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A COMPARITIVE STUDY; EFFECT OF MUSCLE ENERGY TECHNIQUE VS STATIC STRETCHING FOR ILIOPSOAS, QUADRATUS LAMBORUM AND HAMSTINGS TO IMRPOVE PAIN AND FLEXIBILITY IN SUBJECTS WITH LOWER CROSS SYNDROME

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Lower Cross Syndrome, muscle energy technique, static stretching.

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Abstract

Background and Introduction: *Lowe cross syndrome is a posture issue caused by muscle imbalances in the lower body. Some muscles are weakened (phasic) while some are tightened (tonic). Weakened muscles are abdominal muscles while tightened muscles are hip flexors and lower back extensors. LCS leads to postural alteration giving rise to an S-shaped curve effecting ADLs. It is common in individuals with sedentary lifestyle. Studies show a prevalence of low back pain ranging from 1.4 to 2.0% with untreated LCS leading to functional disability.*

Objectives: *To compare the effectiveness of muscle energy technique vs static stretching in individuals with Lower Cross Syndrome. To reduce pain, increase flexibility and ROM.*

Methodology: *66 patients with lower cross syndrome were randomly divided into two groups. Group A (33) was treated with muscle energy techniques while Group B (33) with static stretching exercises for 6 weeks. The outcome tools were Thomas Test, Goniometer, NPRS scale and ODI.*

Conclusion: *It was concluded that METs were slightly more effective than static stretching in in improving pain, and flexibility in patients with LCS.*

Data Analysis: *The data was analyzed using SPSS version 22. Descriptive statistics, in terms of frequency, were applied to gender and age.*

INTRODUCTION

Lower cross syndrome is also known as a pelvic cross syndrome, it occurs if there are changes in muscular strength which results in balance misalignment in lower part of body(1). It is recognized by changes in muscle tone located at ventral and dorsal aspect of body(1). In this syndrome there is tension in

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hamstrings and lower back muscles while at the same there's weakness in abdominal muscles and gluteus maximus giving rise to an S shaped posture(2). Lower cross syndrome can occur due to various factors, some of which are; prolong sitting along with poor posture at workplaces, reduced mobility due to whatever reasons, all these factors have a deleterious impact on working of mechanics of body (3).

Lower cross syndrome can be defined as a poor posture resulting from muscle strength imbalances in the lower segment of body(4). LCS effects people globally of all socioeconomic status, of both genders and of all age groups (5). Studies have shown that the prevalence and estimated incidence of low back pain due to LCS ranges from 1.4 to 20.0% and 0.024-70% respectively(6). There are surveys supporting that annual prevalence of LBP due to LCS is about 34% while monthly prevalence among professional drivers is round about 50% (7). It usually occurs in all of those professions which require sitting for long hours but according to some researches, it was most common among IT workers in comparison to nurses, bankers and dentists (8).

The **lumbar spine** is made of 5 vertebral bodies along with 5 inter-vertebral discs, existing between lower border of 12th thoracic vertebra to upper border of sacrum, affixing spine to the pelvis (9).

The pelvis of humans is made of 3 bones sacrum, coccyx and two os coxae, the os coxae is further composed of 3 parts; (10)

When the hip flexors get tight, they cause the pelvis to rotate anteriorly while the glutei and abdominal muscles are designed to prevent this from occurring by keeping the pelvis in the right position, but they are unable to do so if they are deficient in strength. This anterior tilting of pelvis increases the lumbar lordosis (the inward curve of the lower spine) resulting in hyperlordosis (11).

Some drugs are used to manage the pain, some of the effective ones are NSAIDs, skeletal muscle relaxants, in case of acute pain and TCA, in case of chronic pain (12).

There is an evidence that individuals with low back pain who undergo exercise therapy experience reduction in pain an improvement in their quality of life and a decrease in functional limitations as compare to individuals who just take pain killers and electrotherapy (13).

Corrective exercises i.e. avoiding the postures that worsens the condition and maintaining the correct postures, strengthening the weak muscles, stretching the tightened/shortened muscles.

One of the advanced type of stretching technique, muscle energy technique was used for stretching tightened muscles, improving blood supply and reducing pain as compare to static stretching used for improved flexibility, enhanced muscle relaxation and stress reduction((14, 15).

The aim was to compare the effectiveness of muscle energy technique vs static stretching for iliopsoas, quadratus lamborum and hamstrings to improve pain and flexibility in individuals with Lower Cross Syndrome.

Null Hypothesis:

There is no difference between the effectiveness of METs and Static Stretching in reducing pain and improving flexibility in subjects with LCS.

