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EFFECT OF HEMIBRIDGE WITH BALL AND BALLOON EXERCISE VERSUS CORE STRENGTHENING EXERCISES ON PAIN AND FUNCTIONAL DISABILITY IN SUBJECTS WITH CHRONIC LOW BACK PAIN: A RANDOMIZED CLINICAL TRIAL

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ABSTRACT

Background: Low Back Pain(LBP) is defined as pain localized between 12Th rib and inferior gluteal folds with or without leg pain. LBP lasting for more than 12 weeks is known as chronic LBP. It is characterised by pain that is dull or achy, Stinging, burning pain that moves from the low back to the backs of the thighs, sometimes into the lower legs, Muscle spasms and tightness in the low back. Pain is worsened with movements, like bending, lifting, or twisting.

Objective: To evaluate and compare the effects of hemibridge with ball and balloon exercise and core strengthening exercise on pain and functional ability in subjects with chronic LBP.

Methods: 42 Young individuals with age group 25-35 years were examined for MODQ, MST and NPRS. Individuals were divided into 2 groups equally. Group A received core muscle strengthening exercises and group B received hemibridge with ball and balloon exercise. Participants were given exercise 4 times a week for 5 weeks and post readings were taken for MODQ, MST and NPRS.

Results: After analysing the results by Paired and Unpaired t test,

Mean pre NPRS group A was 7.71, mean pre NPRS group B was 7.86. Mean post NPRS group A was 2.38, mean post NPRS group B was 4.00 ($p<0.001$)

Mean pre MODQ group A was 69.52, mean pre MODQ group B was 70.95. Mean post MODQ group A was 28.00, mean post CRT group B was 43.90 ($p<0.001$).

Conclusion: There is significant difference in core strengthening exercises and hemibridge with ball and balloon exercise in subjects with chronic low back pain.

Training for core muscles can yield significant improvement on receiving core strengthening exercises as an adjuvant to Transcutaneous Electrical Nerve Stimulation.

Keywords: Chronic LBP, Core Strengthening exercises, Hemibridge with Ball and Balloon exercise, MODQ.*IndexTerms* - Component,formatting,style,styling,insert.

INTRODUCTION

Low Back Pain(LBP) is referred as pain present between 12Th rib and inferior gluteal folds with or without leg pain.[1] LBP is generally aggravated by prolonged sitting or holding stationary positions. Worsened pain with certain movements, like bending, lifting, or twisting.

Low back pain is the largest health issue in civilised western countries.[2] The prevalence of LBP in India is about 23.09%. It has entire life occurrence of about 60% to 85%.[1,3] LBP has shown the highest prevalence in female individuals aged 40 to 80 years.[4]

Pain is exaggerated by trunk flexion, sitting, straining, sneezing, coughing, etc. Pain is reduced by rest and in Semi Fowler's position.[10]

Back pain is cause by skeletal irregularities such as scoliosis (a curvature of the spine), lordosis (an abnormally exaggerated arch in the lower back), kyphosis (excessive outward arch of the spine), Injuries like sprains (overstretched or torn ligaments), strains (tears in tendons or muscle), and spasms (sudden contraction of a muscle or group of muscles) and other degenerative problems like Intervertebral disc degeneration which occurs when the usually due to aging and lose their cushioning capability. Spondylosis is the overall degeneration of the spine related to normal wear and tear that occurs within the joints due to aging.[11]

Altered kinematics of diaphragm and pelvic floor muscle were seen in subjects with back pain. Studies have found that diaphragm is primary trunk stabilizer. It has been reported that, diaphragm when activated by phrenic nerve, result in an increase in intra-abdominal pressure which eventually increases spinal stiffness. Along with diaphragm other trunk stabilizers are transversus abdominis, pelvic floor muscle and multifidus. It has been found that, abnormal muscular stabilization results in delayed contraction of transverses abdominis causing LBP. Therefore, alteration in kinematics of trunk stabilizers may be responsible for back pain.[12]

Blowing the balloon requires deep inhalation followed by forceful exhalation. The eccentric contraction of both diaphragm and transversus abdominis during exhalation and inhalation may have developed strength and optimize ZOA and therefore reduce LBP and improve functional ability of the subjects. Activation of deep core muscles contribute to the correction of lumbar lordosis, thereby correcting faulty posture causing pain. Blowing the balloon activates core muscles and reduces activity of paraspinal muscles. This also contributes in the correction of the lumbar lordosis thereby increasing the functional ability of the participant.[6]

