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A STUDY TO COMPARE THE EFFECT OF HEMI-BRIDGE BALL AND BALLOON BREATHING EXERCISE VERSUS INSPIRATORY MUSCLE TRAINING IN NON-SPECIFIC LOW BACK PAIN

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BACKGROUND & PURPOSE: Back pain in the lumbar area without any severe pathology or any particular cause which can be of any type is termed as Non-specific low back pain. A reduced chest wall expansion can be due to dysfunctions in the contractions of the core muscles, respiratory function is frequently ignored in people with LBP. People with chronic low back pain are susceptible to respiratory disorders. The purpose of the study to examine changed into to test the impact of hemi-bridge ball and balloon respiratory exercise versus inspiratory muscle training in the non-specific low back patients. **METHOD:** 30 Subject were recruited on the basis of the inclusion and exclusion criteria. They divided into 2 groups each comprising 15 participants. Group A treated with hemi- bridge with ball and balloon exercise and Group B treated with inspiratory training for 3 days/week for 4 weeks. Subjects of both group were assessed with FEV_1, MIP and MODQ pre and post exercise. **RESULTS:** Statistical analysis was done with paired and unpaired t-test by SPSS 23. The finding shows there was significant improvement in FEV1, MIP and MODQ with $p < 0.01$ in group A and group B, but there was more significant improvement in FEV1, MIP and MODQ in group A rather than group B. **CONCLUSION:** Result showed that there is significant difference in FEV1, MIP and MODQ in both the group in patients with non specific low back pain. But there is greater significant difference in group A (hemi-bridge with BBE) rather than group B (IMT). So, this study concluded that hemi-bridge with ball and balloon breathing exercise shows greater improvements in pain reliving, enhancing FEV_1 and MIP than IMT in non specific low back pain. **Keywords:** hemi-bridge with ball and balloon breathing, inspirtory muscle training, non- specific low back pain, FEV1, MIP, MODQ

INTRODUCTION:

Back pain in the lumbar area without any severe pathology or any particular cause which can be of any type is termed as Non-specific low back pain.[1] It must be intense, sub-acute or chronic.[2] Long term low back pain is a significant clinical issue throughout the world that influences the quality of life and causes disability and social and monetary expenses. This condition uniformly affects men and women.[3] Lower back pain is a main health issue in the western countries. Each year prevalence rate of LBP was noted to be 15% to 45% with a factor prevalence of around 30%. Postural control is one of the main problems in chronic low back pain, and imbalances in the kinetic chain cause chronic low back pain. Disturbance in postural control can increase the possibility of injury.[5] People with chronic low back pain are susceptible to respiratory disorders, while people with respiratory diseases are also susceptible to chronic low back pain.[6] A reduced chest wall expansion can be due to dysfunctions in the contractions of the core muscles; however, respiratory function is frequently ignored in people with chronic low back pain, although it can be one of

the factors contributing to the stability of the lumbar spine and injury in this region.[7] Respiration and spinal stabilization involve the diaphragm, TVA, PFM and the intercostal and internal oblique muscles.[8] The diaphragm muscle function and respiratory rhythm play a imperative role in spinal stability. The attachment of the diaphragm to the lumbar spine creates a synergistic function with the transverse abdominis muscle. In chronic low back pain, their is an altered activation pattern in the diaphragm and transverse abdominis muscle.[9]

Certain muscles used to control posture and breathing was very similar, such as transverse diaphragm, transverse abdomen, multifidus and pelvic floor. Maintaining perfect posture/confidence and breathing was important, and there were a big problems at some point during exercise. ZOA was the zone of the diaphragm that contains a circular and hollow component, which was similar to a double section connected to the internal components of the lower ribs.[11] ZOA plays imperative role in controlling abdominal muscles and it coordinates diaphragm muscle pressure. When the ZOA drops or there was a problem, several negative results could be achieved.[10]