Alternate Hypothesis:

There is difference between the effectiveness of METs and Static Stretching in reducing pain and improving flexibility in subjects with LCS.

Material and Methods

This randomized controlled trial (RCT) was conducted over six months at the Physical Therapy Department of Mayo Hospital, Lahore, with a sample of 66 patients (33 in each group) selected through simple randomization. Eligible participants aged 22–45 years with low back pain (LBP) (4), muscle tightness, positive 90/90 SLR and Thomas tests (16), and mild to moderate disability on ODI were included, while those with fractures, tumors (4), cauda equina syndrome, recent surgeries (16), or systemic conditions were excluded. Data collection involved demographic details and assessment tools including NPRS for pain, ODI for disability, goniometer for muscle length, Thomas test for iliopsoas tightness, and 90/90 SLR for hamstrings tightness. Participants were randomized into two groups: Group A received pulsed Muscle Energy Techniques (METs) and Group B received static stretching, with both groups also receiving moist heat (4), postural education, and warm-up exercises (17). Interventions were delivered three times per week for

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four weeks, with outcomes assessed at baseline, 2 weeks, and 4 weeks. Data were analyzed using SPSS v22, applying descriptive statistics for demographics, Shapiro-Wilk test for normality, independent t-test for between-group comparisons, and repeated measures ANOVA for within-group changes.

RESULTS:

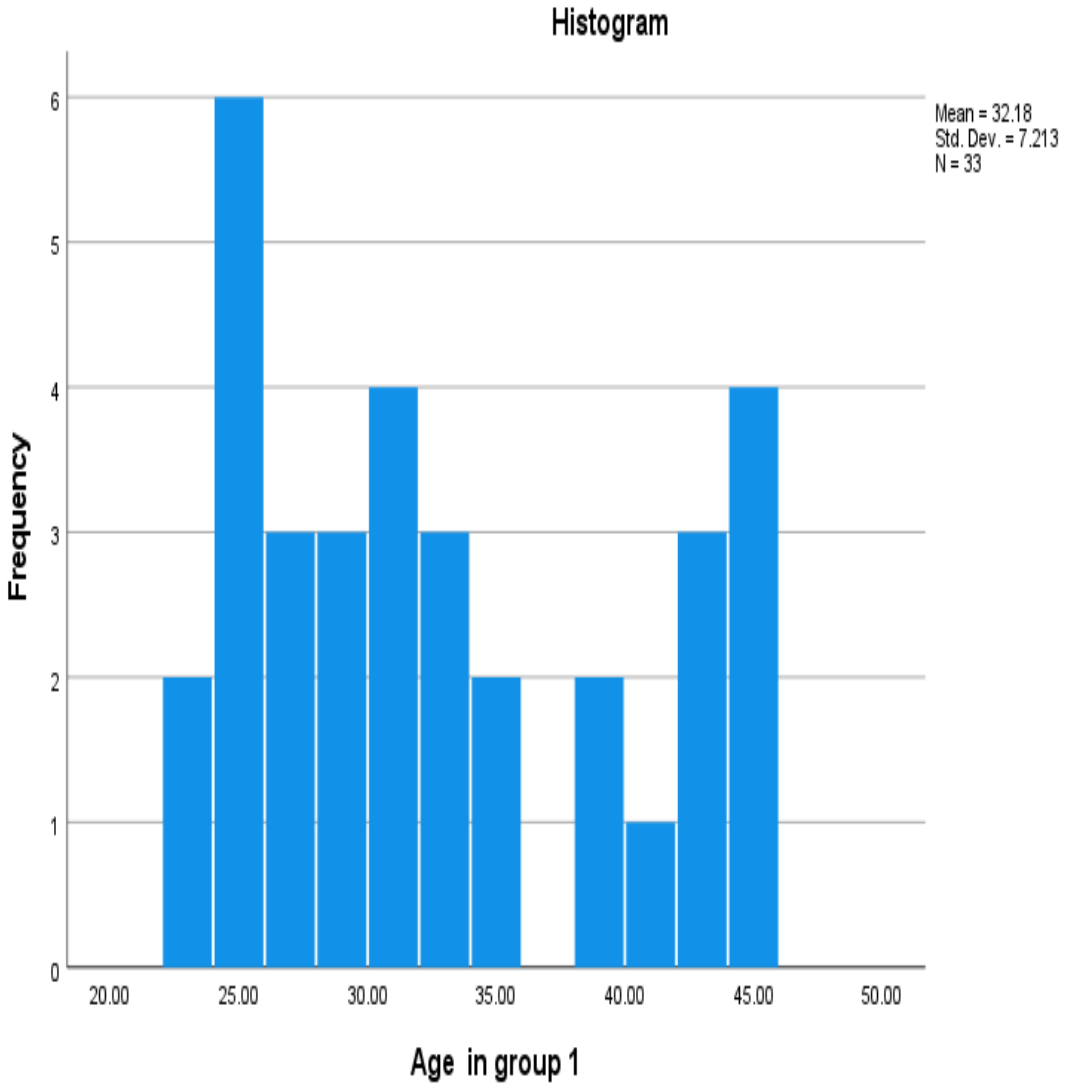

Figure 1: age in group 1: Muscle Energy Technique

Results showed mean age in muscle energy technique group was 32.18±7.21

Figure 1. Histogram of age in group A

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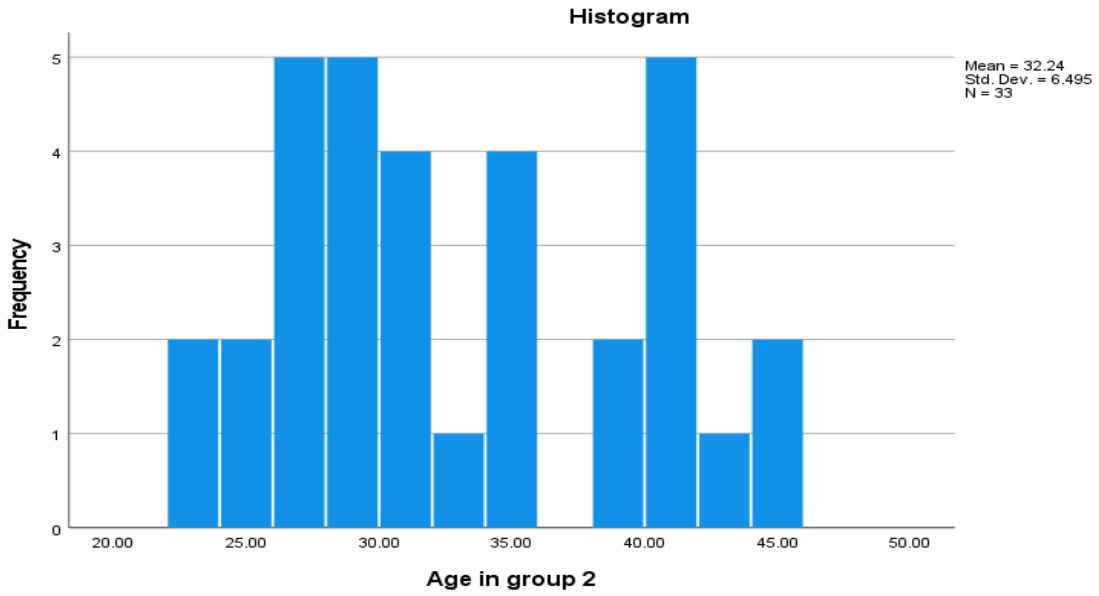

Figure 2: Age in group 2: Static stretching:

Results showed mean age in static stretching group was 32.24±6.49

Figure 2. Histogram of age in group B

Gender:

Table 1: gender in group 1: Muscle Energy Technique:

Results showed that according to gender distribution, there were 13(39.4%) males and 20(60.6%) females in group A

Gender in group 1

		Frequency	Percent
	Male	13	39.4
	Female	20	60.6

Table 2: Gender in group 2: static stretching:

Results showed that according to gender distribution there were 19(57.6%) males and 14(42.4%) females in group B.

Gender in group 2

	Frequency	Percent
Male	19	57.6
Female	14	42.4

Table 3: Normality of data

Normality of data was assessed through Kolmogorov-Smirnov test of normality, p value was less than

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0.05 ($p<0.05$) for all the variables so parametric tests were applied for the comparison of data. Friedman and Wilcoxon were used for within group analysis Mann-Whitney U test was used for between group analyses.

Test of Normality

	Kolmogorov- Smirnov[a]		
	Statistic	df	Sig.
Pre Pain	.228	66	.000
Mid Pain	.265	66	.000
Post Pain	.207	66	.000
Pre ODI	.198	66	.000
Mid ODI	.243	66	.000
Post ODI	.180	66	.000
Pre muscle length of iliopsoas	.132	66	.006
Mid muscle length of iliopsoas	.159	66	.000
Post muscle length of iliopsoas	.152	66	.001
Pre muscle length of hamstrings	.191	66	.000
Mid muscle length of hamstrings	.151	66	.001
Post muscle length of hamstrings	.206	66	.000
Pre muscle length of quadratus lamborum	.181	66	.000
Mid muscle length of quadratus lamborum	.162	66	.000
Post muscle length of quadratus lamborum	.166	66	.000

Within group analysis

Friedman test

Table 4: Friedman of pain in group A:

Results for group 1 showed that median (IQR) for pre, mid and post treatment pain was 7(6,8), 6(4,5) ,2(1,2) respectively.

