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Core Muscle Strengthening Exercises on Stable Surface versus on Labile (Physioball) Surface Along with Moist Pack in Participants with Sacroiliac Joint Dysfunction

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Abstract: ***Objective: To find out whether there was any significant difference between the effectiveness of core muscle strengthening on stable surface versus on labile surface in subjects with sacroiliac joint dysfunction in reducing pain, improvement in muscle strength and reduction in disability. Method: In a 6-week intervention study, 30 participants with features of sacroiliac joint dysfunction were studied. They were divided into 2 groups by convenience sampling; Group A: Core muscles strengthening exercises on stable surface along with moist pack and Group B: Core muscles strengthening exercises on labile surface along with moist pack. Pre and post treatment data was collected and analyzed using SPSS 26.0. Paired and unpaired t test were used to find out the significance difference between both the groups. Study design: Comparative study Result: A significant improvement in pain, disability and muscle endurance (p‹0.05) after the treatment was found. Greater statistical significant improvement was seen in Group A as compared to Group B. Conclusion: The study concluded that core muscle strengthening exercise on stable surface along with moist pack is more effective than core muscle strengthening exercise on labile surface along with moist pack in treating patients with sacroiliac joint dysfunction.***

Keywords: Sacroiliac Joint Dysfunction, Oswestry Disability Index, Core Muscle Strengthening, Pressure Biofeedback Unit, Physioball

1. Introduction

Low back pain (LBP) is a major health problem that has a significant impact on the quality of life and the cost of healthcare [1]. As per data 70-85% of people suffering from LBP at some point in their lives.[2] In many people, the pain will originate from the sacroiliac joint or one of them or be concentrated in the center joint.[3]

The sacroiliac joint is the largest axial joint in the human body, with an average length of 17.5cm. [4] The stability of the joint is maintained by the combination of two bones and a large number of muscles and ligaments. The joint refers to the anterior segment and the posterior segment including the gluteus minimus and gluteus medius, piriformis and sacroiliac ligament.[5] A significant difference was observed only in terms of sex, hence the presence of sacroiliac joint dysfunction being higher in women. [6] The prevalence of sacroiliac joint dysfunction in India estimated to be 17.5% which is similar to the global prevalence. Age being 18-65 maximum and a mean age of 44.58(± 12.3) [7] The most common discomforts include lower back pain, hip, leg, groin, and hip pain. [8, 12] There are also symptoms such as increased urinary frequency and transient numbness/tingling [9, 10]. The most common areas where pain is mentioned are the buttocks (94%), the lower lumbar area (72%), the lower limbs (50%) and the groin (14%). [11] The degree of pain can range from dull and painful to sharp and stabbing. [12,13] The most consistent factor in determining SIJD joint pain is unilateral pain below L5, and the tenderness during palpation of the posterior superior spine (PSIS) is reliable.[14] The most common and reliable special examination is to use the Shimpi prone position [joint test [15] and Gaenslen test [16] to diagnose sacroiliac joint dysfunction.

Strengthening core competence has become the main trend of rehabilitation. Core reinforcement has been promoted as a preventive program, a form of rehabilitation, and a performance enhancement program for various lumbar and musculoskeletal injuries. [17] The "core" is described as a box with the front abdomen on the abdomen, the paravertebral and gluteal muscles on the back, the diaphragm muscles as the roof, the pelvic floor and hip girdle muscles as the bottom, and the hip abductors and rotators on the sides. All these muscles are directly or indirectly attached to the greater thoracolumbar fascia and spine connecting the upper and lower limbs. [18]

The core stabilization exercises for strengthening of spinal muscles to improve their ability to maintain neutral spine using the abdominal, back, neck and shoulder girdle muscles as stabilizers rather than movers. There are two types of core stability exercises; the static activities exercises and dynamic floor exercise. [19]

