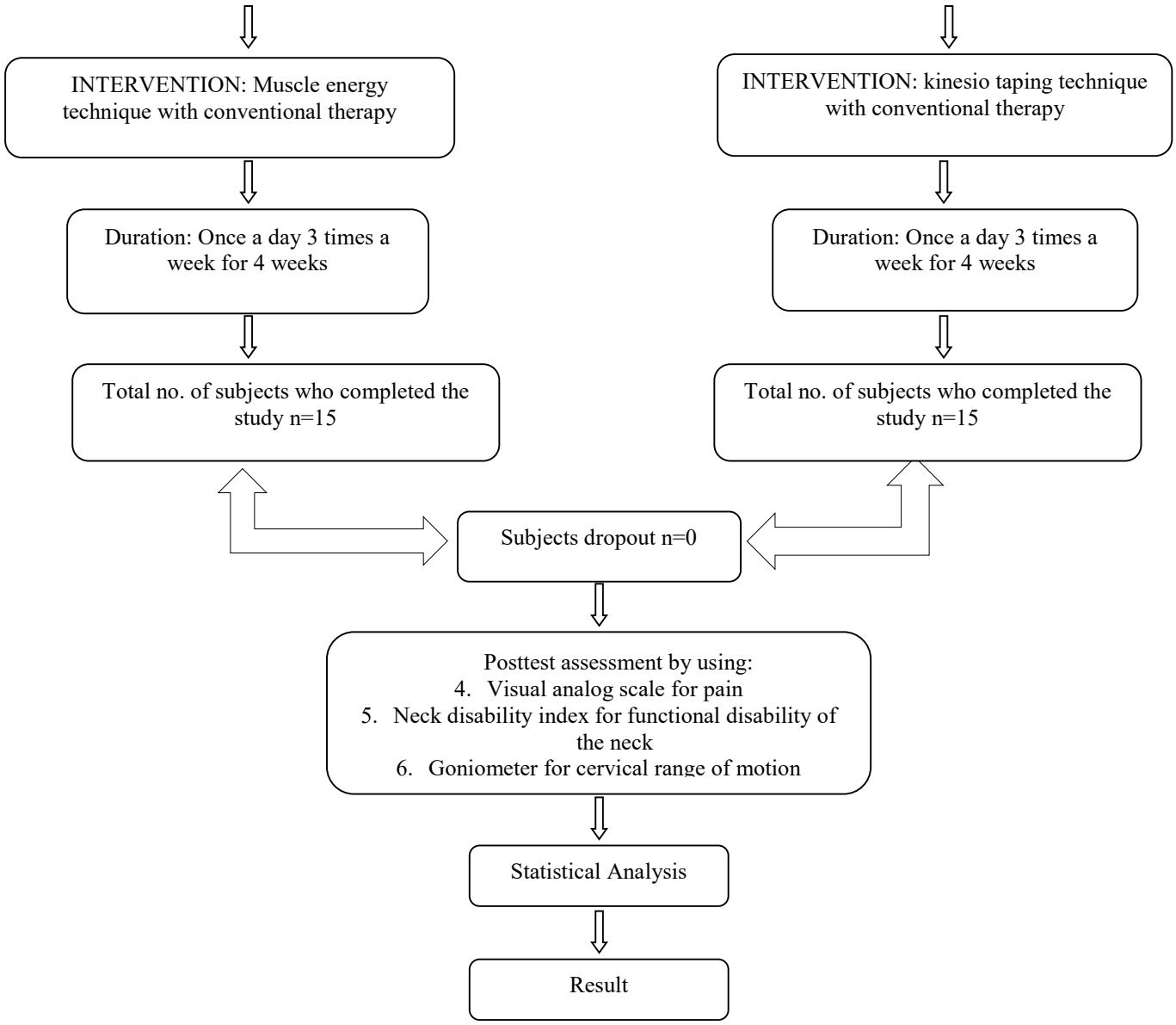


Fig: 1. Flow diagram showing the subjects' progress at each stage.

2.1. Study design

The study was a comparative study approved by the Institutional Research and ethical committee (AdtU/Ethics/stunt-lett/2022/37). Therefore, all the experimental procedures were in accordance with the University's guidelines.