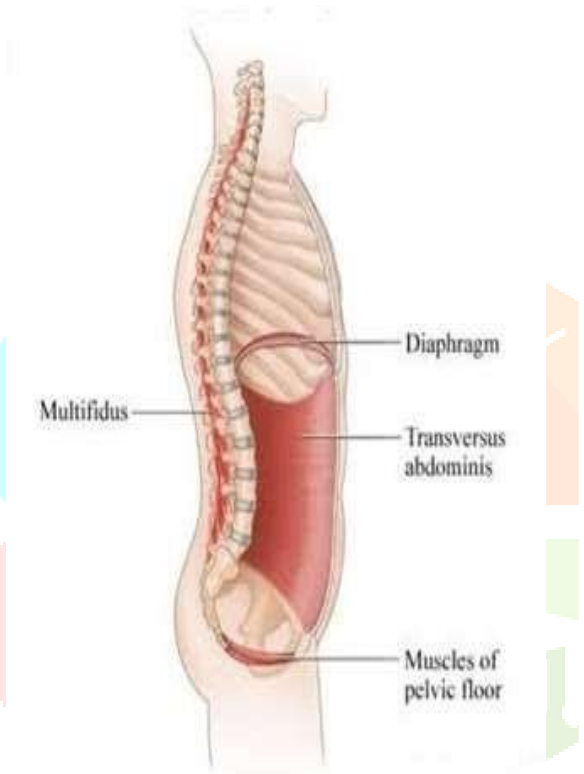


Figure 1: Four main muscles

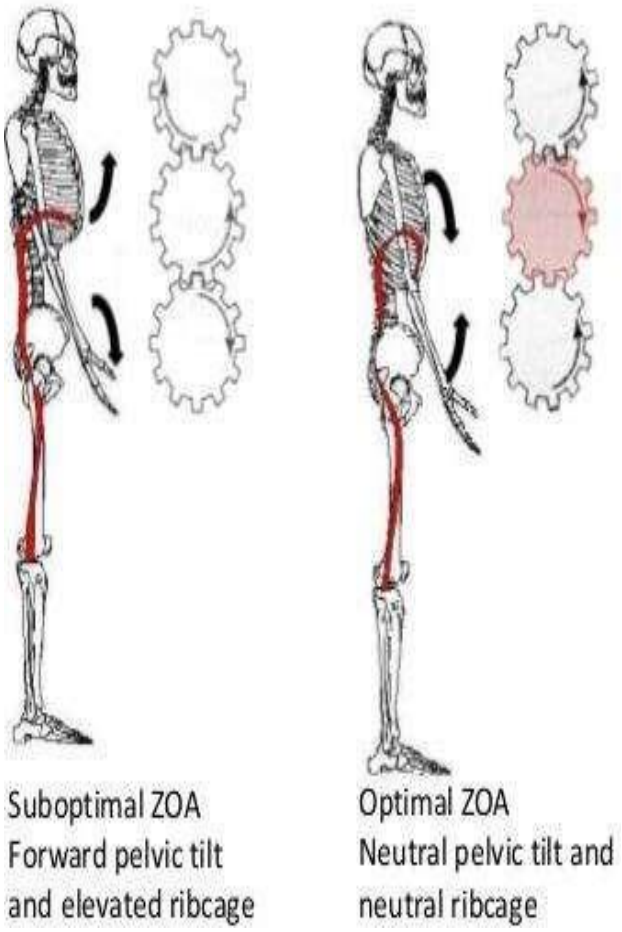


Figure 2: Zone of apposition

In people who suffer from back pain and perform motor tasks, kinesiological disorders of the diaphragm and pelvic floor muscles, as well as the adjustment of breathing patterns, are found. A number of studies have shown that the diaphragm can help maintain the stability of the core in terms of biomechanics. The excitement of the phrenic nerve leads to the expansion of pressure in the abdominal cavity, which ultimately increases the stiffness of the spine.

BBE and shortens our abdomen, which causes our ribs to drop and our spine to bend forward. For most people with quadriceps, calf and back muscle pain or injury, this is mainly caused by excessive inhalation and insufficient exhalation. Blowing will increase the exhalation phase of breathing, making the hamstrings, obliques, hips and hip flexors reach their optimal positions.[12] Respiratory muscle training (IMT) was developed by Delhez et al. (1966) proved that breathing muscles can be strengthened through targeted training. Threshold pressure loading has proven to be the best technique in the clinical group, and it provides a versatile and reliable method to improve inspiratory capacity, strength and endurance.

Immediate Effect of hemi-bridge ball and balloon breathing exercise and IMT was individually examined in different studies. The effect of chronic application of this exercise is yet to be examined. Thus, The motive of the prevailing examine changed into to test the impact of hemi-bridge ball and balloon respiratory exercise versus inspiratory muscle training in the non-unique low ache patients.

