ORIGINAL ARTICLE

The effects of a static exercise programme verses Swiss ball training for core muscles of the lower back and pelvic region in patients with low back pain after child delivery. A single blind randomized control trial

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Abstract

Objectives: To determine the effects of static exercise programme compared to Swiss ball training for core muscles of the lower back and pelvic region in patients with low back pain after child delivery.

Methods: The prospective single-blind randomised controlled trial was conducted at Rehabilitation department of Pakistan Railway General Hospital Rawalpindi from March to December 2018, and comprised patients with low back pain after delivery who were randomised into 2 equal groups. The subjects in Group A received static core exercises, while those in Group B got Swiss ball training. Outcome was measured using numeric pain rating scale, Oswestry disability index, goniometry and core stability assessment scale. Data was analysed using SPSS 21.

Results: Of the 30 patients, 15(50%) were in Group A with mean age of 28.38±4.8 years, and 15(50%) were in Group B with a mean age of 29.57±3.3 years. Intra-group difference was significant ($p<0.05$), while inter-group difference was non-significant ($p>0.05$).

Conclusions: Both exercise protocols used in the study were equally effective in the rehabilitation of postpartum low back pain.

Keywords: Low back pain, Postpartum, Swiss ball training, Static core exercises. (JPMA 70: 1058; 2020)

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Introduction

Pain in lumbar and pelvic region is a worldwide health-related issue and accounts for approximately 6% disability globally and affects approximately 80% people at some stage in their lives.[1] Pain, especially of non-specific type, causes disability and makes an individual bed-bound.[2] It has been observed that females after delivery experience low back pain (LBP) which may influence their occupation and daily living.[3]

Postpartum LBP is a musculoskeletal condition that results from over-utilisation, excessive laxity or damage to the muscles, tendons, ligaments, intervertebral disc, nerves or vertebrae of the lumbar spine.[4,5] During pregnancy, females undergo drastic changes, particularly in terms of abdominal length and strength due to the growing foetus.[6] Also, there is tissue-softening which influences the biomechanics of joints and bones.[7] These constant stresses cause instability in spine and injury to the surrounding spinal musculature and zygapophyseal joints of the spine. These changes significantly weaken the core muscles and result in LBP and pelvic girdle pain (PVP).[3,8] Core means lumbopelvic-hip complex consisting of the muscular box with abdominal muscles in the front, gluteus and paraspinals at the back, diaphragm at the roof and at bottom is the pelvic floor and the hip girdle.[9] These muscles are spine and pelvis stabiliser during functional movements. Without these muscles, the spine would become mechanically unstable.[10] Several exercise regimes are used for core muscle stability. The use of Swiss ball training for core muscle development has been popular for long. It decreases LBP intensity and improves abdominal muscle flexibility.[11,12] Swiss ball training improves the function of neutraliser and stabiliser musculature; neutraliser muscles counteract the actions of other muscles to ensure smooth, coordinated movements.[13] Such training enhances strength, endurance, flexibility and neuromuscular control, and is a cost-effective and enjoyable way to prevent LBP. Ball practices are utilised for differing purposes, like adjusting control, and has impact on spinal adjustment while increasing facilitation and activation of the spinal stabilisers.[14] Swiss ball training is designed to promote stress on pelvic, hip and lower

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back area.[15,16]

The current study was planned to determine the effects of static exercise programme compared to Swiss ball training for core muscles of the lower back and pelvic region in patients with LBP after childbirth.

