



“EFFECTIVENESS OF MUSCLE ENERGY TECHNIQUE AND KALTENBORN MOBILIZATION IN NON SPECIFIC NECK PAIN”- A RANDOMISED CONTROL TRIAL

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ABSTRACT:

Background and objectives:

Neck pain is major problem for the public health and its rate is steadily increasing. The underlying causes can be structural or functional disorders whereas some patients cannot get benefit from the current treatments. The aim of the study is to assess and compare the effectiveness of Muscle energy technique and Kaltenborn mobilization in non specific neck pain to reduce pain and improve function.

Methodology:

90 subjects with non specific neck pain between the age group of 20 to 45 were selected and randomized into three groups (group A, group B and group C). Subjects included both females and males and were screened initially and those fulfilling the inclusion and exclusion criteria were included in the study. Group A (n=30) received muscle energy technique while group B (n=30) received Kaltenborn mobilization and group C (n=30) received conventional therapy for 2 days a week for 3 weeks. Pre and post assessment of pain and function were measured at baseline and after 6 sessions for both the groups using VAS (Visual Analogue Scale) and NDI (Neck Disability Index) score.

Results and Conclusion:

There was statistically significant difference showing improvement in mean of VAS and NDI before and after intervention within groups and there was statistically no significant difference when the post intervention means were compared between the groups. The study was concluded that both MET and kaltenborn mobilization were found to be significant compared to control group in reducing pain and improving neck function in subjects with non specific neck pain.

Keywords: Non specific neck pain, Visual Analogue Scale, Neck Disability Index

INTRODUCTION

Neck pain is a major problem for public health and its rate is steadily increasing.¹The underlying causes of neck pain can be structural or functional disorders of the spine, muscles, ligaments, joints, or poor posture. However in most cases, the underlying patho physiology of neck pain is unknown and as a result it is referred to “non specific neck pain”. Sometimes neck pain becomes chronic and incurs a lot of cost and time to medical health system regarding its diagnosis and treatment process.^{2,3}

Neck pain is a very common condition in clinical practice; recently the International neck pain task force reported the impact of neck pain in social related problems for families, work, health systems and economies. It is the most common musculoskeletal pathology second to low back pain. It is the fourth largest contributor to the global disability with its prevalence ranging between 30 to 71% of the general population.

Two thirds of the adults are affected by neck pain at sometime in their lives. Previous studies have shown an association between neck disability and chronic neck pain. Not only does it have a potential for high burden in disability most people with neck pain do not experience a complete resolution of symptoms. In 2010, 33.6 million people were affected worldwide and neck pain was the fourth most frequent disability with over 291 conditions studied.

About 50–70% of people get affected in their life. It results in disabling the person to perform activities of daily livings.^{4,5}The prevalence of neck pain ranges from 34% to 50%.^{6,7}Women suffer two times as compared to men because of short stature and less muscle strength. Chronic Neck Pain may lead to absence from work and reduce the quality of life.^{8,9} It can be mechanical or non mechanical. Pain can be aggravated in the cervical and thoracic regions with movement. Neck movement also results in increasing pain in the cervicothoracic junction.^{10,11}

The Visual Analogue Scale (VAS) is a single term that is an instrument measuring the whole construct at once. VAS is a commonly used assessment instrument for pain intensity in rehabilitation which has improved to be reliable and valid. The Neck Disability Index (NDI) is a clinical screening tool established for pathology related neck pain which has sufficient support in the literature and is the most commonly used self report measure for neck pain. It consists of ten questions each with six answers scoring from 0 to 5.

Although this problem is common and well-known, some patients cannot benefit from current treatments.¹²Neck pain with limitation of mobility occurs mostly due to constant faulty posture or, frequently, neck movements result in rigidity or decreased range of motions (ROM). A common cause of neck pain is muscle strain or tension.^{13,14} Soft tissue disorders around the head and neck area can limit Range of Motion (ROM) of the neck and cause neck pain and muscle weakness.¹⁵

Manual therapy for neck pain includes manipulation and mobilization. Various studies have shown that high velocity low amplitude techniques may correct joint restriction but not the restriction due to muscles. Muscle Energy Technique is a method of treatment that involves the voluntary contraction of a subjects muscle in a precisely controlled direction against a counterforce provided by the therapist. Post isometric relaxation is claimed to be an effective method for acute tension in soft tissue problems that preclude immediate spinal adjustment reduces muscle spasm that is responsible for spinal fixation, reduces pain and lengthens the tightened muscle to normalize gross cervical range of motion and is very effective for muscles

According to International federation of orthopedic manipulative therapies, orthopedic manipulative therapy is a specialization within physical therapy and provides comprehensive conservative management for pain and other symptoms. Review of trails involving manual therapy or physical therapy show that most intervention in these categories are characterized by a combination of passive and active components.

There are different physical therapy interventions such as massage but with temporary effects.¹⁶Kaltenborn mobilization is used to reduce the pain and improve ROM and reduce pain using sustained traction, compression, and glides in translator movement. It includes passive movements with less velocity at the limit of

joint or in the limit of the joint ROM.¹⁷ There are some systematic study reviews on the treatment of neck pain by manual therapy.^{18, 19}

In most of these studies, manual therapy is known as a non-invasive intervention for non-specific neck pain. Muscle energy technique is an advanced stretching technique. The muscle energy technique has reciprocal inhibition, which is relaxing for short or stiff muscles.²⁰ Studies revealed isometric exercises, neck stabilization exercises, and strength training (as a rehabilitation method) has positive effects on neck pain, reduces the pain and improves its function.^{21,22} Stretching helps in elongation of pathologically shortened soft tissue structures. It is important for restoring normal muscle length.²³

As non specific neck pain is one of the major problem seen in young and middle aged people. It is important to provide proper treatment methods to better patient care. So, there is a great need to derive an effective treatment procedure. Several studies have been done on effect of various methods of manual therapy and other methods. For giving specific treatment it is important to know which technique provides the good output. There are many studies stating that Muscle Energy Technique and Kaltenborn mobilization can improve non specific neck pain. But there is lack of study to know which method provides the good output. Hence there exists the need to compare these two methods and their effectiveness in treating non specific neck pain.

MATERIALS AND METHODOLGY

RESEARCH DESIGN:

Randomized controlled trial

SOURCE OF DATA:

Lotus paying guest, KonappanaAgrahara, Electronic city, Bengaluru.