METHODOLOGY:

Ethical approval was given from Parul University. Subjects were selected for the study from Sainath hospital, Ahmedabad. Subjects were included in this study after taking demographic data and initial detailed of physiotherapy assessment. The participants were selected according to inclusion and exclusion criteria ; inclusion criteria : Patients with age group 21 to 45 years, Non-specific low back pain, No use of pain relief medications, Duration of non-specific low back pain from 6 to 12 months (Chronic) exclusion criteria : Previous spinal surgery, Respiratory disorder, Inflammatory disease and rheumatologic disease, Psychosocial condition, Malignancy, Spinal pathology (disc herniation, spondylolisthesis, spinal stenosis etc.), Pregnancy, Any cardiac condition and informed through patient information form and written consent was taken from the participants who were interested without any complusing force.

Subjects of both group were assessed with Forced expiratory volume (FEV_1), Maximal inspiratory pressure (MIP), Modified oswestry disability questionnaire (MODQ) before starting the treatment and after 4 weeks of treatment. Forced expiratory volume (FEV_1) measured by pulmonary function test (PFT), maximum inspiratory pressure (MIP) measured by a pressure gauge manometer. 30 Subject were recruited on the basis of the inclusion and exclusion criteria. Among them, they divided according to convenient sampling method into 2 groups each comprising 15 participants. Group A treated with hemi-bridge with ball and balloon exercise and Group B treated with inspiratory training for 3 days/week for 4 weeks.

Group-A : Hemi-bridge with ball and balloon exercise: Instructions for Performance of the hemi Bridge with Ball and Balloon: 1. Lie on your back with your feet flat on a wall and knees and hips bent at a 90-degree angle. 2. Place a 4-6 inch ball between your knees. 3. Place your right arm above your head and a balloon in your left hand. 4. Inhale through your nose and as you exhale through your mouth, perform a pelvic tilt so that your tailbone is raised slightly off the mat. Keep low back flat on the mat. Do not press your feet into the wall, instead pull down with your heels. 5. You should feel the back of your thighs and inner thighs engage, keeping pressure on the ball. Maintain this position for the remainder of the exercise. 6. Now inhale through your nose and slowly blow out into the balloon. 7. Pause three seconds with your tongue positioned on the roof of your mouth to prevent airflow out of the balloon. 8. Without pinching the neck of the balloon and keeping your tongue on the roof of your mouth, inhale again through your nose. 9. Slowly blow out as you stabilize the balloon with your left hand. 10. Do not strain your neck or cheeks as you blow. 11. After the fourth breath in, pinch the balloon neck and remove it from your mouth. Let the air out of the balloon.12. Relax and repeat the sequence 4 more times.

Group-B: Inspiratory muscle training exercise (IMT) : The IMT was performed by the Threshold IMT breathing trainer for 4 weeks. Inspiratory muscle strength was evaluated by measuring maximal inspiratory pressure (PImax). Training is performed in relaxed seated position and IMT performed at 60-70% of maximal inspiratory pressure (PImax). They were instructed to breath in and out through a mouthpiece (POWERbreath) with their nose occluded while performing a training session.

STATISTICAL ANALYSIS

The collected data were analysed using statistically package of social science (SPSS) Version 23.0 and excel version 2019. The parametric test was used in statistical analysis because the distribution of the data was normal. Demographic values were compared within and between group using paired and unpaired T-test with P value < 0.05

RESULT:

This present study compared the efficacy of hemi-bridge ball and balloon breathing exercise and inspiratory muscle training in non-specific low back pain. In this study power was kept at 95% and level of significance was kept at 5%. The level of significance for all the test was kept t be 0.05. Total 30 participants were recruited for this study from Sainath Hospital according to inclusion and exclusion criteria.