2.2. Participants

A Total of 30 subjects fulfilling the inclusion criteria were allocated into Group-A and Group-B, where Group-A (n=15) received muscle energy technique with conventional therapy and Group B (n=15) received kinesio taping with conventional therapy. This study was conducted in the Department of Physiotherapy, Down Town Hospital Guwahati.

2.3. Inclusion criteria

Age of18-45 years, both genders were enrolled (i.e., male and female), Subjects suffering from neck pain for at least 3 months, Hypo-mobility of the cervical range of motion due to pain, muscle spasm, and muscle tightness, Nondiscogenic mechanical neck pain, and neck stiffness.

2.4. Exclusion criteria

History of cervical spine fractures or trauma, a history of cervical spine surgeries in the last 12 months, a whiplash injury history, signs of major diseases, such as cancer, inflammatory diseases, cervical radiculopathy or myelopathy symptoms basilar insufficiency, vascular syndrome, Any skin condition or allergy, such as eczema, having been given a fibromyalgia syndrome diagnosis, Toricollis, Sprengel's deformity, etc. Scoliosis, patients who don't cooperate.

2.5. Procedure

The subjects were divided into Group-A and Group-B, Group-A (Muscle energy technique along with conventional therapy) and Group-B (Kinesio therapy along with conventional therapy), comprising 15 subjects in each group. Home exercise programs were incorporated for both groups. Those fulfilling the criteria were explained in detail about the purpose of the study, and a written consent form was obtained from each subject. Demographic data, Pre-test and Post-test for both Group-A and Group-B by Visual Analogue Scale (VAS) [41] for assessing pain, NDI[44] for functional disability of the neck, and Goniometer[45] for cervical range of motion were collected and assessed for each subject. The data about the outcome

measures were collected on day 0 and week 4 of the intervention.

2.6. Outcome Measures

2.6.1. Pain Intensity Measured by VAS

VAS measured subjective pain intensity. VAS is considered a reliable and valid tool for measuring the pain level. VAS with a 5-point verbal descriptive scale (nil, mild, moderate, severe, and very severe) was used [41].

2.6.2. Neck disability index

NDI is designed to measure disability in activities of daily living due to neck pain. This functional scale consists of 10 sections containing 10 functional activities. NDI is a valid and reliable test, specifically for neck pain [44].

2.6.3. Cervical ROM by universal goniometer

Universal Goniometer was used to assess cervical ROM. Goniometric measurement has been seen to have a greater intra-tester reliability. The goniometer was situated on the forehead to measure side bending, just above the ear to measure flexion and extension, and on the vertex to measure rotation[45].

2.7. Intervention

Group-A Received Muscle energy technique along with conventional therapy, and Group B received Kinesio taping along with conventional therapy. Both groups received 12 treatment sessions each with the frequency of 3 sessions in the Physiotherapy department, Down Town Hospital, Guwahati, and Assam Downtown University, Panikhaiti.

2.8. Group A: Muscle energy technique

The PIR technique was applied in a supine lying position with the head free from the couch or treatment table and held by the therapist's hand while the therapist was sitting on a stool at the head of the treatment table. The head was initially positioned so that the stretched muscle was in a lengthened position; the therapist applied isometric resistance to the action of the tight muscle and held for 7 seconds with gentle muscle contraction to avoid the risk of increasing the muscle tone while breathing in with hold his breath during contraction. Next, the patient was asked to breathe out and relax for 3 seconds, then applied static stretching in the opposite direction for 30 sec. The procedure was repeated three times for each muscle bilaterally[11].

2.8.1. Post isometric relaxation for upper fibers of trapezius

While the head and neck were flexed, and the side bent away from the side being treated to just short of the restriction barrier with stabilization of the shoulder with one hand and the ipsilateral mastoid process with the other hand. The patient was asked to take the stabilized shoulder toward the ear, the ear toward the shoulder against resistance from both sides and to breathe in and hold his breath for 7 seconds. Then the patient was asked to breathe out and relax for 3 seconds, and the shoulder was stretched caudally for 30 Seconds[11](Fig 2).

2.8.2. Post-isometric relaxation for levator scapulae

The therapist supported the neck in flexion, contralateral side bending, and rotation with one hand. The other hand was placed on the patient's ipsilateral shoulder. The patient was asked to extend the head backward, slightly to the side from which it was turned, elevate the ipsilateral shoulder, breathe in, and hold his breath for 7 seconds. The therapist's other hand applied resistance against the shoulder elevation for 7 seconds, and the patient was asked to breathe out and relax for 3 seconds; the neck was taken to further flexion, side bending, and rotation, where it was maintained as the shoulder was depressed caudally with the patient's assistance for 30 seconds[11](fig 3).