DURATION: 6 months

SAMPLE SIZE CALUCULATION: 30 per arm, sample was randomly divided into three equal groups Group A – 30 ,Group B – 30 and group C- 30

The sample size was calculated using,

$$n = \frac{(Z\alpha/2 + Z\beta)^2 p q}{d^2} \quad d=0.2, \alpha=5\%, \beta=20\%$$

INCLUSION CRITERIA

- Subjects who are willing to sign the written informed consent form
- Subjects Aged between 20 and 45 years
- Subjects presenting with non specific neck pain

EXCLUSION CRITERIA

- Individual exhibiting sign of tumors, infections.
- Osteoporotic patient, other systemic conditions.
- Pregnant and lactating women , menopause, pre menopausal women
- Individual exhibiting positive neurologic signs

MATERIALS REQUIRED

- Neck Disability Index
- Visual Analogue Scale
- Couch
- Consent form
- Stationery
- TENS
- Ultrasound
- Ultrasonic gel
- Cotton

OUTCOME MEASURES

- Neck Disability Index (NDI)
- Visual Analogue Scale (VAS)

PROCEDURE:

Ethical clearance was obtained. All the subjects fulfilling the inclusion and exclusion criteria were informed about the study and a written consent was taken. Subjects who met the eligibility criteria were assigned randomly into three equal groups based on simple random sampling using a Random number Generator application. Group A received MET, Group B received Kaltenborn mobilization and Group C was control group. Pre intervention evaluation was done.

GROUP A – (MUSCLE ENERGY TECHNIQUE)

- In this technique, the subject was placed supine and the therapist stabilized the shoulder on the affected side with one hand while the ear or mastoid area of the affected side was held by the opposite hand.
- The head and neck was bent towards the contra lateral side, flexed and ipsilaterally rotated and then the subject pushed firmly towards the restriction therapist was resisting the effort producing isometric contraction.
- On ceasing, the effort the subject inhaled and exhaled fully at which the muscle passively lengthened
- This technique was performed for 20 seconds.
- Before repeating, gross stretches to upper trapezius were performed.
- Post isometric relaxation was given to upper trapezius, sternocleidomastoid, suboccipital and levator scapulae muscles for 5 repetitions.
- Stretch was maintained beyond the restriction for 20seconds

GROUP B – (KALTENBORN MOBILIZATION)

- Patients were in supine position, therapist behind his/her head.
- Kaltenborn mobilization was done in giving three different grades GRADE 1 – loosening, GRADE 2-tightening ,and GRADE 3 – stretching.
- For pain intermittent, distraction of 7-10 s hold was given with few seconds of rest.
- For hypomobility, minimum of 6s stretch distraction was given by partial release and then repeated for intermittent stretches 3-4s per cycle.

GROUP C – (CONTROL GROUP)

- Patient was in sitting position, therapist behind his/ her head.
- Ultrasound for 8 mins over the neck with 1:4 ratio in 1 intensity and TENS for 8 mins 4 electrodes were palced over the neck in high frequency between 100 Hz and intensity was adjusted accordingly.
- Active range of motion for neck were taught for flexion, extension, lateral flexion and rotation and repeated for 10 times per cycle.
- Dosage: two sessions for two days a week, for three weeks.
- After the completion of treatment sessions, Post intervention measurements for intensity of pain using Visual Analogue Scale (VAS) and Neck Disability Index (NDI) were assessed. The data obtained was used for statistical analysis

STATISTICAL ANALYSIS

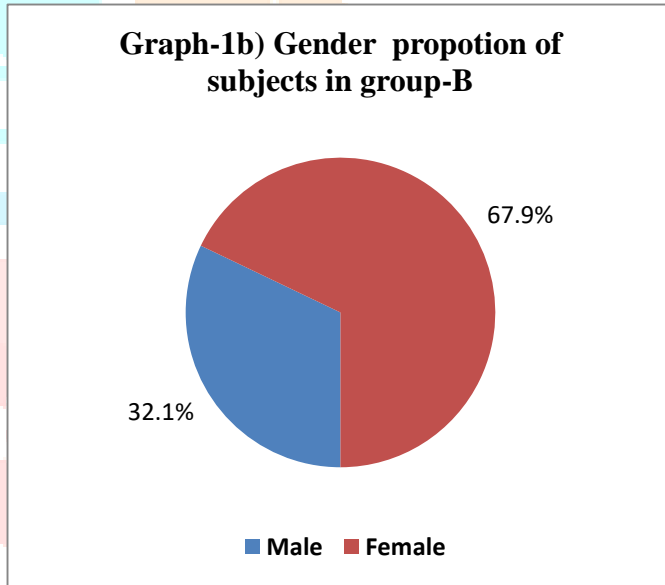
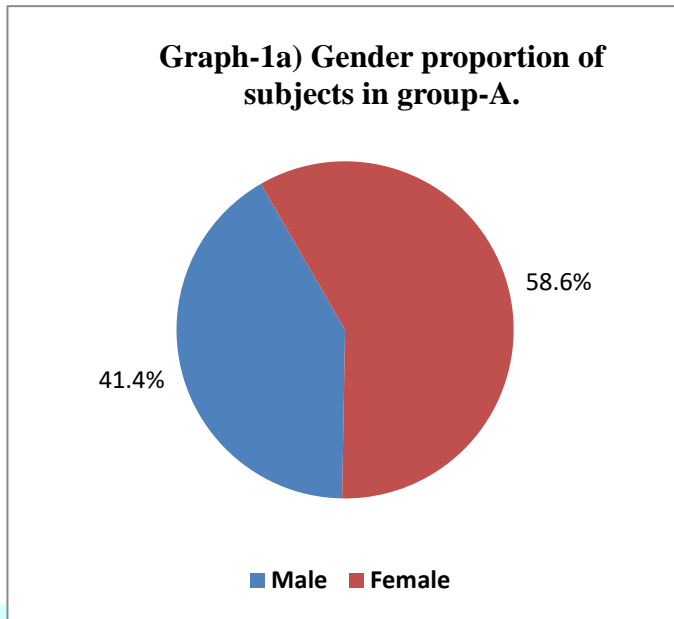
- Descriptive and inferential statistical analysis has been carried out in this present study. In descriptive statistics all categorical variables are presented with percentage and graphic presentation. The quantitative variables are presented on mean \pm standard deviation.
- Wilcoxon test has been used to find the significance of the study within the group.
- Between the groups Krushkalwallis test has been used to find the significance.
- The statistical software namely SPSS version 23 was used for the analysis of the data and Microsoft word and excel have been used to generate graphs and tables.