Table 1: MEAN VALUE OF AGE AND GENDER DISTRIBUTION :

DD		GROUP A	GROUP B
AGE	MEAN	27.93	30.3333
	SD	5.675	7.84371
SEX	FEMALES	8	7
	MALES	7	8

TABLE 2: FEV1, MIP AND MODQ OF WITHIN GROUP COMPARISON IN GROUP A :

OUTCOME	PRE		POST		T VALUE	P VALUE
	MEANS	SD	MEANS	SD		
FEV1	1.553	0.434	2.093	0.463	16. 108	<0.0001
MIP	62.86	11.80	103.43	20.414	11.274	<0.0001
MODQ	38.586	6.323	27.8	5.955	15.117	<0.0001

TABLE 2: Shows the comparison of pre and post treatment values in group A. The P value being <0.0001 showing extremely significant difference between the pre and post treatment value of FEV1, MIP and MODQ. Hence the results indicated there was statistically significant improvement in FEV1, MIP and MODQ in group A (Hemi-bridge with ball and balloon exercise)

TABLE 3: FEV1, MIP AND MODQ OF WITHIN GROUP COMPARISON IN GROUP B

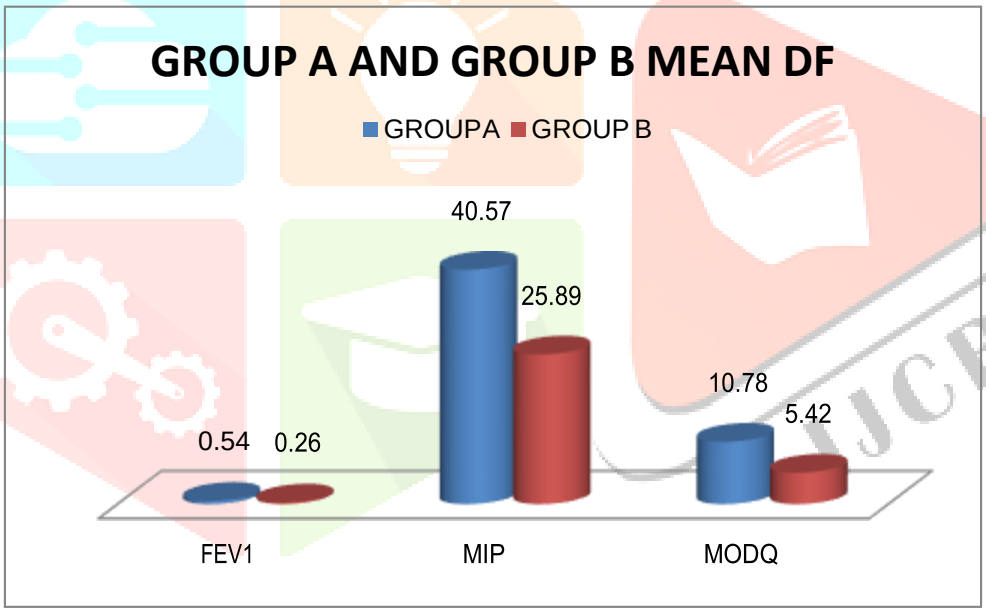
OUTCOME	PRE		POST		T VALUE	P VALUE
	MEAN	SD	MEAN	SD		
FEV1	1.526	0.34	1.793	0.31	11.479	<0.0001
MIP	64.60	15.77	90.493	14.05	20.306	<0.0001
MODQ	37.33	5.253	31.90	4.558	9.557	<0.0001

TABLE 3 : Shows the comparison of pre and post treatment values in group B. The P value being <0.0001 showing extremely significant difference between the pre and post treatment value of FEV1, MIP and MODQ. Hence the results indicated there was statistically significant improvement in FEV1, MIP and MODQ in group B (Inspiratory muscle training)

TABLE 4 : FEV1, MIP AND MODQ MEAN DF IN BETWEEN GROUPS :

OUTCOME	GROUP	MEAN±SD	T VALUE	P VALUE
FEV1	GROUP A	0.54 ±0.129	6.702	<0.0001
	GROUP B	0.26±0.08		
MIP	GROUP A	40.57±13.9	3.845	<0.001
	GROUP B	25.89±4.93		
MODQ	GROUP A	10.78±2.76	5.878	<0.0001
	GROUP B	5.42±1.99		

TABLE 4: Shows FEV1, MIP and MODQ mean DF of group A and group B. Unpaired t -test was used. P value of FEV1 and MODQ is <0.0001 and MIP is <0.001. So, statistically proven that there was significant difference between GROUP A- HBB and GROUP B-IMT in non specific low back pain, but Group A is more effective than Group B



DISCUSSION:

This study conducted to discover differences between the efficacy of hemi-bridge with BBE and IMT in non specific low back pain subjects in equal gender distribution to produce postural stability which lead to reduction in LBP. The purpose of this study was to position the ZOA and spine in the correct position so that the muscles can work normally with the neuromuscular system and reduce muscle tension at rest. An essential ingredient that helps maintain optimal breathing and core stability while preventing back pain.