Core muscle strengthening mainly strengthens diaphragm and abdominals which reduces excessive anterior pelvic tilt. Plank exercise activate core muscles with less compressive forces avoiding more compressive forces like in back extension. During plank exercise objective is to maintain spine in neutral position against the forces acting on the body. Gravity pulls the elevated trunk downwards, while the balance is maintained on ground with toes and forearms against gravitational force. So it is essential to activate core muscles especially abdominals to resist gravity and to maintain neutral position of spine.[13]

Previous study has concluded that LBP is reduced with core strengthening exercises. Studies have also concluded that hemibridge with ball and balloon are beneficial to increase functional ability and reduce pain. Performing core muscle strengthening exercises and hemibridge with ball and balloon exercise helps improving core muscle strength, improve functional ability and lumbar range of motion. Considering data from previous research, there is a need to check which exercise has beneficial effect with TENS for improving functional ability, lumbar range of motion and reduce pain.

The principal aim of the research was to compare the effect of hemibridge with ball and balloon exercise and core strengthening exercises on pain and functional disability in subjects with CLBP.

OBJECTIVE

To evaluate the effects of hemibridge with ball and balloon exercise on pain and functional ability in subjects with chronic LBP.

To evaluate the effects of core strengthening exercise on pain and functional ability in subjects with chronic LBP

To evaluate and compare the effects of hemibridge with ball and balloon exercise and core strengthening exercise on pain and functional ability in subjects with chronic LBP.

ALTERNATIVE HYPOTHESIS - There will be a difference between hemibridge with ball and balloon exercise and core muscle strengthening exercises on pain and functional ability in subjects with chronic LBP.

NULL HYPOTHESIS - There will be no difference between hemibridge with ball and balloon exercise and core strengthening exercises on pain and functional abilities in subjects with chronic LBP.

MATERIAL AND METHOD

STUDY DESIGN

• Study Type – A Randomized Clinical Trial

• Duration of study -6 months

• Sampling method - Envelope sampling

• Sample size- 42

• Study place- Tertiary Health Centre's in Miraj

SELECTION CRITERIA

• Inclusion criteria

• Individual willing to participate voluntarily who were informed about research in their vernacular language and taking written consent for the same.

• Both male and female between age group 25 - 35years.

• Subjects with NPRS score more than 6.

• Subjects with MODQ score more than 40%.

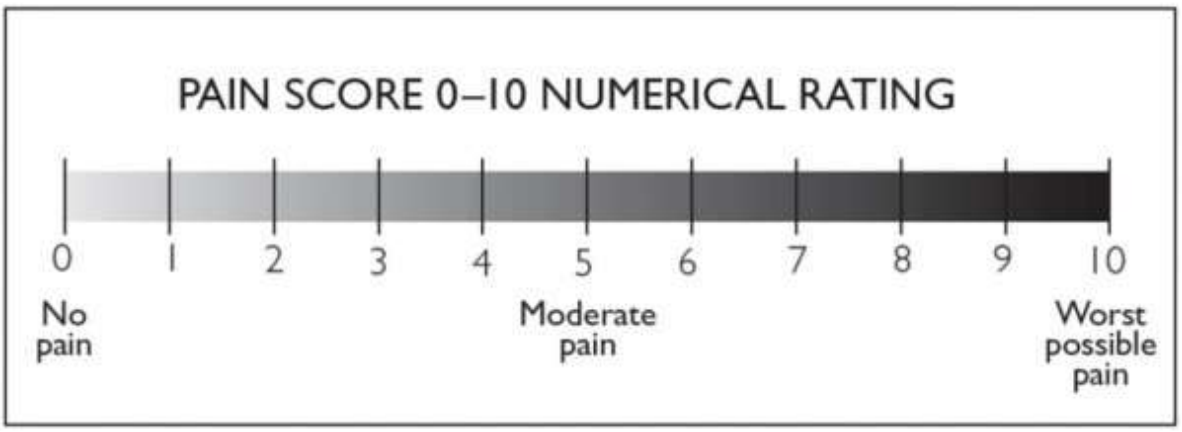
• Subjects with LBP for more than 12 weeks or 3 months.