Patients and Methods

The randomised controlled trial (RCT) was conducted at Rehabilitation department of Pakistan Railway General Hospital Rawalpindi from March to December 2018. The RCT was prospectively registered with the International Standard Randomized Controlled Trial Number ISRCTN14142103.[17]

After approval from the ethics review committee of Riphah College of Rehabilitation Sciences, Riphah International University, Islamabad, Pakistan, the sample size was calculated using Open-Epi calculator with 95% confidence interval (CI), power 80% while using mean and standard deviation of the primary outcome measure on the basis of literature.[18] The sampling technique was non-probability purposive sampling. Females aged 25-35 years complaining of LBP for a minimum of 2 months after normal delivery were part of study. Those who had vitamin D deficiency, any systemic, bony and soft tissues disease, like lumbar spinal stenosis, spondylitis, spondylolisthesis, lumbar radiculopathy, fracture, herniated lumbar disc, ankylosing spondylitis, rheumatoid arthritis, osteoporosis etc, were excluded. Women who met the eligibility criteria and consented to participation were randomly allocated to Group A who were exposed to static exercise training, and those in Group B were exposed to Swiss ball training. The randomisation was done using the sealed envelope method. Demographics and history included name, age, occupation, post-delivery duration, pain onset, nature of pain as well as aggravating and relieving factors. Outcome measures included the Numeric Pain Rating Scale (NPRS) which assesses pain intensity. Its range is 0-10, with 0 = no pain and 10 = worst pain.[19,20]

Also used was the Oswestry Disability Index (ODI) which is the self-regulated tool with 10 questions. The initial segment of survey rates pain intensity and the others identify its debilitating impact on everyday activities, like rest, lifting, standing, sexual coexistence, sitting etc. The scoring range is 0-5, and the aggregate of the 10 scores is taken as the level of the most extreme score, ranging from 0 = no disability to 100 =greatest inability).[21]

The Core Stability Assessment (CSA) scale was used for evaluating the strength of core and abdominal muscles. It was carried out on a flat surface and with the help a mat and watch. Result was analysed by comparing it with the results of previous tests.[22,23]

Goniometer was used to find the range of movement (ROM). It was used for detailed examination and evaluation of joints. The participants actively performed movements and in case any limitation was founded, the therapist assessed it manually. Thoracolumbar ROM defined by the American Medical Association (AMA)[24] is 60º flexion, 25º extension, 25º right-side and 25º left-side bending and upto 30º rotation. The therapist placed the goniometer on the patient in sitting position, stabilised the pelvis and did not allow the participants to bend in any position.[25]

Prior to all exercises, a hot pack was applied for 10 minutes. Group A exercises consisted of stabilization, such as bridging, planks, integrated stabilisation, side plank + bird dog.[11] These exercises were performed for 3 days per week for 2 months. Total 2 sets of 15 repetitions for each strengthening exercise were performed.[26] Group B Swiss ball exercises included stability-Ball-Elevated Split Squat (BESS), Stability-Ball Hamstring Curl (SBHC), Dead Bug (DB) and Stability-Ball Y-Ups (SBYUs).[27] These exercises were performed for 3 days per week for 2 months. Total 2 sets of 15 repetitions for each strengthening exercise were performed. Postural education was guided in both groups. Outcome measures were recorded at baseline and at the end of the 8-week intervention period. Data was analyzed using SPSS 21. Normality of data was analysed using Shapiro-Wilk test. Both parametric and non-parametric tests were applied for intra-group and inter-group analyses, as data for some variables was not normally distributed. Non-parametric Mann Whitney U test was applied on CSA, ODI and NPRS, and for intra-group comparison, Wilcoxon test was applied. $P<0.05$ was considered statistically significant.

Results

Of the 30 subjects enrolled, 27(90%) finished the study (Figure); 13(48%) in Group A with a mean age of 28.38±4.8 years, and 14(52%) in Group B with a mean age of 29.57±3.3 years. Overall, 8(29.6%) subjects were nulliparous and 19(70.4%) were multiparous. Pain onset was 15 days after childbirth in 5(18.5%) cases, after 40 days in 15(55.6%) cases, and after 2 months in 7(25.9%).

Inter-group differences were non-significant (Table-1), while intra-group differences were significant in all aspects (Tables-2, 3).

Table-1: Inter-group analysis.