Fig: 2. MET for upper trapezius

Fig: 3. MET for levator scapulae

2.9. Group B: Kinesio taping

The patient would be in a high sitting position with the back straight and relaxed, on a sitting stool or a treatment couch. A 50 × 0.5 mm waterproof, porous, adhesive kinesio tape will be used. The first layer of tape, a Y-strip, was placed over the posterior cervical extensor muscles, from the insertion to the origin, by stretching it 15% to 25% of its original length. Next, each tail of the first strip was applied with the patient's neck bending and rotating to the opposite side from the dorsal (T1-T2) to the upper cervical region (C1-C2). Next, the overlying tape, spaced-strip with openings, was placed perpendicular to the Y-strip, over the mid-cervical region (C3-C6), with the patient's cervical spine in flexion to apply tension to the posterior structures. This taping technique is commonly used in physical therapy to support and stabilize the cervical spine, especially in patients with neck pain or injury. In addition, the Y-strip and the spaced-strip combination help to improve proprioception and reduce pain during movement.[8] (fig 4).

Fig 4. Kinesio taping application

2.10. Conventional therapy

2.10.1. Moist heat fomentation

The patient was made to sit comfortably on a chair. Next, a hydro-collator pack is heated, wrapped in a towel, and placed on the affected side of the shoulder for about 15-20 minutes.

2.10.2. Neck isometrics exercise

Isometric exercises were performed in the seated position by resistance applied by the therapist at the forehead (cervical flexion, extension, rotation, and side bending) for 10 sec holds for 10–15 repetitions after the intervention.

2.10.3. Home exercise Program(HEP)

Patients in both groups would be taught a home-based standardized exercise program consisting of stretching and strengthening the neck and upper back muscles, reeducation of neutral posture, and retraining the scapular muscles. 10 repetitions of one set daily for each exercise with 5 weekly sessions for 4 weeks.

3. DATA ANALYSIS AND INTERPRETATIONS

Reported data were analyzed using IBM Statistical Package for social sciences (SPSS) Statistics 26 software. Mean, and standard deviation was calculated for quantitative variables, i.e., age, height, weight, BMI, pain intensity scale, cervical range of motion, and functional neck disability index. Frequency and percentage were calculated for qualitative variables, i.e., gender. Analysis of variance was done at the baseline and at the end of the intervention, i.e., after 4 weeks, to assess baseline and post-intervention differences between the groups. Differences in pain intensity scale, cervical range of motion, and functional neck disability index between groups A and B were compared using an independent t-test. A mean comparison of pre and post-intervention values was made by

using paired t-test. Statistical significance was set at $P < 0.05$. P value > 0.05 was considered a non-significant difference, while P value ≤ 0.05 was considered to have represented a significant difference.

4. RESULTS AND OBSERVATIONS

Table 1: Demographic characteristics of participants

	Group A	Group B	Comparison	
	Mean ± SD	Mean ± SD	t	p
Age	30.2667 ± 6.69186	29.5333±7.36659	.285	.777
Height (cm)	155.8400 ± 17.47491	158.2800± 19.055	-.366	.717
Weight (kg)	56.7333 ± 7.60138	63.133± 10.80917	-1.876	.071
Body Mass Index	23.8933 ± 5.08070	25.4533± 3.70807	-.961	.346

As indicated by the independent t – test, there were no statistically significant differences ($p>0.05$) between participants in both the groups concerning age, height, weight and body mass index (BMI) as shown in table above.