• Exclusion criteria - Participants with central nervous system dysfunction (hemiparesis, myelopathy, cerebellar ataxia), amputation of lower limb, angina and other cardiac conditions, patients with bed sores, bell's palsy, dyspnoea, spinal deformity, recent fractures in upper limb and lower limb, road traffic accident

OUTCOME MEASURE:

• Numerical Pain Rating Scale –

The reliability has been observed in both literate and illiterate patients with rheumatoid arthritis (r = 0.96 and 0.95, respectively) before and after medical consultation. The validity of NPRS was shown to be highly correlated with the VAS in patients with rheumatic and other chronic pain conditions (pain>6 months): correlations ran ge from 0.86 to 0.95.[8]



The patients will be asked to circle the number between 0 and 10 that explains best to their pain intensity.

• Modified Oswestry Disability Questionnaire –

This questionnaire has been designed to give therapist information as to how back pain has affected ability to manage in everyday life. The subject is asked to mark one box for one question which resembles his/her symptoms.

There are total 10 questions with each question having 6 options. The first box of every question is marked 0 while the last box is marked 5 indicating maximum disability.

• Modified Schober's Test-

The validity of the modified Schober test is moderate (r=0.67) with an interclass reliability of (r=0.91) and intraclass reliability of (r=95).[9]

With subject in standing position, examiner marks both posterior superior iliac spine (PSIS) and then draws a horizontal line at the centre of both marks. Another is marked 5 cm below the first line and third line is marked 10 cm above the first line.

Subject is then instructed to bend forward as if attempting to touch toes, examiner remeasures distance between the top and bottom line.[9]

PROCEDURE

• Subjects will be screened according to inclusion and exclusion criteria

• Those who will be selected and wish to participate in this study will be ask to sign consent form which explains the procedure in the preferred language.

• Each subject's pain and functional disability will be screened by NPRS, MODQ and MST.

•Subjects in both the groups will be given TENS prior to the exercise protocol for 15 minutes.

Parameters of TENS-

Mode: Burst Mode

Frequency:1 to 4 Hz

Intensity: As per tolerated by the patient

Placement: Painful Area

Two channel: 4 electrodes

Time: 20 minutes

• GROUP A- Participants will be given core strengthening exercise after TENS.

1. Anterior draw in with knee to chest

   Lie on your back on a mat or table

   Draw one knee to the chest while maintaining abdominal draw in.

   Do not grab your knee with your hand.

   Repeat the same exercise 10 times on each leg.

2. Abdominal draw in with double knee to chest

   Lie on your back on a mat or table

   Bring both knees to the chest while maintaining abdominal draw in.

   Do not grab your knee with your hand.

   Repeat the same exercise 10 times.

3. Prone bridging on elbows

   Lie on your stomach on a mat or table with your forearms or elbows on table or mat.

   Rise up so that you are resting on your forearms and toes.

   Maintain abdominal draw in.

   Your back should be completely straight.

   Hold this position for 15sec to 1minute.

   Progress in increments of 15 seconds.

   Repeat the same exercise for 5 to 10 times.

4. Quadrupet opposite arm/leg

   In a quadruped position (on all fours) keep head straight up with knees bent to 90 degrees.

   Engage your core to stabilize back during the entire exercise.

   Use hamstrings, glutes and low back muscles to lift your leg straight up while simultaneously lifting opposite arm

   Repeat the same exercise with opposite leg and arm 10 times on each side.[5]

Strengthening exercises will be performed daily three times and each time every exercise will be repeated 10 times in three sets.

There will be 1-3 min rest between sets.

• GROUP B - Participants will be given Hemibridge with ball and balloon exercise after TENS.

i. Lie on back with feet on a wall and knees and hips bent at 900 angle

ii. Place a 4-6" ball between knees

iii. Place right arm above head and a balloon in left hand

iv. Inhale through nose and as exhale through mouth perform a pelvic tilt so that tailbone is raised slightly off the mat. Keep low back flat on the mat. Do not press feet flat in the wall; instead dig down with heels

v. Shift left knee down so that it is below the level of right without moving feet. should feel left inner thigh engage.

vi. With left knee shifted down, take right foot off the fall should feel the back of the left thigh engage maintain this position for the remainder of the exercise.

vii. Now inhale through nose and slowly blow out into the balloon

viii. Pause 3 seconds with tongue on the roof of mouth to prevent airflow out of the balloon

ix. Without pinching the neck of the balloon and keeping tongue on the roof of the mouth, inhale again through nose.

x. Slowly blow out as stabilize the balloon with hand

xi. Do not strain neck or cheeks as blow.

xii. After the fourth breath in, pinch the balloon neck and remove it from mouth. Let the air out of the balloon.

xiii. Relax and repeat the sequence 4more times.[6]

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The procedure was done 5 days a week for 4 weeks regularly for both groups.