Between Groups Analysis		Median (IQ)	Mean Rank	Z- value	P value
NPRS at Baseline	Static Core Exercises	6(1)	14.62	-0.41	0.68
	Swiss Ball Training		13.43		
NPRS at Post-intervention	Static Core Exercises	2(2)	13.54	-0.30	0.76
	Swiss Ball Training		14.43		
ODI at Baseline	Static Core Exercises	53(24)	14.54	-0.34	0.73
	Swiss Ball Training		13.50		
ODI at Post-intervention	Static Core Exercises	19(15)	14.23	-0.14	0.88
	Swiss Ball Training		13.79		
CSA at Baseline	Static Core Exercises	2(1)	15.23	-0.867	0.38
	Swiss Ball Training		12.86		
CSA at Post-intervention	Static Core Exercises	4(2)	17.35	-2.18	0.03
	Swiss Ball Training		10.89		
Extension at baseline	Static Core Exercises	18(5)	12.15	-1.19	0.23
			15.71		
Extension at post intervention	Swiss Ball Training	25(3)	14.08	-0.05	0.96
			13.93		

NPRS: Numeric pain rating scale. ODI: Oswestry disability index. CSA: Core stability assessment. IQR: Interquartile range.

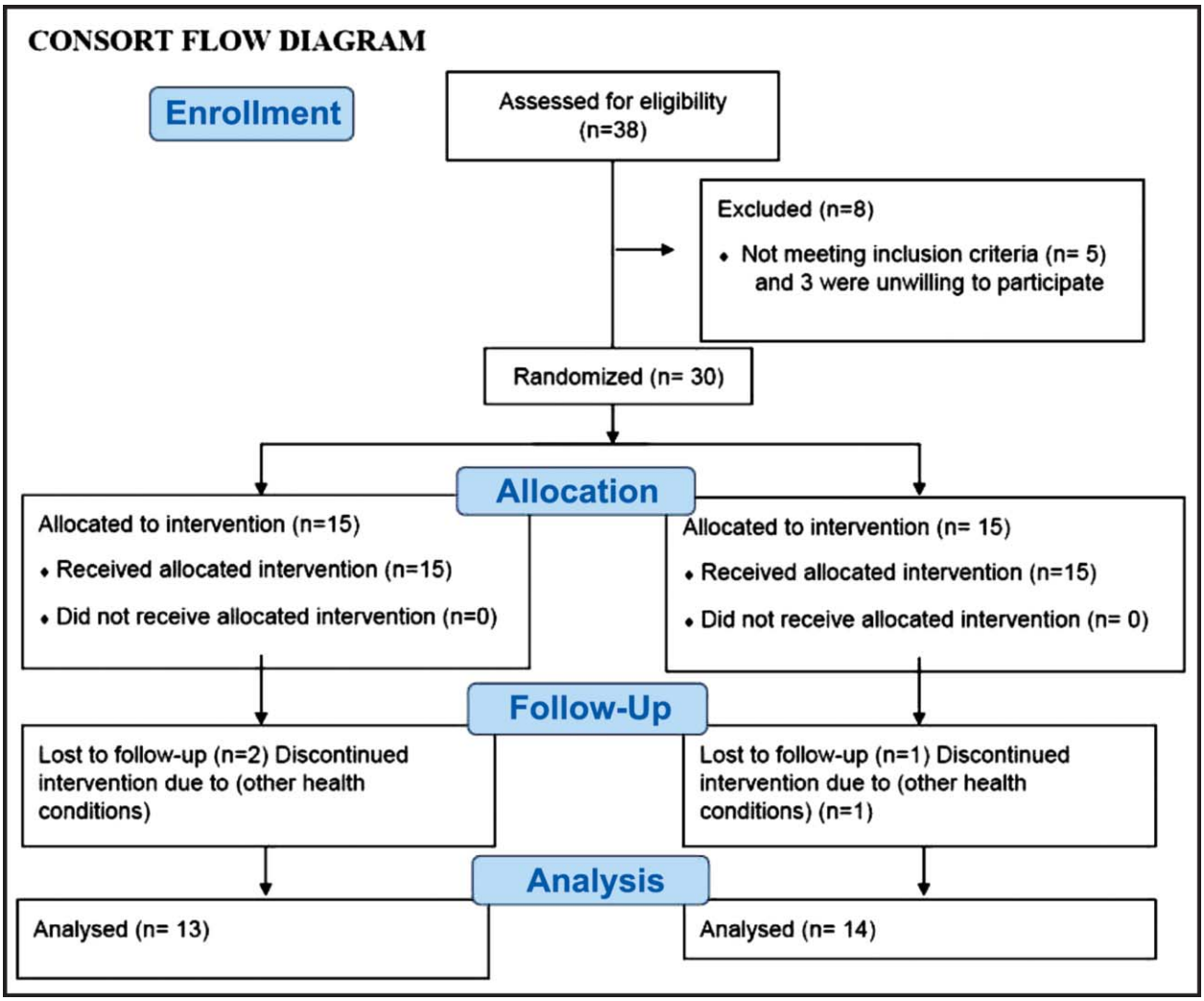

Figure: Consolidated Standards of Reporting Trials (CONSORT) flow chart.

Table-2: Intra-group analysis.

Within group analysis Swiss ball training Group		Median (IQ)	Mean Ranks	Z-value	P-value
NPRS	Pre-intervention	6(2)	7.50	-3.33	0.001
	Post-intervention	2(2)			
ODI	Pre-intervention	49(24)	7.50	-3.29	0.001
	Post-intervention	18(15.5)			
CSA	Pre-intervention	1(1)	7.50	-3.39	0.001
	Post-intervention	3(2)			
Extension	Pre-intervention	18(6.25)	7.50	-3.34	0.001
	Post-intervention	24(3.5)			
Static core exercise Training Group					
NPRS	Pre-intervention	6(1)			
	Post-intervention	2(2)	7	-3.23	0.001
ODI	Pre-intervention	53(24)			
	Post-intervention	20(14)	7	-3.18	0.001
CSA	Pre-intervention	2(1)			
	Post-intervention	4(2)	7	-3.23	0.001
Extension	Pre-intervention	18(4)			
	Post-intervention	25(4)	7	-3.20	0.001

NPRS: numeric pain rating scale
ODI: Oswestry disability index
CSA: Core stability assessment
IQR: Interquartile range.

Table-3: Intra-group mean values.

Within Group analysis	Variable	Mean ± SD	P value
Static core exercise Group	Pre flexion	45.07±8.80	0.001
	Post flexion	67.61±8.08	
Swiss ball training Group	Pre flexion	39.57±5.68	0.001
	Post flexion	57.35±6.60	