There was significant difference between NPRS values for pre, mid and post-treatment for group1 according to the Friedman test.

Descriptive Statistics

		Percentiles		
	N	25th	50th (Median)	75th
Pre Pain in group 1	33	6.0000	7.0000	7.0000
Mid Pain in group 1	33	4.0000	5.0000	5.0000
Post Pain in group 1	33	1.0000	2.0000	2.0000

Test Statistics

N	33
Chi-Square	65.511
Df	2
Asymp. Sig.	.000

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Table 5 Pair wise comparison (Wilcoxon test):

Test Statistics

	Mid Pain in group 1 - Pre Pain in group 1	Post Pain in group 1 - Mid Pain in group 1	Post Pain in group 1 - Pre Pain in group 1
Z	-5.091[b]	-5.130[b]	-5.080[b]
Asymp. Sig. (2-tailed)	.000	.000	.000

There was also significant difference ($p<0.017$) between NPRS values when comparison was made between pre and mid treatment, mid and post treatment and post and pre-treatment. This indicates that NPRS was effective in treating pain in LCS in group1

Table 6: Friedman of ODI in group A:

Results for group 1 showed that median (IQR) for pre, mid and post treatment functional disability was 20(17, 21), 15(12, 15), 9(7, 12) respectively. There was significant difference between NPRS values for pre, mid and post treatment for group1 according to the Friedman test.

Descriptive Statistics

	N	Percentiles 25th	50th (Median)	75th
Pre ODI in group 1	33	17.0000	20.0000	21.5000
Mid ODI in group 1	33	12.0000	15.0000	15.0000
Post ODI in group 1	33	7.5000	9.0000	12.0000

Test Statistics

N	33
Chi-Square	66.000
df	2
Asymp. Sig.	.000

Table 7: Pair wise comparison (Wilcoxon test):

There was also significant difference ($p<0.017$) between ODI values when comparison was made between pre and mid treatment, mid and post treatment and post and pre-treatment. This indicates that ODI was effective in treating functional disability in LCS in group1

Test Statistics

	Mid ODI in group 1 - Pre ODI in group 1	Post ODI in group 1 - Mid ODI in group 1	Post ODI in group 1 - Pre ODI in group 1
Z	-5.069[b]	-5.028[b]	-5.021[b]
Asymp. Sig. (2-tailed)	.000	.000	.000

Table 8: Pre Treatment values of groups:

There was no significant difference between baselines comparison of group1 and 2 shown by the p value which is more than 0.05 ($p>0.05$) for all outcome tools.

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Descriptive Statistics

	N	Percentiles 25th	50th (Median)	75th
Pre Pain in group 1	33	6.0000	7.0000	7.0000
Pre ODI in group 1	33	17.0000	20.0000	21.5000
Pre muscle length of iliopsoas in group 1	33	11.0000	12.0000	13.0000
Pre muscle length of hamstrings in group 1	33	18.0000	19.0000	20.0000
Pre muscle length of quadratus lamborum in group 1	33	13.5000	15.0000	20.0000
Pre Pain in group 2	33	6.0000	7.0000	8.0000
Pre ODI in group 2	33	17.5000	20.0000	26.0000
Pre muscle length of iliopsoas in group 2	33	11.0000	12.0000	13.0000
Pre muscle length of hamstrings in group 2	33	18.0000	19.0000	21.0000
Pre muscle length of quadratus lamborum in group 2	33	12.0000	15.0000	20.0000

Test Statistics

	Pre Pain	Pre ODI	Pre muscle length of iliopsoas	Pre muscle length of hamstrings	Pre muscle length of quadratus lamborum
Mann-Whitney U	435.500	453.500	478.000	517.500	527.500
Wilcoxon W	996.500	1014.500	1039.000	1078.500	1088.500
Z	-1.456	-1.179	-.872	-.353	-.223
Asymp. Sig. (2-tailed)	.145	.238	.383	.724	.823

Table 9: Post treatment values of group:

There was significant difference between post treatment comparison of group1 and 2 shown by the p value which is less than 0.05 ($p<0.05$) for all outcome tools.

