



EFFECT OF MUSCLE ENERGY TECHNIQUES [METS] ON PAIN AND RANGE OF MOTION OF LUMBAR SPINE IN SUBJECTS WITH MECHANICAL LOW BACK PAIN [QUADRATUS LUMBORUM]

Physiotherapy

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ABSTRACT

Background: Low back pain (LBP) is one of the most prevalent musculoskeletal disorders worldwide and a leading cause of disability. The quadratus lumborum (QL) muscle plays a vital role in spinal stability and is frequently implicated in mechanical low back pain. Muscle Energy Techniques (METS) have been proposed as an effective intervention to alleviate QL dysfunction. **Objective:** To evaluate the effect of METS on QL muscle strain in subjects with non-specific low back pain (NSLBP). **Methodology:** A pre-post interventional study was conducted on 30 female participants aged 25–35 years diagnosed with NSLBP involving the QL. Participants received METS (post-isometric contraction technique) for three weeks. Pain intensity was measured using the Numerical Pain Rating Scale (NPRS), and lumbar lateral flexion range of motion (ROM) was assessed using an inch tape. **Results:** METS demonstrated significant improvements in NPRS scores (pre: 7.90 ± 0.96 ; post: 6.03 ± 0.92 ; $p < 0.01$) and lumbar ROM (pre: 10.03 ± 2.31 ; post: 11.62 ± 2.17 ; $p < 0.01$). **Conclusion:** METS significantly reduced pain and improved lumbar lateral flexion ROM in NSLBP patients, supporting its use as an effective non-invasive intervention.

KEYWORDS

INTRODUCTION

Low back pain is among the most prevalent musculoskeletal disorders worldwide, impacting millions of people and significantly contributing to disability and reduced productivity. It is recognized as a leading cause of disability across all age groups in both developing and developed nations. Around 80% of affected individuals experience moderate to severe pain, with women being more commonly affected than men. Nearly 90% of low back pain cases are classified as non-specific^{1,2}

Non-specific low back pain is defined as the pain arises due to exact cause or pathology is unknown. Non-specific low back pain typically varies with physical activity, duration, and is often localized to the lumbosacral, buttock, and thigh regions, with occasional radiating pain into the leg or foot. Individuals with higher body mass index and those who are involved in sedentary work are considered to be at high risk in developing low back pain.^{1,3,4}

Due to its anatomical position and function, the QL is frequently implicated in mechanical low back pain, particularly in individuals with poor posture, uneven loading (such as carrying loads on one side), or muscle imbalances. Dysfunction in the QL can lead to myofascial pain syndrome, characterized by deep, aching discomfort in the lower back, often accompanied by trigger points that refer pain to the hip or sacroiliac region.^{5,6}

The Quadratus Lumborum (QL) is a deep muscle of the posterior abdominal wall that plays a crucial role in stabilizing the spine and pelvis. Originating from the iliac crest and inserting into the 12th rib and the transverse processes of the lumbar vertebrae, the QL is involved in lateral flexion of the trunk, extension of the lumbar spine, and fixation of the 12th rib during respiration.^{5,7}

Understanding the role of the QL in low back pain is essential for accurate diagnosis and effective treatment. Recognizing the involvement of the QL in low back pain is crucial for effective assessment and treatment planning, including manual therapy,

targeted exercise, and postural correction strategies.⁶

According to the Indian Council of Medical Research (ICMR), nearly 8% of people across all states of India experience low back pain (LBP), with women showing higher rates of Years Lived with Disability (YLD) compared to men. Current estimates indicate that LBP accounts for 24.5 million cases per year (3.2% of all cases globally; 15th leading cause worldwide) and 57.7 million YLDs annually (7.6% of all YLDs; 6th leading cause globally). Disability-adjusted life years (DALYs) due to LBP total 64.9 million (2.6% of all DALYs; 6th leading cause worldwide). Over the past two decades, the incidence, prevalence, and DALYs of LBP have shown a notable rise of around 50%. LBP is slightly more common in women than men and tends to increase with age, peaking between 40–50 years before gradually declining. Analysis by age groups shows the most significant increase in prevalence after the age of 80. Projections based on recent trends suggest that by 2050, incidence, prevalence, and DALYs of LBP could rise by approximately 1.4 times compared to current levels.^{8,9}

The lifetime prevalence of low back pain is estimated at 60–70%, with 70–85% of people expected to experience it at some point. Most cases involve non-specific low back pain (NSLBP), where no clear underlying cause is identified.^{1,10}