FINDINGS

Table 1: Comparison of subjects receiving core strengthening exercises and hemibridge with ball and balloon exercise via NPRS, MST MST flexion and extension, MODQ using unpaired t test.

	Group	Mean	Std. Deviation	Unpaired t statistic	p value
NPRS Post	Core strengthening exercise	2.38	0.50	8.58	**<0.001**
	Hemibridge exercise with ball and balloon	4.00	0.71	8.58	
MST Flexion Post	Core strengthening exercise	4.45	0.30	6.65	**<0.001**
	Hemibridge exercise with ball and balloon	3.97	0.14	6.65	
MST Extension Post	Core strengthening exercise	2.41	0.29	2.63	**0.01**
	Hemibridge exercise with ball and balloon	2.22	0.15	2.63	
MODQ Post	Core strengthening exercise	28.00	4.34	9.30	**<0.001**
	Hemibridge exercise with ball and balloon	43.90	6.53	9.30	

Unpaired t test was done to compare NPRS, MST flexion, MST extension and MODQ between two groups.
It revealed that, there was significant difference between two groups for NPRS, MST flexion, MST extension and MODQ ($P<0.05$).

- It was found that, after following exercises protocol, mean NPRS (2.38) was significantly lower in patients having core strengthening exercise than mean NPRS (4.00) of patients having hemibridge exercise with ball and balloon.
- It was found that, after following exercises protocol, mean MST flexion (4.45) was significantly higher in patients having core strengthening exercise than mean MST flexion (3.97) of patients having hemibridge exercise with ball and balloon.

- It was found that, after following exercises protocol, mean MST extension (2.41) was significantly higher in patients having core strengthening exercise than mean MST extension (2.22) of patients having hemibridge exercise with ball and balloon.
- It was found that, after following exercises protocol, mean MODQ (28.00) was significantly lower in patients having core strengthening exercise than mean MODQ (43.00) of patients having hemibridge exercise with ball and balloon.

Fig 2: Average NPRS, MST flexion and extension, MODQ of subjects receiving core strengthening exercises and hemibridge with ball and balloon exercise.

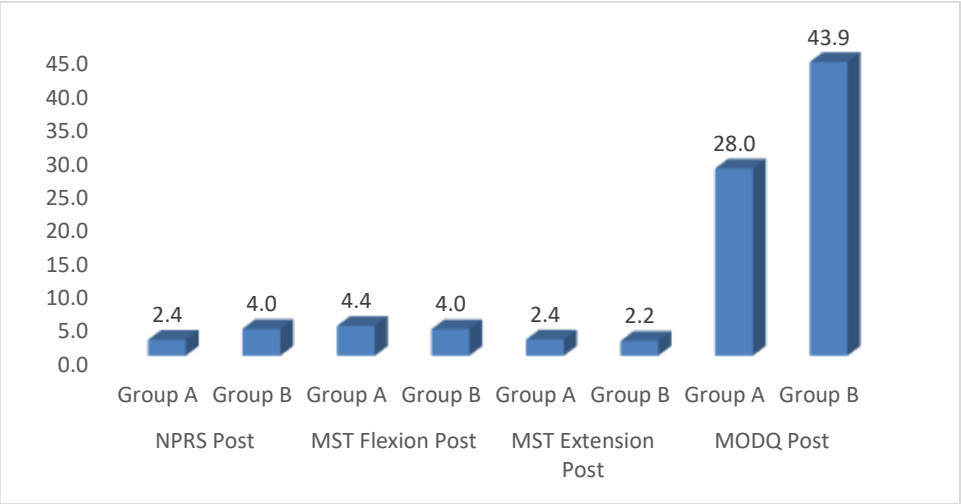


Table 3: Analysis of subjects receiving core strengthening exercises via NPRS, MST MST flexion and extension, MODQ using paired t test.