Descriptive Statistics

	N	Percentiles 25th	50th (Median)	75th
Post Pain in group 1	33	1.0000	2.0000	2.0000
Post ODI in group 1	33	7.5000	9.0000	12.0000
Post muscle length of iliopsoas in group 1	33	24.0000	25.0000	26.0000
Post muscle length of hamstrings in group 1	33	40.0000	40.0000	45.0000
Post muscle length of quadratus lamborum in group 1	33	24.5000	27.0000	29.0000

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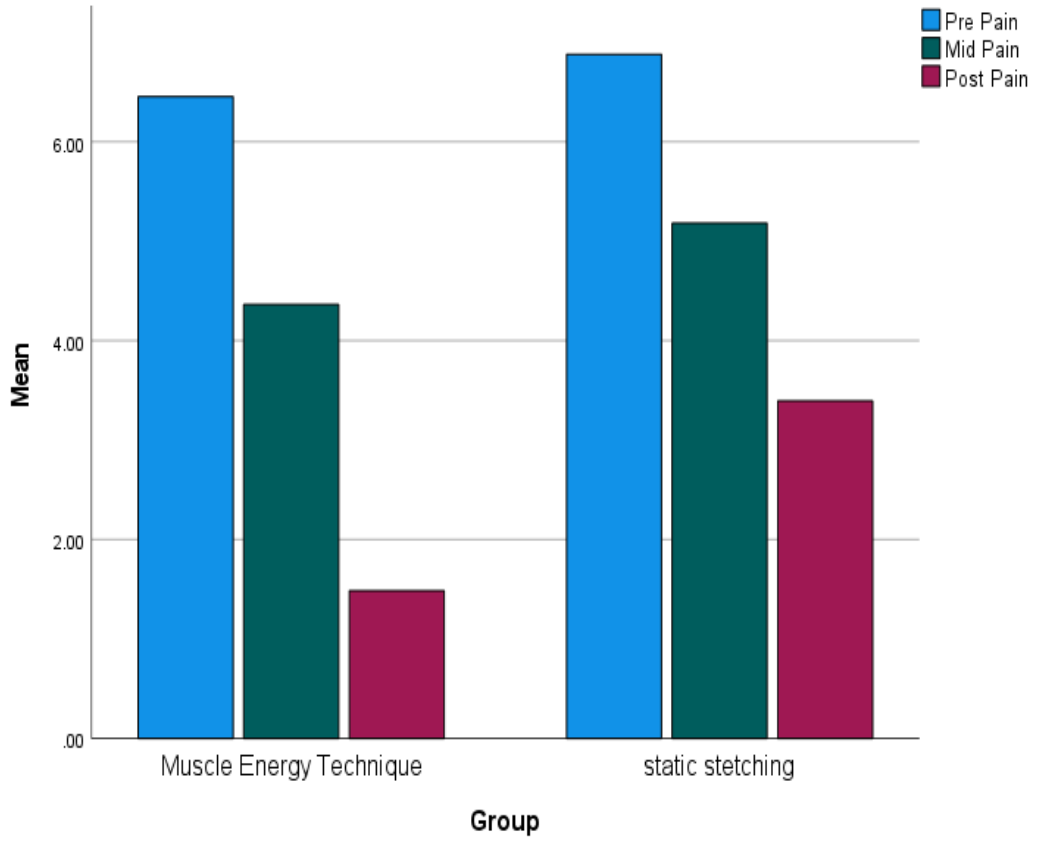
Post Pain in group 2	33	2.0000	3.0000	4.0000
Post ODI in group 2	33	7.5000	10.0000	14.0000
Post muscle length of iliopsoas in group 2	33	20.0000	20.0000	22.0000
Post muscle length of hamstrings in group 2	33	35.0000	35.0000	37.0000
Post muscle length of quadratus lamborum in group 2	33	20.0000	22.0000	27.0000

Test Statistics

	Post Pain	Post ODI	Post muscle length of iliopsoas	Post muscle length of hamstrings	Post muscle length of quadratus lamborum
Mann-Whitney U	82.500	239.000	77.000	72.000	305.500
Wilcoxon W	643.500	800.000	638.000	633.000	866.500
Z	-6.109	-3.942	-6.062	-6.138	-3.122
Asymp. Sig. (2-tailed)	.000	.000	.000	.000	.002