Table-1: Distribution subjects with non specific neck pain according to gender in both groups.

Sno	Gender	Group-A	Group-B	Group-C	Chi--square value
		No. (%)	No. (%)	No. (%)	
1	Male	12(41.4%)	9(32.1%)	6(20.7%)	2.389, df=2,NS, p>0.05
2	Female	17(58.6%)	19(67.9%)	23(79.3%)	

NS- denotes Not significant.

The table shows the proportion of subjects with non specific neck pain according to gender. Of the subjects with non specific neck paint he proportion 12(41.4%) of them were males and 17(58.6%) of them were girls in group-A. In group-B, 9(32.1%) of them were males and 19(67.9%) of them were females. Similarly, 6(20.7%) of them were males and 23(79.3%) of them were females. The gender proportion between the groups was not significant (Chi-square value=2.389 p>0.05).



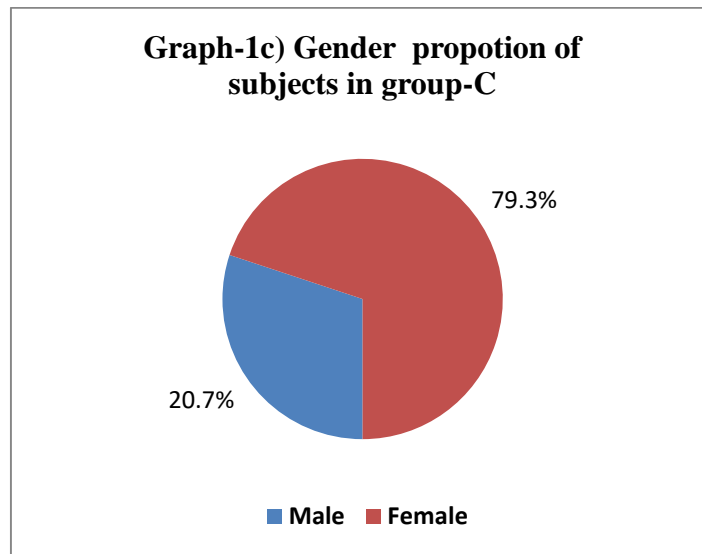


Table-2: Mean and SD of age of the subjects with non specific neck pain in between the groups.

Sno	Groups	Range	Mean \pm SD	F-test (ANOVA)	p-value
1	Group-A	20-36	27.31 \pm 4.06	F=2.430, NS	p>0.05
2	Group-B	20-40	27.43 \pm 4.09		
3	Group-C	24-37	29.93 \pm 3.54		

Note; NS- denotes –Not Significant

The above table-2 presents the mean and SD of age of the subjects with non specific neck pain. In group A mean and SD was 27.31 \pm 4.06. In group=B, mean and SD was 27.43 \pm 4.09. Similarly, in group C mean and SD was 29.93 \pm 3.54. The age distribution of the subjects was homogeneous in all the groups.

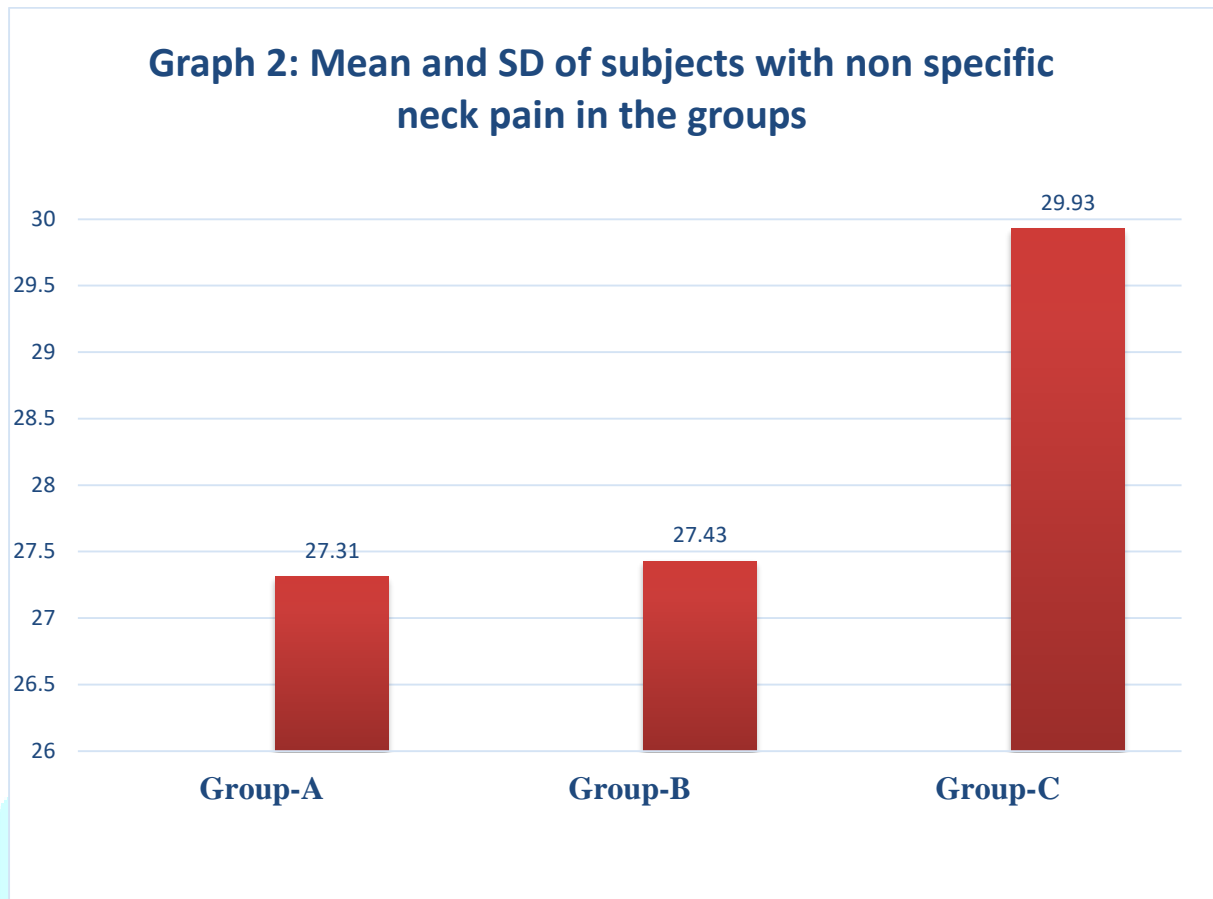
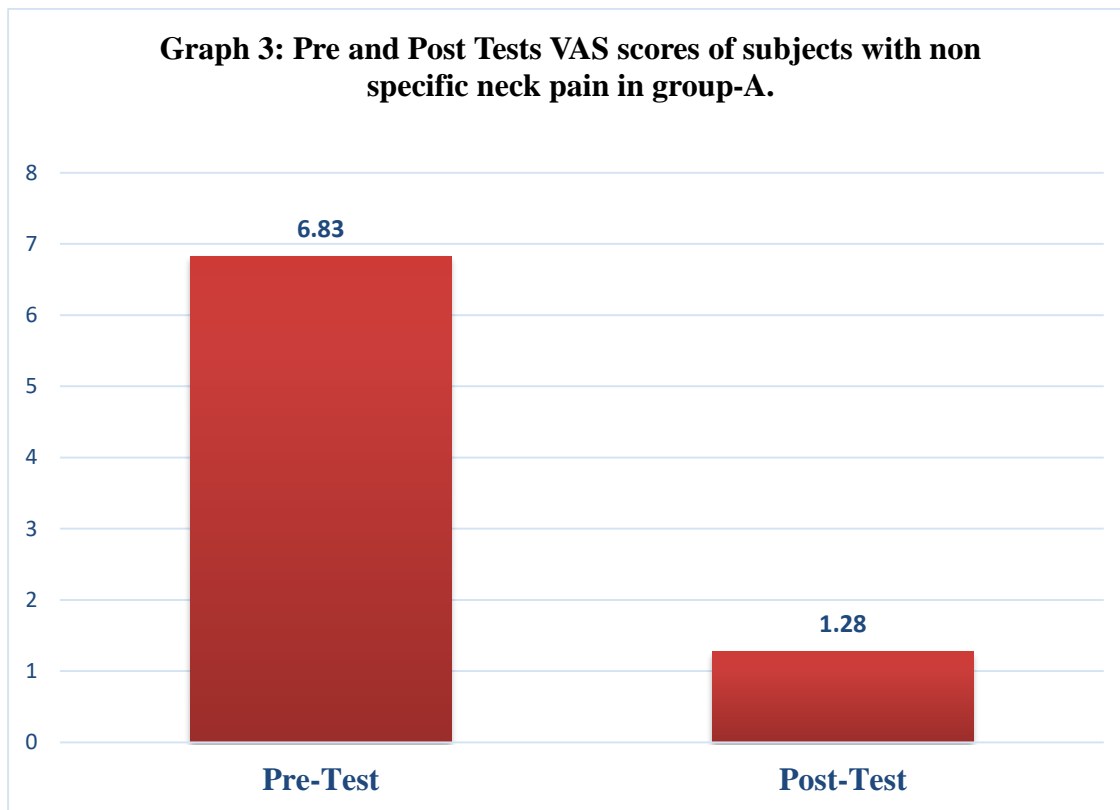