Core strengthening exercise	Mean	Std. Deviation	Paired t statistic	p value
NPRS Pre	7.71	1.15	30.71	<0.001
NPRS Post	2.38	0.50		
MST Flexion Pre	2.71	0.56	12.04	<0.001
MST Flexion Post	4.45	0.30		
MST Extension Pre	1.40	0.36	15.60	<0.001
MST Extension Post	2.41	0.29		
MODQ Pre	69.52	13.20	17.95	<0.001
MODQ Post	28.00	4.34		

Paired t test was done to compare NPRS, MST flexion, MST extension and MODQ before and after following the exercises.
It revealed that, there was significant difference before and after following the exercises for NPRS, MST flexion, MST extension and MODQ (P<0.001).

- It was found that, after following core strengthening exercises protocol, mean NPRS (2.38) was significantly lower in patients as compared to before mean NPRS (7.71).
- It was found that, after following exercises protocol, mean MST flexion (4.45) was significantly higher in patients as compared to before mean MST flexion (2.71).
- It was found that, after following exercises protocol, mean MST extension (2.41) was significantly higher in patients as compared to before mean MST extension (1.40).
- It was found that, after following exercises protocol, mean MODQ (28.00) was significantly lower in patients as compared to before mean MODQ (69.52).

Fig 3: Average NPRS, MST flexion and extension, MODQ of young females and males receiving core strengthening exercises.

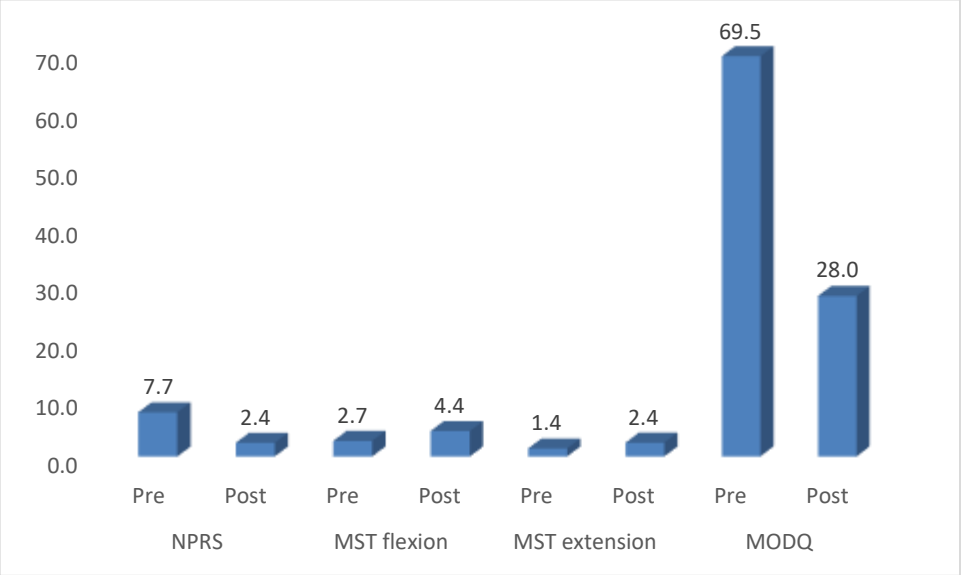


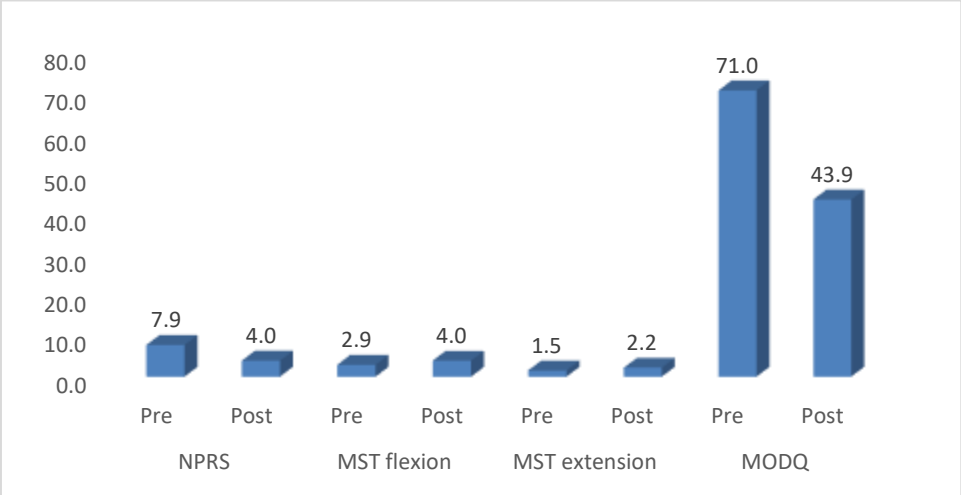
Table 4: Analysis of subjects receiving hemibridge with ball and balloon exercise via NPRS, MST MST flexion and extension, MODQ using paired t test.