Table 2: Baseline Characteristics

	Group A	Group B
Duration (d)	28	28
Age (y)	30.2667 ± 6.69186	29.5333±7.36659
Height (cm)	155.8400 ± 17.47491	158.2800± 19.055
Weight (kg)	56.7333 ± 7.60138	63.133± 10.80917
Body Mass Index	23.8933 ± 5.08070	25.4533± 3.70807
Males (n)	6	7
Females (n)	9	8
Visual Analog Scale	6.9333± .88372	7.0000± 1.06904
Flexion	30.8000± 4.78390	30.1333± 4.85308
Extension	31.9333± 8.41314	31.6000± 8.38195
Lateral Flexion (Right)	14.1333± 3.27036	14.3333± 3.41565
Lateral Flexion (Left)	14.2667± 2.91466	14.2667± 2.91466
Rotation (Right)	37.5333± 5.12510	36.5333± 5.02660
Rotation (Left)	33.9333± 4.51136	33.0667± 3.84460
Neck Disability Index	40.6000± 7.19921	41.3333± 7.38402

In the study, 30 subjects were selected by random sampling method and then allocated in Group A (treated with muscle energy technique) and Group B (treated with kinesio taping technique). In Group A, mean age was 30.26 years ranging from 21 to 43 years. In Group B, mean age was 29.53 years ranging from 19 to 42 years.

Table 3: Distribution of the patients according to their age

Age	Group A		Group B	
	Frequency	Percent	Frequency	Percent
15 – 20 Years	0	0.0	1	6.7
20 - 25 Years	3	20.0	3	20.0
25-30 Years	5	33.3	4	26.7
30-35 Years	3	20.0	3	20.0

35 -40 Years	2	13.3	2	13.3
40 – 45 Years	2	13.3	2	13.3
Total	15	100.0	15	100.0

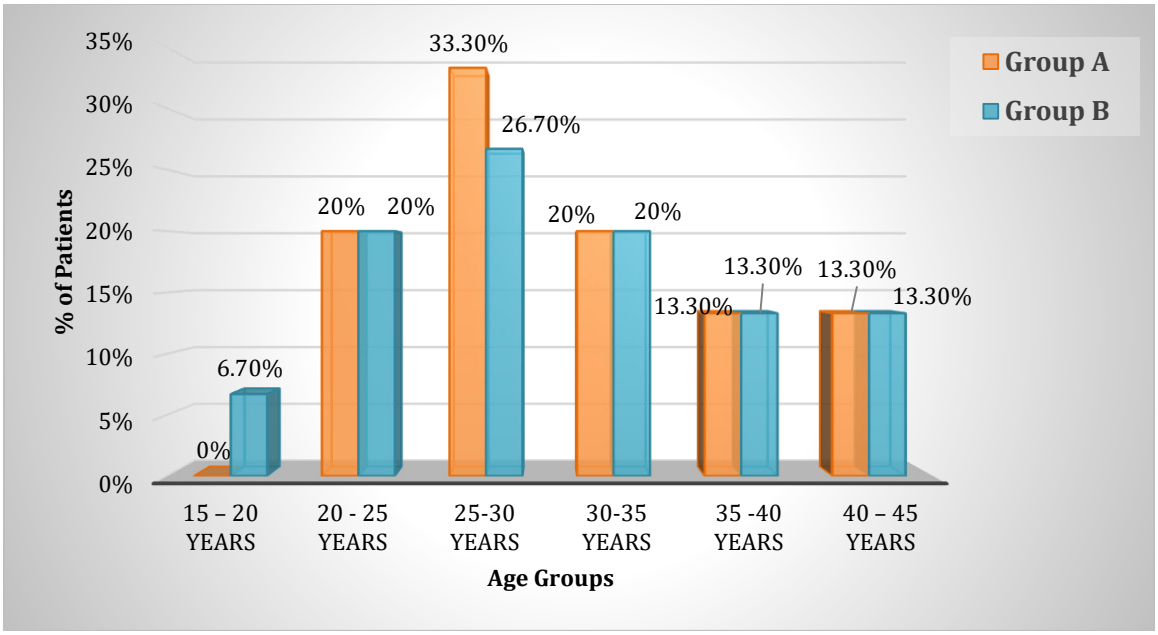


Fig 5: Age distribution of the patients in Group A and Group B

Table 4: Distribution of the patients according to their gender:

Gender	Group A		Group B	
	Frequency	Percent	Frequency	Percent
Female	9	60.0	8	53.3
Male	6	40.0	7	46.7
Total	15	100.0	15	100.0