Table-3: Range, mean and SD of outcome measures of VAS and NDI of subjects with non specific neck pain in group-A.

Sl.no	Groups	Group-A				Wilcoxon test	p-value
		Pre test		Post test			
		Range	Mean \pm SD	Range	Mean \pm SD		
1	VAS	6-9	6.83 \pm 0.84	0-3	1.28 \pm 0.70	z=4.810*	p<0.001
2	NDI	5-24	14.72 \pm 5.45	0-8	3.07 \pm 2.37	z=4.708*	p<0.001

Note; * denotes –Significant, z- Wilcoxon test.

Graph 3: Pre and Post Tests VAS scores of subjects with non specific neck pain in group-A.



Graph 4: Pre and Post Tests NDI scores of subjects with non specific neck pain in group-A.

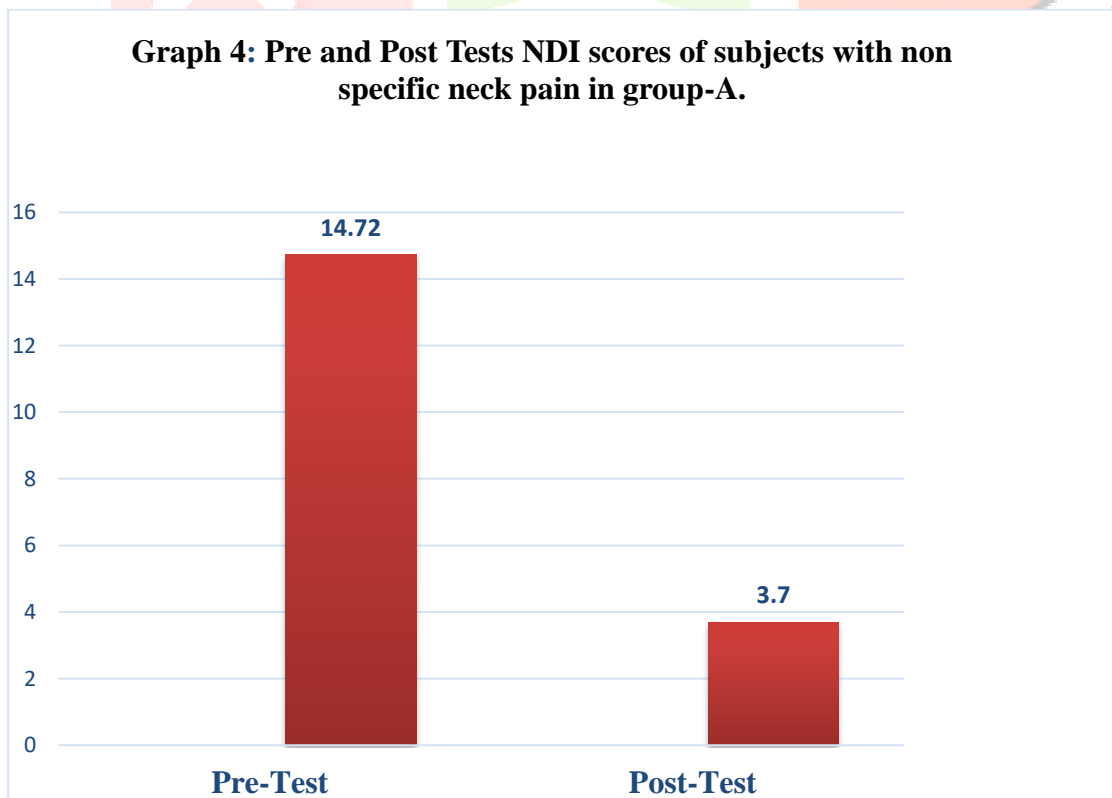
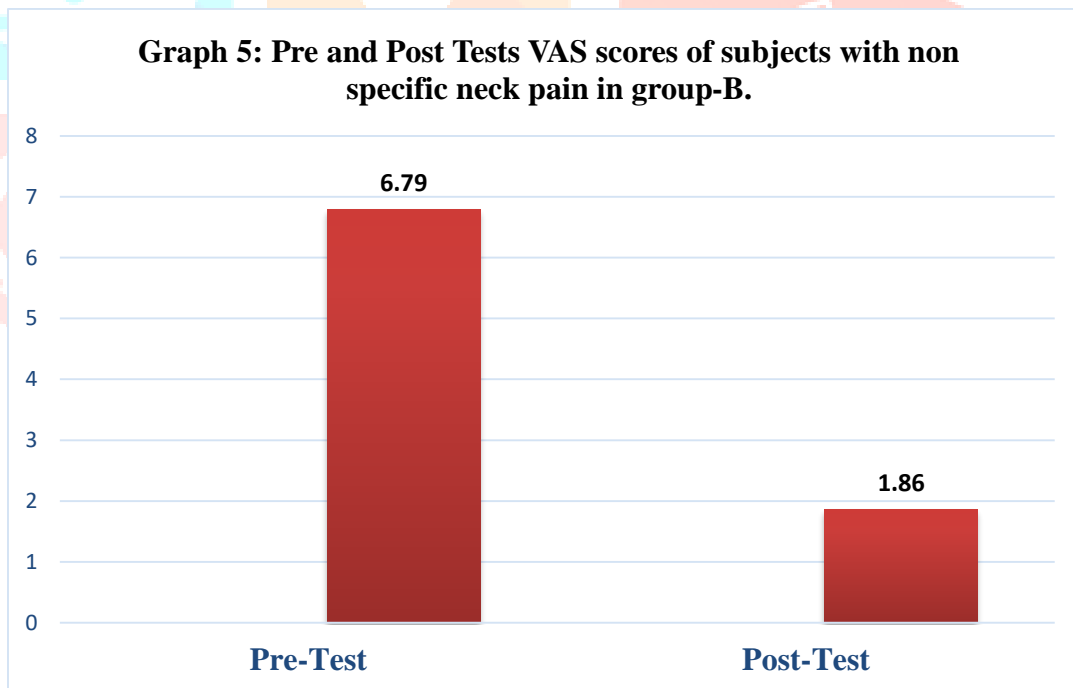


Table-4: Range, mean and SD of outcome measures of VAS and NDI of subjects with non specific neck pain in group-B.