The Swiss ball has been proven to be not only effective for development of the upper body but also to provide stability for the spine. [20] Exercises at unstable surfaces have a positive and significant effect on pain and disability control, as well as increased activity of trunk muscles, especially abdominal muscles. [21] However, there is little scientific evidence to support its use. It is not clear whether working out on a Swiss ball has greater benefits than doing the same exercise on a stable surface. [22]

Moist heat is very useful for treating back pain caused by muscle cramps caused by strain and tension. Increased blood flow can help relax muscles in spasms and help maintain flexibility in joints and muscles. [23]

The purpose of this research was to discover the effectiveness of core stabilization exercises on unstable surfaces and core stabilization exercises on unstable surfaces, and to determine better ways to obtain the best results and bring greater results to the entire population.

2. Methodology

Participants of female with the age was between 30 to 60 years of age, having sacroiliac joint dysfunction, Clinically diagnosed patients of sacroiliac pain, and who were willing to be a part of the study were included in the study. These individuals were informed about the study and the procedure was clearly explained to all. An informed and written consent was obtained from the subjects those who agreed to be a part of the study that was to be conducted. Individuals with history of pain in the sacroiliac joint (PSIS) for more than 2 months with or without radiating down to the buttocks. On initial assessment should exhibit pain on passive anterior pelvic tilt. Tenderness on palpation on the PSIS. Participants with spondyolisthesis, spondylosis, hip replacement, spondyloarthropathies, acute TB were excluded.

The participants which were selected were then randomly assigned by lottery method in to 2 groups A and B. Thirty subjects with mean age of 42.8± 7.54 (mean ± SD) became a part of the study. The participants underwent a detailed pre-evaluation. The pre-evaluation included an orthopedic assessment which obtained information about demographic details, medical history, personal history, pain assessment, functional scale, muscle strength and endurance of the subjects. Pain was assessed by Numerical Pain Rating Scale (NPRS), functional disability was scored by oswestry disability index (NDI) and Muscle Endurance by Pressure Biofeedback Unit (Chattanooga).

The participants of Group A were treated with core strengthening exercise on stable surface with moist pack and Group B were treated with core strengthening exercise on labile surface. The treatment protocol consisted of 5 sessions of core strengthening treatment for 6 weeks. Moist pack will be given for 10 minutes for both the Groups. After 6 weeks of treatment the participants of both groups underwent post-evaluation and the pre and post- treatment data were noted.

Table 1: Exercise Protocol for Group A

Week 1	Week 2	Week 3
• Bridging - 5 seconds hold, 5 repetitions. • Wall squat – 10 seconds hold, 5 repetitions. • Knee to chest – 5 repetitions.	• Bridging – 5 seconds. hold, 5 repetitions • Wall squat – 10seconds hold, 5 repetitions. • Knee to chest – 5 repetitions. • Prone arm opposite leg raise on met - hold 5 seconds, 5 repetitions.	• Bridging – 5 seconds. Hold, 5 repetitions. • Wall squat – 10 sec hold, 7 repetitions. • Knee to chest– 7 repetition. • Prone arm opposite leg raise on met - hold 5 seconds, 5 repetitions. • Back extension – 5seconds hold 5 repetitions.
Week 4	**Week 5**	**Week 6**
• Bridging – 10 seconds Hold, 7 repetitions. • Wall squat – 10 sec hold, 7 repetitions. • Knee to chest – 7 repetitions. • Prone arm opposite leg r.aise on met - hold 5 seconds, 7 repetitions. • Back extension – 5 repetitions.	• Bridging – 10 seconds Hold, 10 repetitions. • Wall squat – 10 seconds hold, 10 repetitions. • Knee to chest– 7 repetitions. • Prone arm opposite leg raise on met - hold 5 seconds, 7 repetitions. • Back extension – 7 repetitions.	• Bridging – 10 seconds. Hold, 10 repetitions. • Wall squat – 10 seconds hold, 10 repetitions. • Knee to chest - 10 repetitions. • Prone arm opposite leg raise on met - hold 5 seconds, 7 repetitions. • Back extension – 10 repetitions.