In this study, Group A was given hemi-bridge with ball and balloon breathing exercise. After intervention FEV1, MIP and MODQ were measured. The result of pre intervention mean score of FEV1 = 1.553 and post FEV1 = 2.093, pre MIP = 62.86 and post MIP = 103.43 and pre MODQ = 38.58 and post MODQ = 27.8 so, in FEV1 = 0.54, MIP = 40.57 and MODQ = 10.78 was greater improvement in within group. Mellin led a connected investigation of the hemi-bridge ball and inflatable and tracked down that persistent low back torment was related with the advancement of the thoracic spine, and this affiliation can likewise influence respiratory capacity tests. While breathing in the stomach and cross

over mid-region, the stomach would limit concentrically; while breathing out the offbeat territory of the cross over midsection the unpredictability of the stomach would limit, and the cross over mid-region would limit concentrically.[13]

Group B was given inspiratory muscle training. After intervention FEV1, MIP and MODQ was measure. The result of pre intervention mean score of FEV1= 1.526 and post FEV1 = 1.793 , pre MIP = 64.60 and post MIP = 90.49 and pre MODQ = 37.33 and post MODQ = 31.90 so, in FEV1 = 0.27, MIP = 25.89 and MODQ = 5.43 was improved in within group. IMT enhanced inspiratory muscle strength and diminished the severity of LBP. Pressure threshold training may additionally make a contribute to an enhancement of postural control in individual with LBP by the variety of possible mechanism.[14]

As per statistical analysis of this study showed positive findings with clinically and statistically significant improvement in FEV1 , MIP and MODQ within Group A and group B. So, all two groups individually showed significant improvement. Some study showed that deep muscle training helps change the body position, alter breathing amplitude and improve postural control significantly. In group A and group B, the mean difference of FEV1 = 0.54 and 0.27 is seen respectively, MIP = 40.57 and 25.89 is gained in group A and group B as shown in table 4. Mean difference in MODQ = 10.78 in group A and mean difference of MODQ = 5.43 in group B is achieved. So, group A was greater effective than group B. In mean difference of between group P value of FEV1 and MODQ was <0.0001 and MIP <0.001. So, Group A and Group B between significant differences

Szczygieł et al. (2018) find out the effect of IMT in deep muscle training on postural and respiratory quality among samples receiving the same training program of deep muscle activation. Their results showed that deep muscle training helps change the body position, alter breathing amplitude and improve postural control significantly. Training of this muscle improves its endurance and increases the core stability, and improvements in core stability decrease postural sway. Smith et al. also found a significant and positive relationship between transverses abdominis and diaphragm activity, which controls breathing and posture simultaneously.

The four main muscles work together to maintain abdominal pressure i.e. pelvic floor, transversus abdominis, diaphragm muscles, and lumbar multifidus. Transverse and correct the position of the lumbar spine. When the balloon exercise, expiration promotes the activation of the abdominal muscles and the inspiration activation of the paraspinal muscles. Activating these muscles can correct lumbar lordosis and improve the function of participants.[15]

Statistically and clinically, both groups showed significant effects, however, a greater improvement was observed in group A, because patients with the hemi bridge with ball and balloon breathing exercises can change ZOA and increase transverse abdominal muscles and diaphragm The efficiency of the muscle can thus be a strong core stabilizer and relieve back pain.

CONCLUSION:

In this study, result showed that there is significant difference in FEV1, MIP and MODQ in both the group in patients with non specific low back pain. But there is greater significant difference in group A (hemi-bridge with ball and balloon breathing exercise) rather than group B (Inspiratory muscle training). So, this study concluded that hemi-bridge with BBE training programme does produce greater improvements in pain reliving, enhancing post expiratory volume and maximum inspiratory pressure than IMT in non specific low back pain.

LIMITATIONS AND FUTUTE RECOMMENDATIONS

LIMITATIONS:

1. There was no long term follow up of FEV1, MIP and MODQ.
2. Study duration was short

FUTURE RECOMMENDATIONS:

1. This study can also be done for longer period of time.
2. Similar study may be extended with larger sample size.
3. This study can also include EMG and Ultrasound for abdominal muscle, ultrasound for diaphragm length.
4. Future followup can be taken.

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