	Groups	Group-B				Wilcoxon test	p-value
		Pre test		Post test			
		Range	Mean \pm SD	Range	Mean \pm SD		
1	VAS	5-9	6.79 \pm 0.89	1-4	1.86 \pm 0.93	z=4.810*	p<0.001
2	NDI	5-24	14.93 \pm 4.83	0-8	3.93 \pm 2.41	z=4.708*	p<0.001

Note; * denotes –Significant, z- Wilcoxon test.



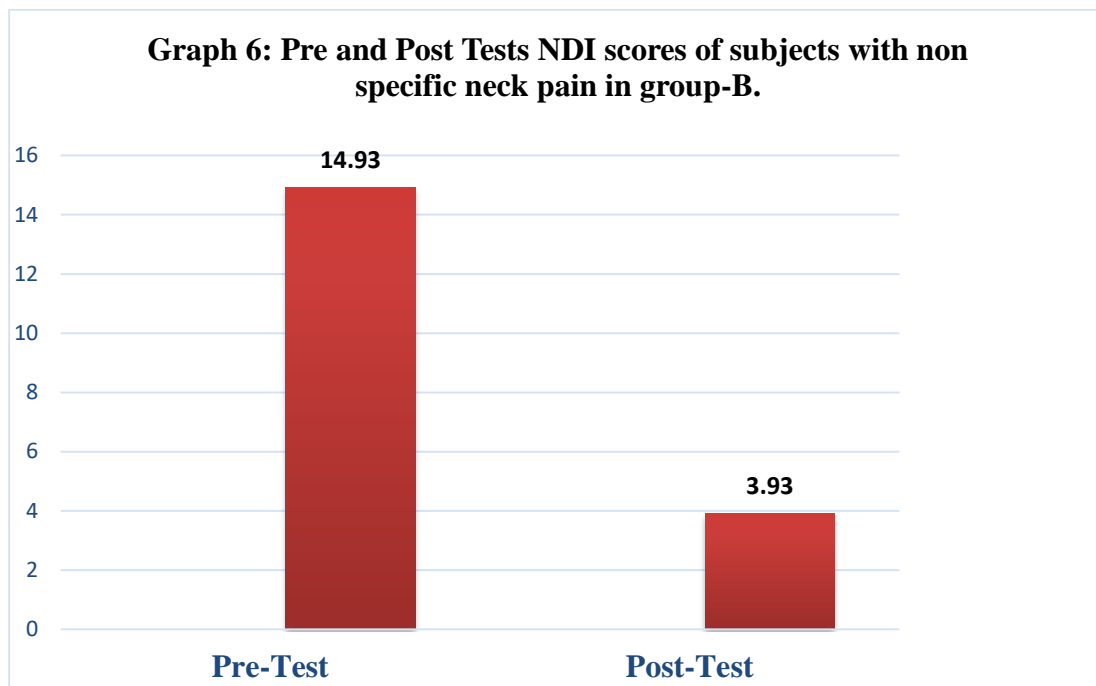


Table-5: Range, mean and SD of outcome measures of VAS and NDI of subjects with non specific neck pain in group-C.

Sno	Groups	Group-C				Wilcoxon test	p-value
		Pre test		Post test			
		Range	Mean \pm SD	Range	Mean \pm SD		
1	VAS	6-8	6.97 \pm 0.77	3-7	5.03 \pm 0.86	z=4.759*	p<0.001
2	NDI	11-20	15.24 \pm 3.28	7-11	8.07 \pm 1.28	z=4.713*	p<0.001

Note; * denotes –Significant, z- Wilcoxon test.