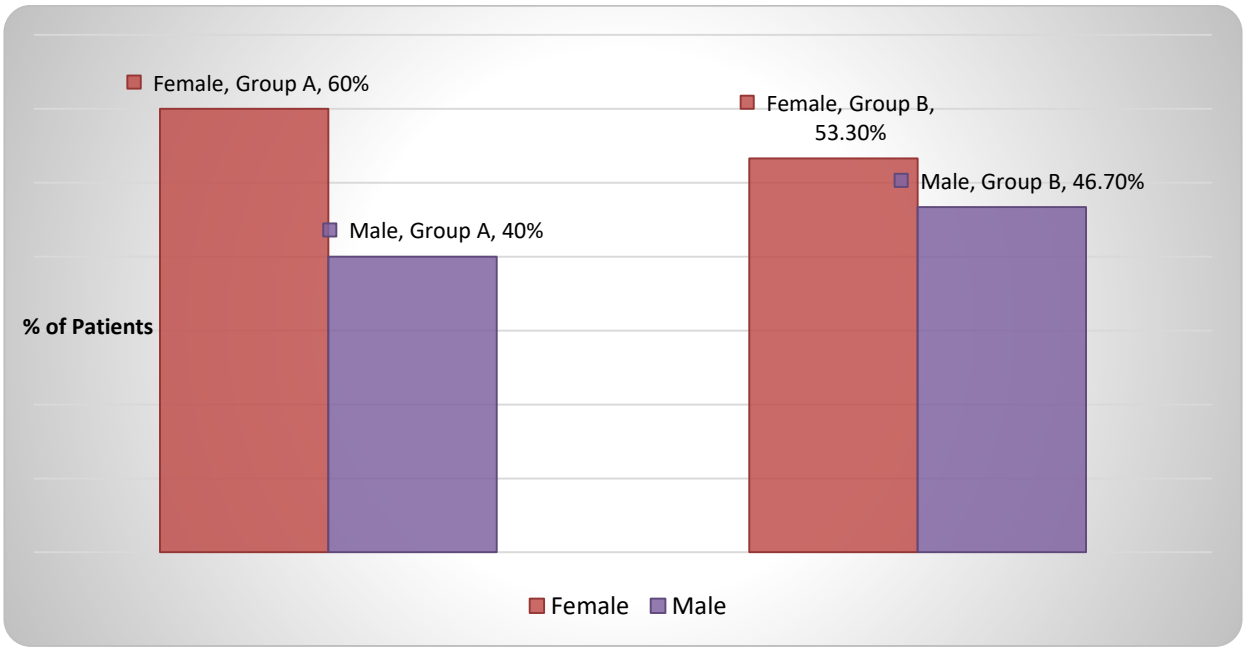


Fig 6: Gender distribution of the patients in Group A and Group B

Table 5: To find out whether muscle energy technique along with conventional therapy can improve chronic mechanical neck pain, cervical range of motion, and functional disability of the neck

Measures		Mean	N	Std. Dev	t	df	p
Visual Analogue Scale	Before Treatment	6.9333	15	.88372	20.949	14	0.00**
	After Treatment	.5333	15	.99043			
Flexion	Before Treatment	30.8000	15	4.78390	-6.683	14	0.00**
	After Treatment	37.6667	15	2.12692			
Extension	Before Treatment	31.9333	15	8.41314	-6.679	14	0.00**
	After Treatment	45.4000	15	3.86929			
Lateral Flexion (Right)	Before Treatment	14.1333	15	3.27036	-8.844	14	0.00**
	After Treatment	20.8000	15	1.82052			
Lateral Flexion (Left)	Before Treatment	14.2667	15	2.91466	-8.035	14	0.00**
	After Treatment	21.0667	15	1.66762			
Rotation (Right)	Before Treatment	37.5333	15	5.12510	-7.696	14	0.00**
	After Treatment	47.2000	15	3.25576			
Rotation (Left)	Before Treatment	33.9333	15	4.51136	-7.177	14	0.00**
	After Treatment	44.2667	15	5.37809			
Neck Disability Index	Before Treatment	40.6000	15	7.19921	23.876	14	0.00**
	After Treatment	2.2667	15	2.60403			

NS: Not Significant; *: Significant at 5%; **: Significant at 1%

The above table shows the effectiveness of the muscle energy technique and conventional therapy in chronic mechanical neck pain, cervical range of motion, and functional disability of the neck. In addition, paired t-test was performed to see the significant difference in VAS, flexion, extension, lateral flexion (right), lateral flexion (left), rotation (right), rotation (left), and neck disability index before and after treatment of muscle energy technique.