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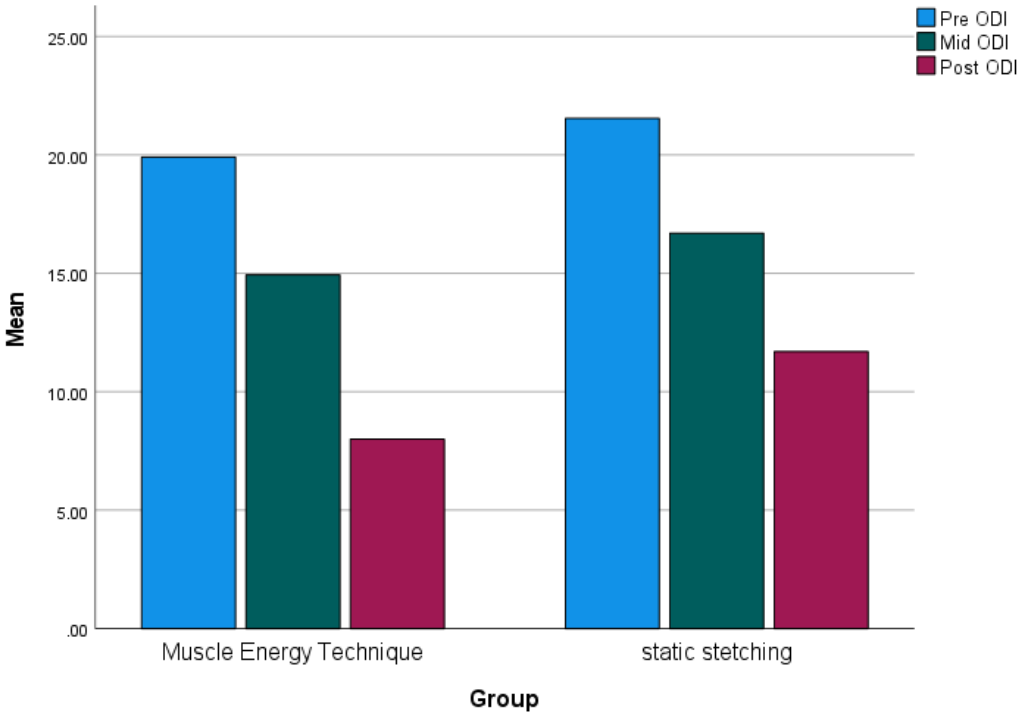

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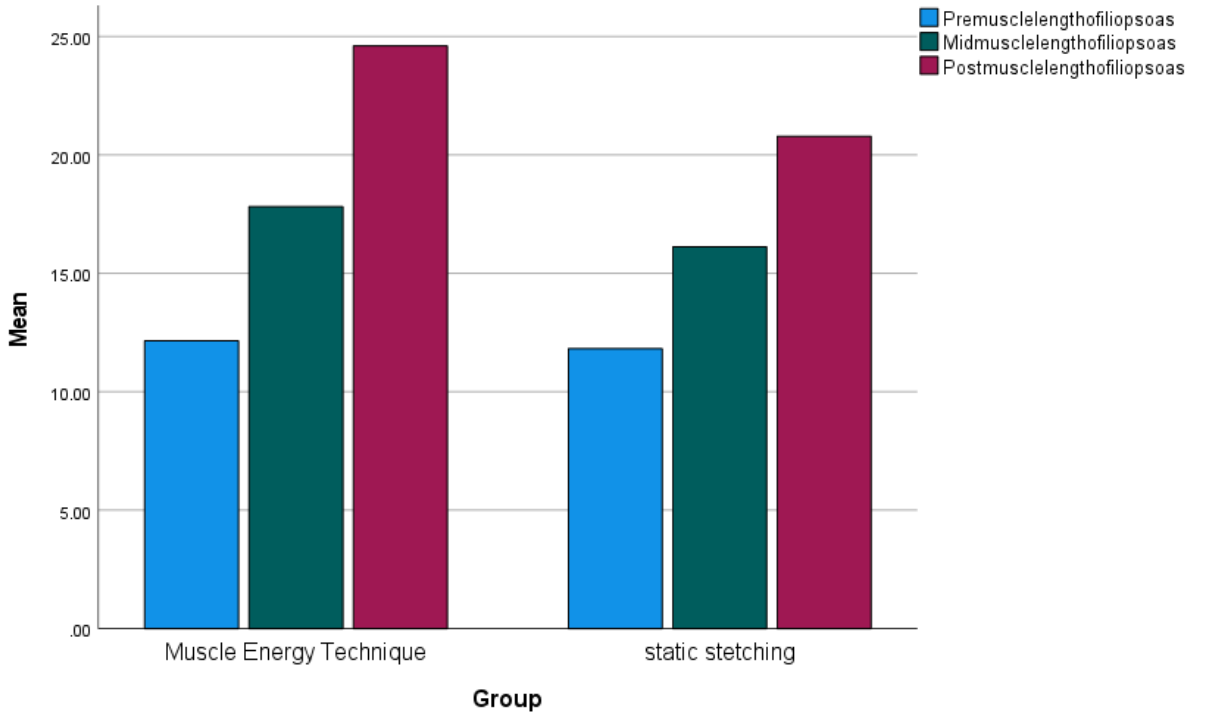