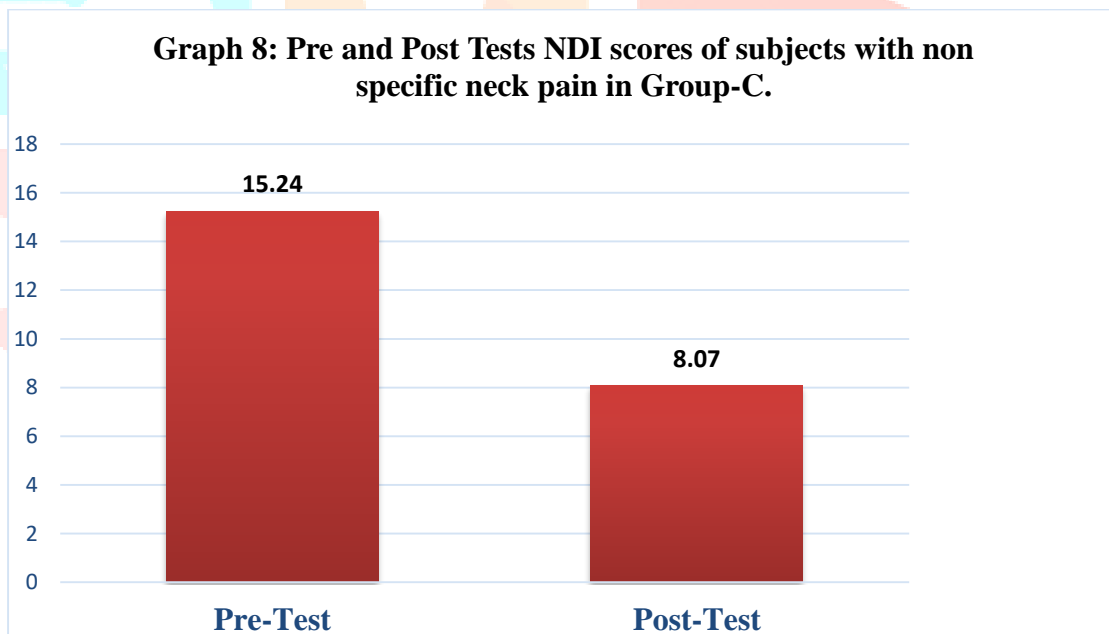
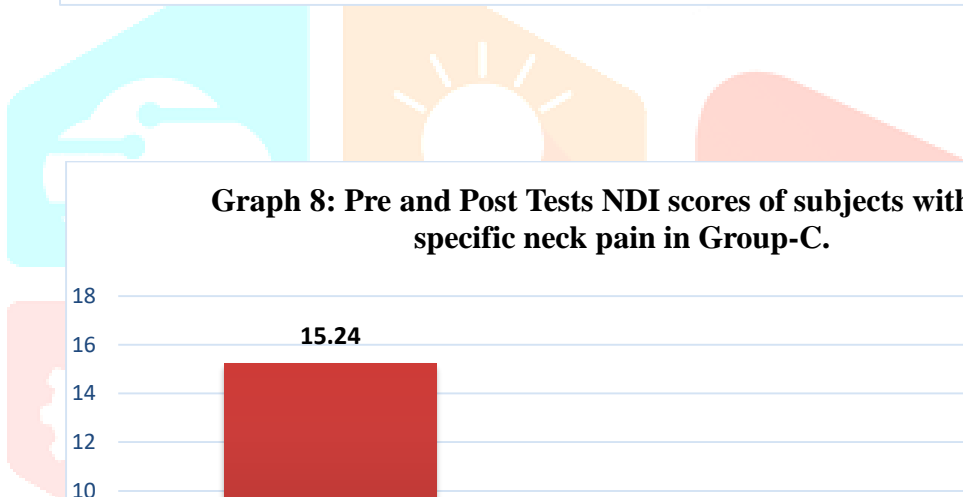
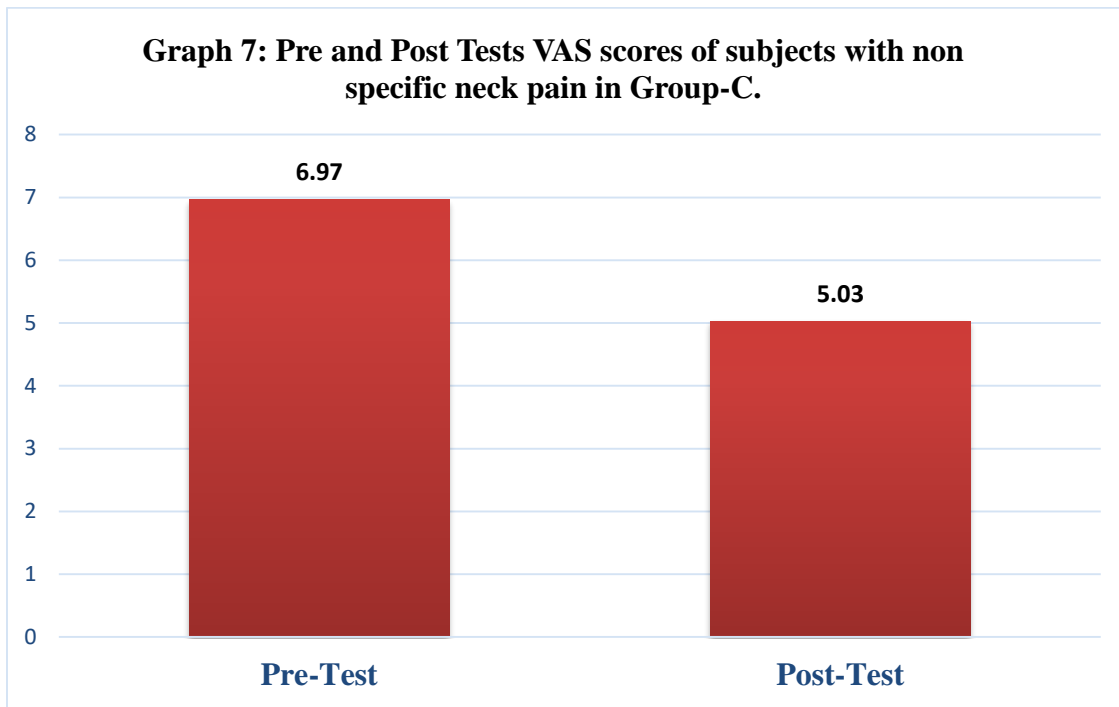