Table 6: To find out whether kinesio taping along with conventional therapy can improve chronic mechanical neck pain, cervical range of motion, and functional disability of the neck

Measures		Mean	N	Std. Dev	t	df	p
Visual Analogue Scale	Before Treatment	7.0000	15	1.06904	23.482	14	0.00**
	After Treatment	.6000	15	.91026			
Flexion	Before Treatment	30.1333	15	4.85308	-6.376	14	0.00**
	After Treatment	37.8667	15	2.19957			
Extension	Before Treatment	31.6000	15	8.38195	-6.418	14	0.00**
	After Treatment	45.6667	15	4.16905			
Lateral Flexion (Right)	Before Treatment	14.3333	15	3.41565	-7.218	14	0.00**
	After Treatment	20.9333	15	1.66762			
Lateral Flexion (Left)	Before Treatment	14.2667	15	2.91466	-8.367	14	0.00**
	After Treatment	20.9333	15	1.66762			
Rotation (Right)	Before Treatment	36.5333	15	5.02660	-8.410	14	0.00**
	After Treatment	47.8000	15	2.48424			
Rotation (Left)	Before Treatment	33.0667	15	3.84460	-9.498	14	0.00**
	After Treatment	45.1333	15	4.67312			

Neck Disability Index	Before Treatment	41.3333	15	7.38402	24.682	14	0.00**
	After Treatment	2.7333	15	3.51460			

NS: Not Significant; *: Significant at 5%; **: Significant at 1%

The above table is constructed to see the effectiveness of Kinesio taping and conventional therapy in chronic mechanical neck pain, cervical range of motion, and functional disability of the neck. In addition, paired t-test was performed to see the significant difference in VAS, Flexion, Extension, lateral Flexion (right), lateral Flexion (left), rotation (right), rotation (left), and neck disability index before and after treatment of Kinesio taping.

Table 7: Comparing mean value for the measured outcome pre-treatment for both groups

Measures	Technique	N	Mean	Std. Dev.	t	df	p
Visual Analogue Scale	Muscle energy technique (group A)	15	6.9333	.88372	-.186	28	.854
	Kinesio Taping (group B)	15	7.0000	1.06904			NS
Flexion	Muscle energy technique (group A)	15	30.800	4.78390	.379	28	.708
	Kinesio Taping (group B)	15	30.133	4.85308			NS
Extension	Muscle energy technique (group A)	15	31.933	8.41314	.109	28	.914
	Kinesio Taping (group B)	15	31.600	8.38195			NS
Lateral Flexion (Right)	Muscle energy technique (group A)	15	14.133	3.27036	-.164	28	.871
	Kinesio Taping (group B)	15	14.333	3.41565			NS
Lateral Flexion (Left)	Muscle energy technique (group A)	15	14.266	2.91466	.000	28	1.000
	Kinesio Taping (group B)	15	14.266	2.91466			NS
Rotation (Right)	Muscle energy technique (group A)	15	37.533	5.12510	.540	28	.594
	Kinesio Taping (group B)	15	36.533	5.02660			NS
Rotation (Left)	Muscle energy technique (group A)	15	33.933	4.51136	.566	28	.576
	Kinesio Taping (group B)	15	33.066	3.84460			NS
Neck Disability Index	Muscle energy technique (group A)	15	40.600	7.19921	-.275	28	.785
	Kinesio Taping (group B)	15	41.333	7.38402			NS

NS: Not Significant; *: Significant at 5%; **: Significant at 1%

The table above compares the chronic mechanical neck pain, cervical range of motion, and functional disability of the neck of the patients before they were treated with muscle energy technique and conventional therapy and Kinesio taping conventional therapy. In addition, an Independent t-test was performed to compare chronic mechanical neck pain, cervical range of motion, and functional disability of the neck.