SIGNS AND SYMPTOMS

Dull, aching, or throbbing pain localized to the lower back. Pain may occasionally radiate to the buttocks, thighs, or hips (but not beyond the knee in most cases). Intensity can vary from mild discomfort to severe, limiting pain.¹¹ May appear suddenly (acute) or develop gradually over time (chronic). Often recurrent, with episodes separated by symptom-free periods.¹² Worsens with prolonged sitting, standing, bending, or lifting. Triggered or intensified by twisting movements. Morning stiffness or pain after waking, improving with gentle movement.¹¹ Improves with short rest, gentle stretching, or positional changes. Mild relief from application of heat or light exercise. Stiffness and reduced flexibility in the lower back. Tenderness on palpation of lumbar muscles or ligaments. Difficulty in maintaining posture for extended

periods.¹⁵No significant neurological deficits (e.g., numbness, tingling, or weakness in legs).No bladder or bowel dysfunction. No unexplained weight loss, fever, or history of cancer.

DIAGNOSIS OF MECHANICAL LBA INVOLVING QL:

The patient may experience difficulty with lateral flexion to the opposite side when one side of QL muscle is involved. Patient may experience difficulty with lumbar spine extension when bilateral QL muscle is Involved This criterion is taken for diagnosis of mechanical LBA involving quadratus lumborum.

Physiotherapy plays a central role in the management of NSLBP, aiming to reduce pain, restore mobility, and prevent recurrence. The approach is typically active, patient-centred, and evidence-based. Education & Self-Management explain the benign nature of most NSLBP cases and encourage staying active rather than bed rest. Address psychosocial factors (fear avoidance, catastrophizing) to improve adherence and recovery. Exercise therapy, core stabilization exercises (e.g., transversus abdominis and multifidus activation) to improve spinal support, Flexibility exercises for hamstrings, hip flexors, and lumbar spine to reduce mechanical strain. conditioning (walking, swimming, cycling) for general fitness. Graded activity programs to progressively restore functional capacity. Manual therapy Spinal mobilization and manipulation may be used as an adjunct to exercise, particularly in the acute and subacute phases. Soft tissue techniques (massage, myofascial release) to reduce muscle tension. Electrotherapy like TENS, ultrasound therapy, interferential therapy. Functional rehabilitation, postural correction.

Muscle Energy Technique (MET) activates the Golgi tendon organs within the muscle, where afferent nerve impulses travel to the dorsal root of the spinal cord, triggering an inhibitory response. This mechanism facilitates muscle lengthening, strengthens shortened muscles, enhances flexibility, and improves fluid mechanics. Additionally, MET helps reduce oedema and muscular tightness. Research by Kumar et al. demonstrated that MET is effective in managing acute low back pain in patients with quadratus lumborum (QL) muscle involvement.

AIM:

The aim of the study is to evaluate the effect of METS on quadratus lumborum muscle in non-specific low back pain patients.

OBJECTIVES:

- To study the effect of METS on pain using NPRS scale in subjects with non-specific low back pain [NSLBP]
- To study the effect of METS on ROM of lumbar spine using inch tape in subjects with NSLBP.

MATERIALS AND METHODOLOGY:

Materials used for the study were: Treatment couch and plinth, Pillows, Inch tape, Moist heat therapy Methodology:

- study design: pre and post interventional study
- study setting : college of physiotherapy ,SVIMS
- sample size:30 subjects
- study period : June to august [3 months]
- study duration : 3 weeks

Inclusion Criteria:

- Individuals diagnosed with non-specific low back pain [NSLBP]
- Individuals with non-specific low back pain involving quadratus lumborum
- Only female individuals are considered.
- Age group: 25 to 45

Exclusion Criteria:

- Male individuals were excluded
- Osteoporosis with risk of vertebral compression fracture
- History of trauma
- Herniated disc with radiculopathy
- Spinal stenosis
- Age group of below 25 years and above 45 years

Out Come Measures:

- 1.pain intensity: measured with numerical pain rating scale [NPRS] questionaries
2. lumbar lateral flexion range of motion [ROM]: measured using inch

tape

Procedure:

Subjects who fulfilled the inclusion and exclusion criteria and expressed willingness to participate where recruited for the study. Informed consent was obtained from all participants after providing a detailed explanation of the treatment procedure. The study protocol was reviewed and approved by the institutional Ethical committee of SVIMS.