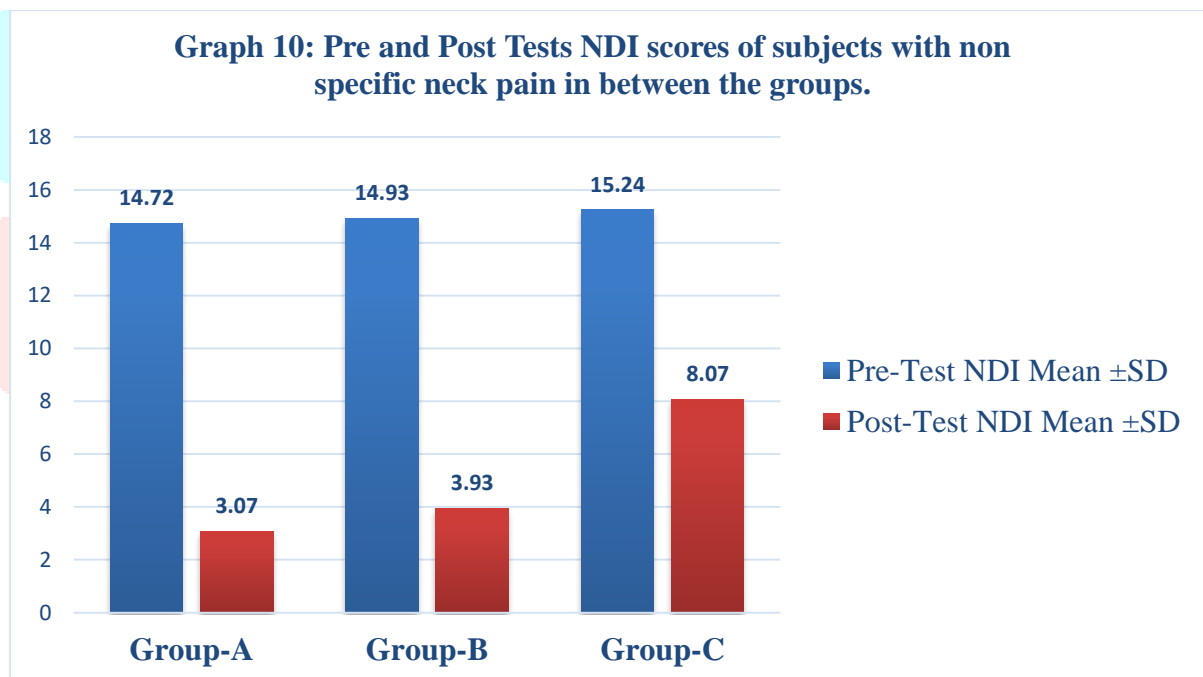
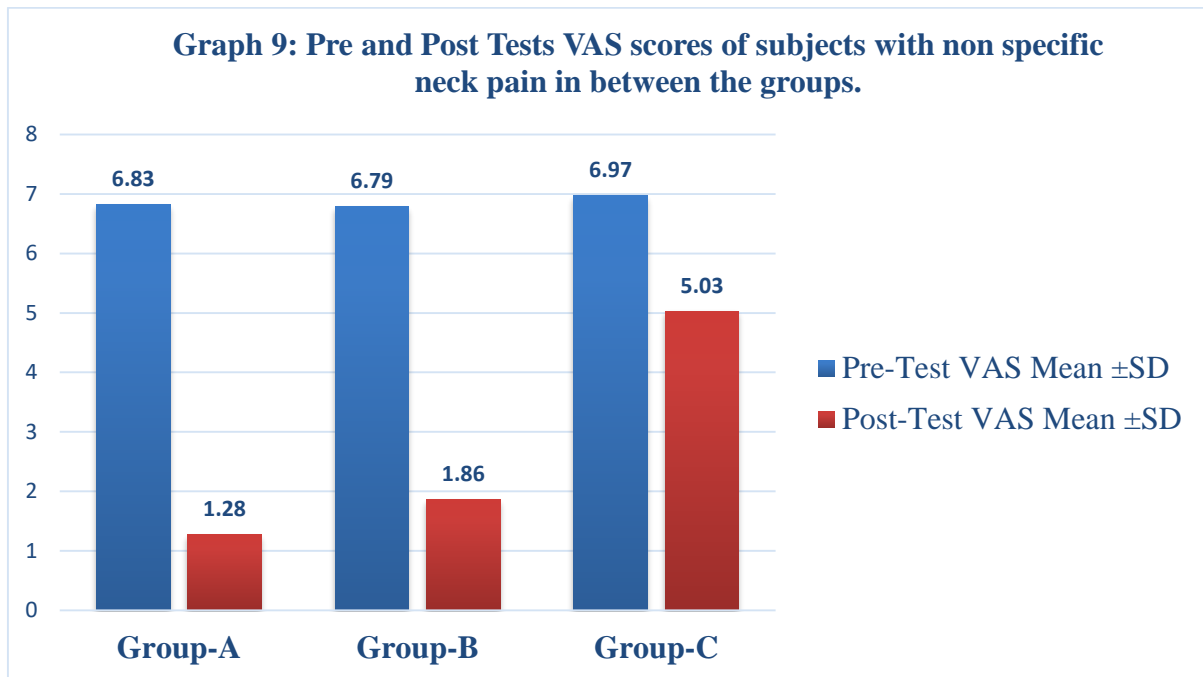
Table-5: Comparison of pre outcome measure of VAS and NDI among subjects with non specific neck pain in between the groups.

Sno	Groups	Pre test		Post test	
		VAS	NDI	Pre test	Post test
		Mean \pm SD	Mean \pm SD	Mean \pm SD	Mean \pm SD
1	Group-A	6.83 \pm 0.84	14.72 \pm 5.45	1.28 \pm 0.70	3.07 \pm 2.37
2	Group-B	6.79 \pm 0.89	14.93 \pm 4.83	1.86 \pm 0.93	3.93 \pm 2.41
3	Group-C	6.97 \pm 0.77	15.24 \pm 3.28	5.03 \pm 0.86	8.07 \pm 1.28
Between groups comparisons/ Non parametric ANOVA(Krushkal Wallis test)		Chi-square _o =0.950, df=2, NS, p>0.05	Chi-square _o =0.294, df=2, NS, p>0.05	Chi-square _o =61.038 df=2, S, p<0.001	Chi-square _o =42.254, df=2, S, p<0.001

NS – not significant (p>0.05).