SD: Standard deviation.

Discussion

Most women have complaints of pregnancy-related low back pain (PR-LBP). During and after pregnancy, almost 80% women experience daily discomfort while performing domestic work, childbearing and in job performance.[28]

The current study showed that both Swiss ball training and static exercises were effective in treating patients with postpartum LBP. An experimental study revealed that pelvic floor muscles as well as core stability exercises were beneficial in minimising pain and disability, and in enhancing abdominal muscle strength. However, core stability exercise produced many significant benefits.[26] One study concluded that stabilisation exercises decreased functional disability in South African women with PR-LBP. The results of current study are in accordance with a studies showing decline in pain intensity and improvement in the functional level.[29]

A meta-analysis proposed that core stability exercises were more effective than general exercises when compared in terms of decreasing pain and enhancing physical functioning in individuals with LBP.[1]

A study determined the effects of a stability ball exercise programme on LBP.[28]

The results of the current study are in line with literature.[30] A laboratory study on 18 adult participants aged 23-45 years reported that prone position exercises on ball proved to be fine substitutes for supine position exercises for achieving core musculature. Side position exercises that did not include ball were better for sloping and lumbar para-spinal postures.[30]

The limitations of the current study include a small sample size and a short follow-up. Studies with prolonged intervention time and follow-up as well as a large sample size are recommended in this regard.

Conclusion

Static core exercises and Swiss ball exercises were equally effective in decreasing pain and level of disability, and in improving lumbar spine mobility, and both protocols can help in the rehabilitation of postpartum LBP.

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Conflict of Interest: None.

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