Table 8: Comparing the mean value of both groups post-treatment

Measures	Technique	N	Mean	Std. Dev.	t	df	p
Visual Analogue Scale	Muscle energy technique (group A)	15	.5333	.99043	-.192	28	.849
	Kinesio Taping (group B)	15	.6000	.91026			NS
Flexion	Muscle energy technique (group A)	15	37.666	2.12692	-.253	28	.802
	Kinesio Taping (group B)	15	37.866	2.19957			NS
Extension	Muscle energy technique (group A)	15	45.400	3.86929	-.182	28	.857
	Kinesio Taping (group B)	15	45.666	4.16905			NS
Lateral Flexion (Right)	Muscle energy technique (group A)	15	20.800	1.82052	-.209	28	.836
	Kinesio Taping (group B)	15	20.933	1.66762			NS
Lateral Flexion (Left)	Muscle energy technique (group A)	15	21.066	1.66762	.219	28	.828

	Kinesio Taping (group B)	15	20.933	1.66762			NS
Rotation (Right)	Muscle energy technique (group A)	15	47.200	3.25576	-.567	28	.575
	Kinesio Taping (group B)	15	47.800	2.48424			NS
Rotation (Left)	Muscle energy technique (group A)	15	44.266	5.37809	-.471	28	.641
	Kinesio Taping (group B)	15	45.133	4.67312			NS
Neck Disability Index	Muscle energy technique (group A)	15	2.2667	2.60403	-.413	28	.683
	Kinesio Taping (group B)	15	2.7333	3.51460			NS

NS: Not Significant; *: Significant at 5%; **: Significant at 1%

The table above compares the chronic mechanical neck pain, cervical range of motion, and functional disability of the neck of the patients after they were treated with muscle energy technique and conventional therapy and Kinesio taping conventional therapy. In addition, an Independent t-test was performed to compare chronic mechanical neck pain, cervical range of motion, and functional disability of the neck.

After comparing VAS in both groups, t = -.192 was found, which is insignificant. Hence, the VAS of the patients of both groups was equal after treatment.

For ROM,

After comparison of Flexion in both groups: It was found that t = -.253, which is insignificant. Hence, the Flexion of the patients of both groups was equal after treatment.

After comparison of Extension in both groups: It was found that t = -.253, which is insignificant. Hence, the Extension of the patients of both groups was equal after treatment.

After comparing Lateral Flexion (Right) in both groups: It was found that t = -.209, which is insignificant. Hence, the lateral Flexion (right) of the patients of both groups was equal after treatment.

After comparing Lateral Flexion (Left) in both groups: It was found that t =0.219, which is insignificant. Hence, the lateral Flexion (left) of the patients of both groups was equal after treatment.

After comparison of Rotation (Right) in both groups: It was found that t = -.567, which is insignificant. Hence, the rotation (right) of the patients of both groups was equal after treatment.

After comparison of Rotation (Left) in both groups: It was found that t = -.471, which is insignificant. Hence, the rotation (left) of the patients of both groups was equal after treatment.

After comparing the Neck Disability Index in both groups: It was found that t = -.413, which is insignificant. Hence we may conclude that the neck disability index of the patients of both groups was equal after treatment. Therefore, it can be concluded that the techniques, viz., muscle energy technique and kinesio taping, were equally effective in decreasing chronic mechanical neck pain, cervical range of motion, and functional disability of the neck of the patients.