All the subjects were undergone measure of pre values of low back pain and ROM of lateral flexion of lumbar spine.

The subjects were given METS to Quadratus lumborum

INTERVENTION: METS

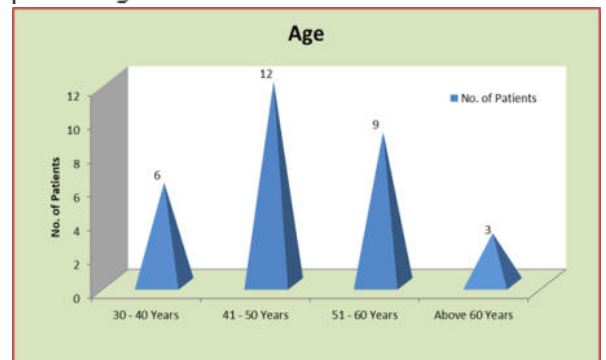
Participants underwent the METS for a duration of 3 weeks

1. METS: Post isometric contraction technique
2. Contraction: Isometric contraction of Quadratus lumborum
3. Resistance: manual resistance applied
4. Hold time: 30 seconds
5. Repetitions: 2 sets per day [1set =10 repetitions per day]
6. Rest interval: 20 seconds between contractions
7. Frequency: 6 days per week for 3 weeks

Post values of low back pain and ROM of lateral flexion of lumbar spine was tabled and recorded in Microsoft excel sheet.

Statistical Analysis:

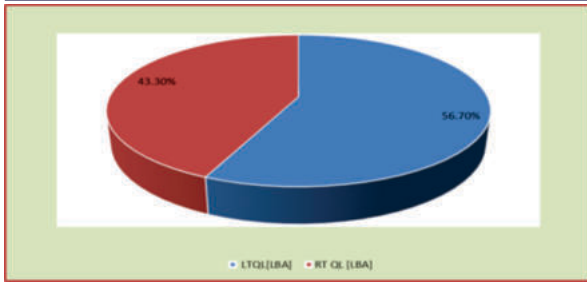
Age Group Yrs	Group	
	No. of Patients	%
30 - 40 Years	6	20.0
41 - 50 Years	12	40.0
51 - 60 Years	9	30.0
Above 60 Years	3	10.0
Total	30	100.0
Mean Age	48.33 ± 8.798	



Intereference:TABLE1 AND GRAPH1 represents the categorization of subjects according to the age

This table shows mean age of all subjects and mean value age of 48.33 years.

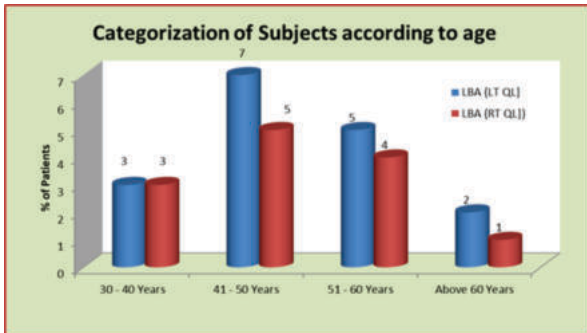
Diagnosis	No. of Patients	%
LT QL [LBA]	17	56.7
RT QL [LBA]	13	43.3
Total	30	100.0



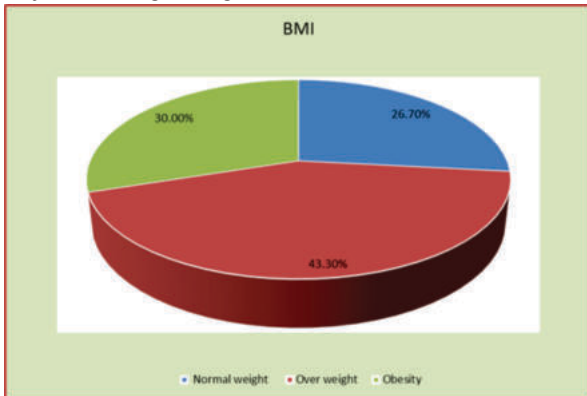
INTERFERENCE: Table2 and Graph2 represents the categorization of subjects according to the side QL involved