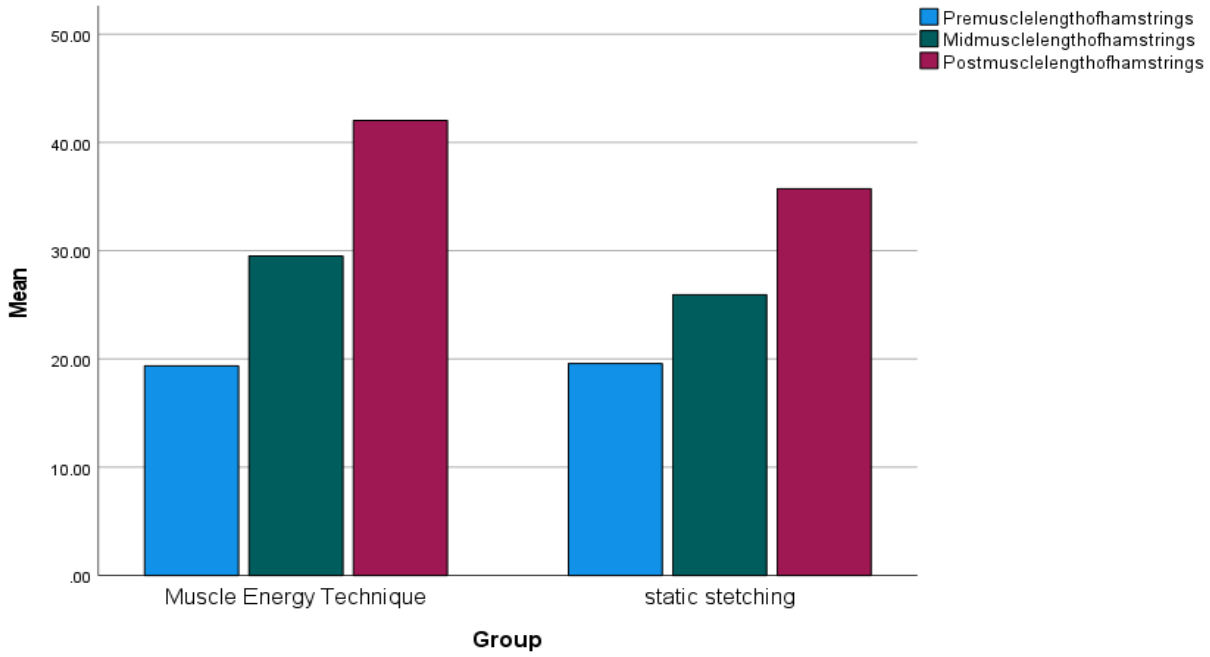

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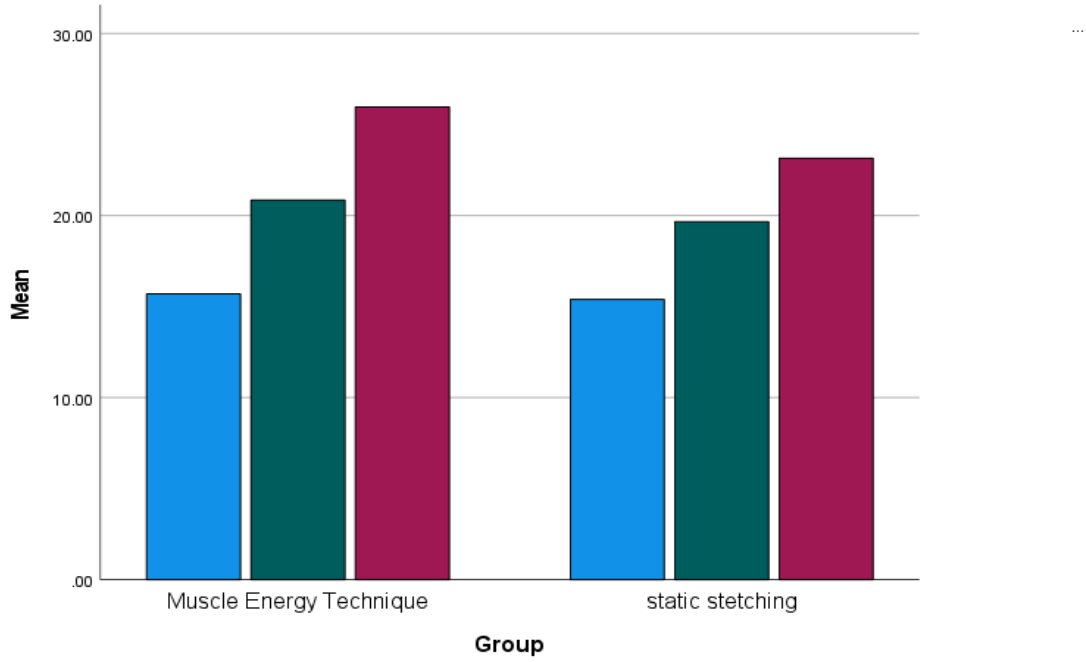