5. DISCUSSION

Mechanical neck pain can be defined as generalized neck and shoulder pain with mechanical properties, which includes symptoms developed by sustained neck postures, neck movement, or by palpation of the muscles around the neck. The nature of mechanical neck pain is insidious and is generally multifactorial, which includes: poor posture, anxiety, depression, muscle tightness, sports, or occupational activities[7,8]. In addition, postural muscles often become short and tight due to our daily activities, which can lead to muscle imbalances that can further limit the ROM and can cause joint restrictions[11,31] The most common muscles to be impaired in the cervical region are the upper trapezius, levator scapulae, cervical erector spinae, scalene, and sternocleidomastoid muscles[11]. This study was designed to compare the efficacy of muscle energy technique when given along with moist heat therapy and neck isometric strengthening exercise vs. kinesio taping along with moist heat therapy and neck isometric strengthening exercise in patients with chronic mechanical neck pain by measuring VAS for neck pain, neck ROM with the help of Goniometer and NDI for a neck disability. Each group consisted of 15 randomly assigned subjects, and each subject completed their therapy session. Therefore, no dropouts were recorded. Pretest was taken for all 30 subjects before intervention and posttest after completion, i.e., after 4 weeks. The results of the current study showed that adding MET in the form of PIR to traditional conventional therapy (moist heat therapy and isometric neck strengthening) significantly improved the effect of treatment on pain, cervical ROM, and functional disability in patients with chronic MNP. The results of this study agree with previous studies that showed that the PIR has a significant effect in the reduction of pain and increase of ROM and improves the functional disability in the neck area or other areas of the body[11,31,42-43,46-51]. MET is based on the physiological principles of PIR and reciprocal inhibition. The effect of PIR reduces the tone of a muscle or group of muscles, followed by isometric contraction. Pain reduction followed by PIR is due to the inhibitory Golgi tendon reflex, which activates during isometric contraction and induces reflex relaxation of the muscle[29]. Pain reduction followed by an isometric contraction can be due to an increased level of endorphin that usually occurs after training and finer neuromuscular control. Isometric contraction activates muscle stretch receptors. These receptors cause the release of endogenous opioids and beta-endorphin from the pituitary gland, which may cause pain reduction[52]. Improvement in ROM can be explained based on a physiological mechanism that changes muscle extensibility. It further increases muscle length by integrated creep and plastic change of the connective tissue [53]. Increased ROM followed by PIR is mainly due to the effect of autogenic inhibition. The inhibitory effect of the Golgi tendon reflex activates during isometric contraction of the muscle, which leads to reflex relaxation of the muscle and reduces muscle spasm and tightness; thereby, ROM improves [54]. The result of this study reveals that KT, along with conventional therapy (moist heat therapy and neck isometric strengthening), significantly improved the effect of treatment on pain, cervical ROM, and functional disability in patients with

chronic MNP. The results of this study agree with the results of Takasaki et al.' [55]which concluded that both tensioned and non-tensioned taping across the UT muscle reduced its activity during a standardized typing task in healthy participants without interfering with typing performance. Paolini et al. [56] showed the efficacy of KT on lumber muscle activities and low back pain. Dawood et al.[57] concluded that KT significantly affects cervical curves in patients with MND. Some studies also suggest the influence of KT on neck or shoulder pain [58,59]. It may be possible that the application of KT provides proper sensory feedback to the patients, decreasing the fear of movement and thus improving ROM. When KT is applied over the skin, it creates some tension which lifts the skin relieving the pressure on the pain-sensitive structures and decreasing nociceptive stimuli. Traction from the tape also produces afferent stimuli facilitating pain-inhibiting mechanisms, leading to a reduction of the pain level of the patient. In addition, KT helps in lymphatic and vascular flow and also helps in the correction of possible misaligned articular structures [8,39]. Therefore both the techniques, viz., muscle energy technique and kinesio taping, were equally effective in decreasing chronic mechanical neck pain, cervical range of motion, and functional disability of the neck of the patients.

6. CONCLUSION

Both (Muscle energy technique and conventional therapy) and (Kinesio taping along with conventional therapy) showed improvement post-treatment. Hence, this study can be concluded that the intervention given in both the groups, i.e., group-A a (Muscle energy technique along with conventional therapy) and Group B (Kinesio taping along with conventional therapy), showed significant improvement in VAS in terms of pain, in Goniometer in terms of cervical range of motion and NDI in terms of functional disability of the neck. Furthermore, these techniques were easy to apply to chronic mechanical neck pain patients. So, it can be further recommended to include it in the Mechanical neck pain treatment regime.

7. AUTHORS CONTRIBUTION STATEMENT

Ayang Kino, MPT Scholar, carried out the research work in data collection and literature review and prepared the thesis as a part of the curriculum of Masters in Physiotherapy. Dr. Abhijit Dutta, Associate Professor, Assam Down Town University, guided as the main supervisor in the study along with methodology, result analysis, and discussion. Dr. Pompy Mahato, Assistant Professor, Dept. of Physiotherapy, helped review the literature and the methodology of the research work. Dr Abhijit Kalita helped in reviewing the final draft of the manuscript. Finally, all the authors read and approved the final version of the manuscript.

8. LIMITATION

The duration of the treatment was short, consisting of 4 weeks, the result only showed short-term effects of the interventions, there was no follow-up for the interventions, and the sample size was small (Group A, n = 15; Group B, n = 15) which may not be representative of the entire population of individuals with MNP, all measurements were taken manually, and this may introduce human error which could affect the reliability of the study, the intervention was given only to upper trapezius and levator scapulae muscle.

9. CONFLICT OF INTEREST

Conflict of interest declared none.

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