Age	Diagnosis					
	LBA QL (LT)		LBA QL (RT)		Total	
	No. of Patients	%	No. of Patients	%	No. of Patients	%
30 - 40 Years	3	17.6	3	23.1	6	20.0
41 - 50 Years	7	41.2	5	38.5	12	40.0
51 - 60 Years	5	29.4	4	30.8	9	30.0
Above 60 Years	2	11.8	1	7.7	3	10.0
Total	17	100.0	13	100.0	30	100.0

Chi-square $\chi^2 = 0.249^{ns}$; (p = 0.969); df= 3;



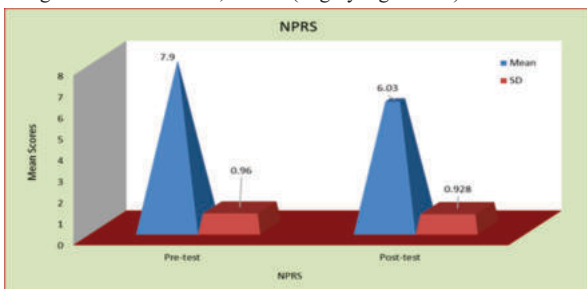
INTERFERENCE: Table3 and Graph3 represents the categorization of subjects according to the age



INTERFERENCE: Graph4 represents the categorization of subjects according to the body mass index

Group	N	Pre-value Mean \pm S. D	Post-value Mean \pm S. D	Mean Difference	t-value (p-value)	Sig. (2-tailed)
NPRS	30	7.90 \pm 0.960	6.03 \pm 0.928	1.867	17.895**	0.000

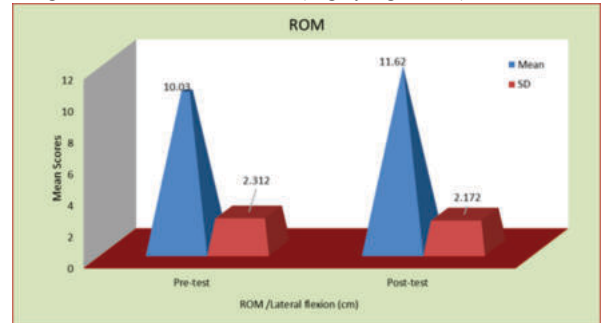
**significant at 0.01 level; P<0.01(Highly Significant)



INTERFERENCE: the table represents the pre and post values of NPRS score from pre value 7.90 to 6.03 with 1.867 mean difference

Group	N	Pre-Test Score Mean \pm S. D	Post-Test Score Mean \pm S. D	Mean Difference	t-value (p-value)	Sig. (2-tailed)
ROM of LUMBAR: Lateral Flexion (cm)	30	10.03 \pm 2.312	11.62 \pm 2.172	-1.583	10.181**	0.000

**significant at 0.01 level; P<0.01(Highly Significant)



INTERFERENCE: Table 6 and graph 6 shows the pre & post values of lumber ROM from 10.03 to 11.67 with a mean difference of 1.583

DISCUSSION:

According to a study conducted by chang-yu J.Hseih the combined use of manual therapy approaches such as mobilisations and MFR has shown to be effective in reducing low back pain and functional disability.

The present study evaluated the effectiveness of METS protocol in reducing low back pain improving rom of lateral flexion of lumbar spine in subjects with mechanical low back pain. significant improvements were observed across all outcome measures, which are consistent with findings from previous literature.

The pain assessment was carried out using the NPRS scale the pre-test mean and SD was 7.90+ 0.960 whereas the post-test 6.03 \pm 0.928 values were showing a mean difference of 1.867 with p<0.01

The functional assessment was done using the lumbar range of motion [lateral flexion] with tape method using modified Schober's test. The pretest mean and SD was 10.03+ 2.312 whereas the post test score was 11.62+ 2.172 were showing the mean difference of -1.583 with p<0.01

The result of the present study showed extremely significant improvement in NPRS and ROM within a short-term duration of [3 weeks].

LIMITATIONS OF THE STUDY:

1. The sample size for the study was relatively small [30 subjects] which may reduce the generalizability of the findings to the broader population
2. The study duration was short [3 weeks] and therefore the long term effects and sustainability of the METS protocol for mechanical low back pain were not assessed
3. The study includes only female subjects

FUTURE RECOMMENDATIONS:

1. Conduct studies with a larger and more diverse sample to improve the robustness and generalizability of the results
2. Assess long term outcomes including functional performance and quality of life through extended follow up after the intervention period
3. Conduct studies including all individuals regardless of gender.

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