Hemi bridge exercise with ball and balloon	Mean	Std. Deviation	Paired t statistic	p value
NPRS Pre	7.86	0.96	24.31	<0.001
NPRS Post	4.00	0.71		
MST Flexion Pre	2.94	0.65	8.24	<0.001
MST Flexion Post	3.97	0.14		
MST Extension Pre	1.54	0.27	11.38	<0.001
MST Extension Post	2.22	0.15		
MODQ Pre	70.95	10.40	17.77	<0.001
MODQ Post	43.90	6.53		

Paired t test was done to compare NPRS, MST flexion, MST extension and MODQ before and after following the exercises.
It revealed that, there was significant difference before and after following the exercises for NPRS, MST flexion, MST extension and MODQ (P<0.001).

- It was found that, after following hemibridge exercise with ball and balloon protocol, mean NPRS (4.00) was significantly lower in patients as compared to before mean NPRS (7.86).
- It was found that, after following exercises protocol, mean MST flexion (3.97) was significantly higher in patients as compared to before mean MST flexion (2.94).
- It was found that, after following exercises protocol, mean MST extension (2.22) was significantly higher in patients as compared to before mean MST extension (1.54).
- It was found that, after following exercises protocol, mean MODQ (43.90) was significantly lower in patients as compared to before mean MODQ (70.95).

Fig 4: Average NPRS, MST flexion and extension, MODQ of subjects receiving hemibridge with ball and balloon exercise.



DISCUSSION

Here is a randomized clinical trial of hemibridge with ball and balloon exercise and core strengthening exercise along with TENS. The results indicate reduction in pain, improved ROM and functional ability in both the groups. But significant improvement in the study was found using core strengthening exercises along with TENS. This proves that there is improved core muscle strength using core strengthening exercises. Core muscle exercises activate core muscles with less compressive forces avoiding more compressive forces. During core muscle exercises objective spine is maintained in neutral position against the forces acting on the body. Gravity pulls the elevated trunk downwards, while the balance is maintained on ground with toes and forearms against gravitational force. So it is essential to activate core muscles especially abdominals to resist gravity and to maintain neutral position of spine.[7]

The NPRS, MST flexion and extension and MODQ values were statistically significant. The change in the values could be attributed to the hemibridge with ball and balloon exercise and core strengthening exercise. During both the types of exercises coordinated activity of core muscles is responsible to maintain trunk stability and pelvis in position. During inhalation, there is concentric contraction of diaphragm and eccentric contraction of transversus abdominis while at the time of exhalation there is concentric contraction of transverses abdominis and eccentric contraction of diaphragm. The eccentric contraction of core muscles during respiration improves strength and optimize ZOA. This reduces LBP and improve functional ability.[6]

Low back stability largely depends upon on the supporting core muscles and lumbar spine musculature. When performing core muscle strengthrning exercises abdominal muscles contract, they provide support to lumbar spine anteriorly by exerting pressure posteriorly thus supporting vertebral column anteriorly. The lumbar spine musculature stabilize the spine posteriorly and hence provide support to the same. Vertebral column is surrounded by the strong musculature due to which there is less stress placed on the vertebral column. Hence by improving lumbar spine stability LBP is reduced.

CONCLUSION

This study concludes that there is improvement in NPRS, MODQ and MST with core strengthening exercises and hemibridge with ball and balloon exercise as an adjunct to TENS. It proves the hypothesis that significant difference for core strengthening exercises and hemibridge with ball and balloon exercise. Also, significant improvememt was found using core strengthening exercises as it engages maximum core muscles and improves their strength. The results of the study have to be confirmed over larger population.

Conflict of Interest: -None

Source of Funding: - Self

Ethical Clearance: - Obtained by College of Physiotherapy, Wanless Hospital.

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