DISCUSSION

The purpose of this study was to determine the efficiency of two technique METs and static stretching in in order to improve pain, improve flexibility and improved posture in individuals with LCS. A total of 66 patients were selected for this study, with 33 allocated tin each group. Patients were allocated by using a randomized generated list, obtained from computer. Group A received METs exercises along with conventional treatment whereas group B received static stretching at setting of physiotherapy department of Mayo hospital. The patients were given treatment on the period of 4 weeks with assessment done every 2 weeks. The inclusion criteria for these patients was to have a score ranging from 3-8 on NPRS (for pain assessment), score ranging from 5-34 on ODI (for functional disability assessment), and positive Thomas test (for iliopsoas tightness) and slr90/90 test (hamstrings tightness). When results were analyzed, it was obvious that pain, flexibility and ROM were enhanced at both mid-level and after the treatment. There was no significant difference between two groups at baseline as $p>0.05$ but the significant increase at mid-treatment and post-treatment indicated that both treatments are effective. Patients also received general physiotherapy treatment which was hot pack for 10 minutes, performing warm up exercises such as isometrics etc. patients were also given instruction on how to maintain a correct posture throughout the day.

According to the research conducted by Fiona Ballentine and her colleagues, showed that METs provide an immediate increase in ROM after only one session but it was temporary indicating that to obtain long lasting tests, METs need to be performed repetitively for some time, but they are effective in improving pain and increasing flexibility(18).

There is study showing that METs not only improve pain but also results in increase in ODI score (for functional disability index). Ten men and nine women were selected in the study. They received treatment for 8 times over a time period of four weeks, that is, every two weeks. Two tailed test was applied supporting the fact that METs are effective in improving functional ability of people(19).

Osama and his colleague, Muhammad performed a research, providing the fact that METs are also competent in improving muscle lengths. 78 patients were selected. All of them received 3 to 5 repetitions of their selected techniques along with conventional Physiotherapy treatment comprising of TENS, hot pack and unilateral posterior-anterior glide. Showed that METs were more effective in increasing muscle length. It also proved that autogenic inhibition (AI) was more efficient that reciprocal inhibition (IR)(20).

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There are studies signaling that static stretching is effective in increasing flexibility but does not make any notable change in muscle power, as is suggested by Yamaguchi and his colleagues. Almost all healthy school going boys took part in research. There was no significant difference in muscle power before or after the treatment but range was improved while dynamic stretching was effective in improving strength(21).

There is evidence, extracted from the research performed by David G and his colleagues to determine the effects of stretching on pain relief, that acute stretching does indeed help with the pain even when performed alone. But there's a risk of delayed muscle soreness, if the stretching exercises are performed quite vigorously or without taking in account muscle's condition(22).

Static stretching also helps in improving ODI score, as hinted by study performed by Apoorva Phadke and his colleagues. They conducted research to determine the efficacy of METs and static stretching in treating pain and functional disability in patients with mechanical neck pain. Sixty patients were selected, one half received METs and other half received static stretching. There was improvement in pain and functional disability but METs were more effective that static stretching(23).

The aim of this study was to determine if METs was more effective in improving pain and flexibility in patients with LCS or the static stretching is more effective. The results showed that while both of them were effective in treating pain, improving ROM and flexibility along with functional disability METs was slightly more effective.

CONCLUSION

The results of this study concluded that both techniques METs and static stretching were effective in improving pain, ROM, flexibility and functional disability in patients with LCS. However, METs were slightly more effective than static stretching in improving pain, ROM, flexibility and functional disability.

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