Table 2: Exercise Protocol for Group B

Week 1	Week 2	Week 3
Ball sit - 2 minutes • Ball bridging – 5 seconds. Hold, 5 repetitions. • Ball wall squat – 10 seconds hold, 5 repetitions. • Ball hamstring roll–5 repetition.	• Ball sit - 2 minutes • Ball bridging – 5 seconds. hold, 5 repetition • Ball wall squat – 10 sec hold, 5 repetitions. • Ball hamstring roll– 5 repetitions. • Prone arm opposite leg raise on ball- hold 5 seconds, 5 repetition.	• Ball sit - 2 minutes • Ball bridging – 5 seconds. Hold, 5 repetitions. • Ball wall squat – 10 seconds hold, 7 repetitions. • Ball hamstring roll– 7 repetitions. • Prone arm opposite leg raise on ball- hold 5 seconds, 5 repetitions. • Back extension with physio ball – 5 seconds hold 5 repetition.
Week 4	Week 5	Week 6
• Ball sit - 3 minutes • Ball bridging – 10 sec. hold, 7 repetitions. • Ball wall squat – 10 seconds hold, 7 repetitions. • Ball hamstring roll - 7 repetitions. • Prone arm opposite leg raise on ball- hold 5 seconds, 7 repetitions. • Back extension with physio ball – 5 repetitions.	• Ball sit - 3 minutes • Ball bridging – 10 seconds. Hold, 10 repetitions. • Ball wall squat – 10 seconds hold, 10 repetitions. • Ball hamstring roll– 7 repetitions. • Prone arm opposite leg raise on ball- hold 5 seconds, 7 repetitions. • Back extension with physio ball – 7 repetitions.	• Ball sit - 3 minutes • Ball bridging – 10 seconds. Hold, 10 repetitions. • Ball wall squat – 10 seconds hold, 10 repetitions. • Ball hamstring roll- 10 repetitions. • Prone arm opposite leg raise on ball- hold 5 seconds, 7 repetitions. • Back extension with physio ball – 10 repetitions.

Core Muscle Endurance Assessment by Pressure Biofeedback Unit

Bridging

wall squats

Ball sit

Ball bridging

Ball squat exercise

Back extension with Physio-ball

3. Result

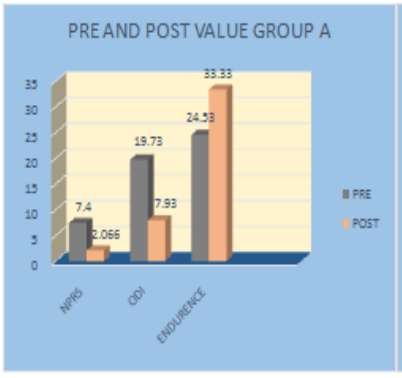
Pre and post-treatment data of the participants of both group were noted. All statistical analysis was done using SPSS 26 software for windows. Descriptive analysis was obtained by using mean & standard deviation. The intergroup comparison between Group A and B of pre-treatment and post-treatment of NPRS, ODI and cervical muscle endurance was done by paired t-test. The intragroup comparison of pre-treatment and post-treatment of NPRS, ODI and core muscle endurance within Group A and Group B was done by unpaired t-test.