The above table-5 presents the comparison of pre and post test outcome measures in between the groups. The pre test scores of VAS was 6.83 \pm 0.84 in group-A ,6.79 \pm 0.89 in group-B and 6.97 \pm 0.77 in group-C which were more or less same and it not significant(p>0.05) . But, the post test mean and SD of VAS was 1.28 \pm 0.70 in group-A and 1.86 \pm 0.93 in group-B, were comparably less than the post test mean and SD of 5.03 \pm 0.86 in group -C. The non parametric test for testing the significant difference between independent outcomes of more than two groups when the scores were ordinal, the Krushkal Wallis ANOVA test was used and found to be statistically not significant (p>0.05).

The pre test scores of NDI was 14.72 \pm 5.45 in group-A, 14.93 \pm 4.83in group-B and 15.24 \pm 3.28 in group-C which were more or less same and it not significant (p>0.05). But, the post test mean and SD of NDI was 3.07 \pm 2.37 in group-A and 3.93 \pm 2.41 in group-B, were comparably less than the post test mean and SD of 8.07 \pm 1.28 in group -C. The non parametric test for testing the significant difference between independent outcomes of more than two groups when the scores were ordinal, the Krushkal Wallis ANOVA test was used and found to be statistically not significant (p>0.05).



- The interventions in each group were individually effective in reducing VAS and NDI among subjects with non specific neck pain.
- But, the interventions in group-A and group-B were better than the intervention of conventionally therapy in group-C in reducing the VAS and NDI among subjects with non specific neck pain and group A was more effective comparatively.

DISCUSSION:

Neck pain is common medical problem resulting from any diseases or biomechanical disturbances leading to tightening of muscles and restricted neck mobility. Various studies showed neck pain with limitation of mobility occurs mostly due to constant faulty posture of frequently neck movements result in rigidity or decreased range of motion. Neck movement also results in increasing pain in the cervicothoracic junction.

In most neck pains no distinct underlying dysfunction or abnormal anatomical structure is found. Overusing muscles in our body can cause some injuries. Furthermore soft tissue disorders around the head and neck area can limit range of motion of neck and cause neck pain and muscle weakness. This study included three groups, Group A – Muscle energy technique, Group B – Kaltenborn mobilization and Group – Control group.

The study showed reduction in the VAS score and NDI score in Muscle energy technique with the mean and SD from 6.83 ± 0.84 to 1.28 ± 0.70 and 14.72 ± 5.45 to 3.07 ± 2.37 respectively and it was found to be significant ($p < 0.001$). Post isometric relaxation is a effective method of dealing with tension in soft tissue problems which is similar to the study conducted by Walker MJ found that MET's were significant effective in short and long term improvement in neck pain, ROM and disability. The reduction in the pain following MET that can be explained on the basis of inhibitory effects of Golgi tendon organ which causes a dampening effect on the motor neuronal discharges thereby causing relaxation of the musculotendinous unit by resetting its resting length. These reflexes will allow relaxation in musculotendinous unit tension and decreased pain perception.

In group B Kaltenborn mobilization also showed significant decrease in both VAS score and NDI score with mean and SD from 6.79 ± 0.89 to 1.86 ± 0.93 and 14.93 ± 4.83 to 3.93 ± 2.41 respectively) was found to be significant ($p < 0.001$). Kaltenborn mobilization grade 1 and 2 were used to stimulate mechanoreceptors (pain relief) and suppress nociceptors of pain. Pain reduction mechanism with mobilization technique and defined on the basis of different effects occurs during treatment. Since the role of soft tissue and muscle in the neck area are very important techniques used are to be safe and more effective in treatment of non specific neck pain.

Group C was control group provided with conventional treatment showed reduction in the scores of VAS and NDI with mean and SD from 6.97 ± 0.77 to 5.03 ± 0.86 and 15.24 ± 3.28 to 8.07 ± 1.28 respectively and was found to be significant ($p < 0.00$). The reduction of pain can be attributed to the effect of TENS on the electrical stimuli, pressure and touch impulses which arrive faster at the levels of the spinal cord in the substantia gelatinosa of the dorsal horn and in the higher levels of the central nervous system than the pain impulses and close the gate for pain impulses resulting in a suppression of pain signals and TENS causes activation of endogenous analgesic systems involving opiate – like peptides, such as endorphins. Ultrasound is related to washout of pain mediators by increased blood flow, changes in nerve conduction, or alterations in cell membrane permeability that decreases inflammation.

Group A and group B showed significant improvement in VAS and NDI compared to group C. For VAS mean and SD of group A 1.28 ± 0.70 and group B 1.86 ± 0.93 which was less than 5.03 ± 0.86 in group C and for NDI means and SD of group A 3.07 ± 2.37 and group B 3.93 ± 2.41 was less than 8.07 ± 1.28 in group C. Group A and group B showed similar effect compared to group C. Inhibition of Golgi tendon organ and stimulation of mechanoreceptors and suppression of nociceptors showed more significant improvement compared to activation of endogenous analgesic system.

The present study found that 6 sessions of MET and kaltenborn mobilization for twice a week for 3 weeks were improving pain and neck function in subjects with non specific neck pain compared to control group.

CONCLUSION:

The study was intended to compare the effectiveness of Muscle energy technique, Kaltenborn mobilization and conventional therapy on pain and neck function in subjects with non specific neck pain.

Both groups of Muscle energy technique and Kaltenborn mobilization showed statistical significance of $p < 0.001$ within the groups compared to pre and post test but between the groups it was not significant but

Muscle energy technique and Kaltenborn mobilization showed significance compared to control group. However, Muscle energy technique and Kaltenborn mobilization showed no statistical significance.

The study concluded that both the Muscle energy techniques and Kaltenborn mobilization are effective for reducing pain and improving neck function compared to control group in subjects with non specific neck pain.

LIMITATIONS

Study did not include follow ups. It could find out its long term effects. Study was limited by the fact of daily activities of the subjects which was not monitored or documented which could have influenced.

SCOPE FOR FURTHER STUDY: Study can be done with longer duration. Further studies can be done with ergonomic advice to improve neck function and posture correction with some flexibility. Strengthening exercises as home program and following some discipline of physical activity in a regular basis

CONFLICT OF INTEREST:

There was no personal or institutional conflict of interest for this study.

SOURCE OF FUNDING:

Self

ETHICAL CLEARANCE:

Ethical clearance taken from RV COLLEGE OF PHYSIOTHERAPY, Bengaluru

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