Pre and Post treatment values of Group A

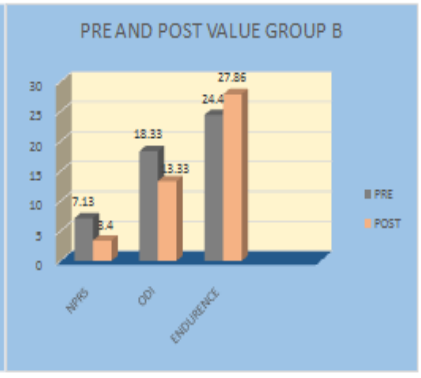
GROUP A	PRE – TREATMENT (MEAN±SD)	POST TREATMENT (MEAN±SD)	t - value	p- value
NPRS	7.40±1.18	2.066±0.70	15.00	0.034
ODI	19.73±4.21	7.93±2.01	9.77	0.000
Core muscle Endurance	24.53±1.92	33.33±2.69	-10.30	0.184

Pre and Post treatment values of Group B

GROUP B	PRE – TREATMENT (MEAN±SD)	POST TREATMENT (MEAN±SD)	t - value	p- value
NPRS	7.13±1.46	3.46±0.74	8.68	0.011
ODI	18.33±3.81	13.33±2.28	4.35	0.052
Core muscle Endurance	24.40±2.02	27.86±1.76	-4.99	0.440



Graph No. 1: Pre and Post-Treatment values in Group A



Graph No. 2: Pre and Post-Treatment values in Group B

The results found in this study disclosed that after a six-week treatment program, both groups, Group A, who received core strengthening exercise on stable surface and Group B who received core strengthening exercise on labile surface attained a significant improvement in the endurance of core muscle and reduced pain and disability. But statistically greater significant improvement was seen in Group A as compared to Group B (p value < 0.05).

4. Discussion

The aim of the study was effect of core muscle strengthening exercises on stable surface versus on labile (physioball) surfaces along with moist pack in subjects with sacroiliac joint dysfunction. The present results are in accordance with the literature regarding the effect of core muscles strengthening on stable and labile surface on sacroiliac joint dysfunction in young women.

Following 6 weeks of core muscles strengthening exercise showed that there was significant improvement in core muscle strength, endurance and reduce pain in women.

Core strength is improved by multiple sets and long contraction time. According to table there was improvement in core strength in both stable as well as labile surface. On comparing stable with labile surface training, core strength was better in stable surface than labile surface

Core endurance is improved by multiple repetitions at a given time. According to table, there was improvement in core endurance in both stable as well as labile surface. On comparing stable with labile surface training, core endurance was better in stable surface (Mean: pre=24.5, post=33.3) than labile surface (mean: pre=24.4, post=27.5). Core endurance is necessary for caring out daily activity smoothly and for longer duration.

According to Killer's findings, activation of core muscles in the movement pattern of lower limbs improves postural control, and the body uses core muscle strengthening to produce rotational force torque around the body and create limb movement.

This study was conducted on thirty subjects with mean age of 42.8 ± 7.54 (mean ± SD). The subjects were divided into two groups; Group A received core muscles strengthening exercise on stable surface along with moist pack and Group B received core muscles strengthening exercise on labile surface along with moist pack for 1 session/day and 5 days/week for 6 weeks. In this study oswestry Disability Index (ODI), Numerical Pain Rating Scale (NPRS), Core Muscles Endurance were used as outcome measures. The results showed a significant improvement in the outcome measures in post-treatment stage as compared to the pre-treatment stage. A significant improvement was found after treatment in both the groups but Group A showed greater improvement in the ODI Score, NPRS Score, core muscles Endurance (p value < 0.05).

The above exposed statement suggests that core muscles strengthening exercise on stable surface along with moist pack in the effective management of subjects with sacroiliac joint dysfunction in improving core muscle endurance, reduce pain and disability.

5. Conclusion

In the experimental conditions used in this study, both the groups showed significant improvement in core muscles strengthening on stable and labile surface. Core muscles strengthening exercise on Stable surface along with moist pack (Group A) and Core muscles strengthening exercise on labile surface along with moist pack (Group B) but, core muscles strengthening exercise on stable surface along with moist pack (Group A) evidenced a significantly greater improvement in Sacroiliac Joint Dysfunction.

6. Future Scopes

The study can be done with longer treatment duration and with larger sample size and with different outcome measures.

Conflict of interest: None

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