

## The effects of an exercise programme for core muscle strengthening in patients with low back pain after Caesarian-section: A single blind randomized controlled trial

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### Abstract

**Objective:** To determine the effects of an exercise programme for core muscle strengthening in patients with low back pain after caesarean section.

**Method:** The single-blind randomised controlled trail was conducted from August 2018 to January 2019 at the Helping Hand for Relief and Development Comprehensive Rehabilitation Centre, Chakwal, Pakistan, and comprised post-caesarean section women aged 25-40 years with low back pain. Patients were randomised into supervised group I and unsupervised group II using the sealed envelope method. Group I received supervised core stability exercise programme, while group II received unsupervised, home-based core stability exercise programme. Baseline and post-intervention values were compared for numeric pain rating scale, Oswestry disability index, inclinometer and core stability assessment. Data was analysed using SPSS 21.

**Results:** Of the 30 subjects, there were 15(50%) in each of the two groups. There was no significant difference at baseline between the groups ( $p>0.05$ ). Post-intervention results showed significant intra-group and inter-group differences ( $p<0.05$ ) with respect to all parameters. No improvement was observed for right and left side bending ( $p>0.05$ ).

**Conclusion:** Supervised core stability exercise programme was more effective in reducing pain and disability, and improved core muscle activation than unsupervised, home-based core exercise programme.

**Keywords:** Core stability, C-section, Exercise, Low back pain, Pregnancy. (JPMA 71: 1319; 2020)

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### Introduction

Low back pain (LBP) is experienced by almost everyone at some point in life.<sup>1</sup> Its prevalence is 23% out of which 12% individuals experience disability performing their daily life activities (DLAs).<sup>2</sup> Females usually complain of back pain during and after pregnancy.<sup>3</sup> After delivery, the occurrence of LBP is almost 5-40%, and it not only leads to impairment, but also affects the quality of life (QOL) of a woman.<sup>4</sup> LBP is usually due to change in posture in order to hold the uterus, increase in abdominal size that leads to weakening of abdominal musculature, shifting the centre of gravity to the heel of the foot, increase in lumbar lordosis and thoracic kyphosis that may lead to muscular strain and ligamentous sprain.<sup>5</sup> Variation in the level of hormones causes laxity in joints and ligaments of pelvic girdle, leading to difficulty in walking. Loosening of pelvic musculature and changes in symphysis pubis starts in the first trimester of pregnancy and keeps on increasing as pregnancy proceeds. This laxity in pelvic musculature and

joints is also one of the causes of LBP.<sup>6</sup> However, it is also said that LBP is either due to prolonged labour pain or might be attributed to poor hip and core muscles' strength.<sup>7</sup>

After caesarean section (CS), core musculature weakness is very common as surgeons give incision through abdominal muscles. Usually healing ensues, but abdominal muscles get weaker with time as they are not trained or exercised properly by way of involvement in some core strengthening programme.<sup>8</sup> This will be considered as an LBP risk factor after CS. Core stability training has been well recognised as an efficient fitness programme for treating LBP,<sup>9</sup> and physical therapists use it in treating patients. Core stability training exercises move from simpler to complex and dynamic forms with preceding activation of superficial and deep musculature.<sup>10</sup> These types of exercises provide both static as well as dynamic stability either with or without specific equipment.<sup>11</sup> Literature suggests that supervised core stabilisation exercises are more effective than normal therapeutic exercises in the postpartum period, but very few studies have been conducted on post-CS subjects, as most studies focus on vaginal delivery and on the incidence of backache rather than core stability exercise training.<sup>12</sup> The current study was

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planned to determine the effects of an exercise programme on strengthening of core body muscles in patients with LBP after CS.

## Subjects and Methods

The single-blind randomised controlled trial (RCT) was conducted from August 2018 to January 2019 at the Helping Hand for Relief and Development Comprehensive Rehabilitation Centre, Chakwal, Pakistan. After approval from the ethics review committee of Riphah College of Rehabilitation and Allied Health Sciences, Islamabad, the sample size was calculated using Open Epi tool calculator with 95 % confidence interval (CI) and power 80%.<sup>13</sup> The RCT was prospectively registered with the International Standard Randomized Controlled Trial Number (ISRCTN) 12478688, registry.<sup>14</sup> Females aged 25-40 years who had LBP for minimum 2 months after CS were part of study. Women having other systemic, bony and soft tissues diseases, like lumbar spinal stenosis, spondylitis, spondylolisthesis, lumbar radiculopathy, fracture, herniated lumbar disc, ankylosing spondylitis, rheumatoid arthritis, osteoporosis, psychological disorders or physical disability, were excluded and so were those who had LBP for <2 months.

After taking informed consent from the subjects, they were randomised into supervised group I and unsupervised group II using the sealed envelope method. The participants were blinded to randomisation

Group I was treated with a supervised core stability exercise programme consisting of three levels (Figure-1). Each level lasted 2 weeks during which the participants were trained on selected exercises. At each level, 3 sessions per week were given with 2 sets of 10 repetitions and 10 seconds hold. Level I included easy strengthening exercises in which patients were guided to draw in their abdomen with single knee to chest, with heel slide and with double knee to chest.<sup>14</sup> The next exercise was supine twist prone bridging on elbow and side bridging on elbow.<sup>15</sup> The third exercise in level I was supine butt lift, with arm at side, across chest and with single leg lift.

Level II consisted of medium strengthening exercises. These exercises were abdominal draw-in, with feet on medicine ball, with feet on ball-add movement, supine dead bugs, rolling like a ball, prone bridging on elbows with single leg hip extension, side bridging on elbows with single leg hip abduction, quadruped opposite arm/leg raise-add weight or dumbbell, abdominal crunches on physioball, abdominal crunches on physioball with rotation and bridging with head on physioball.<sup>16,17</sup>

Level III consisted of difficult strengthening exercises that patients performed in 4-6 weeks. These exercises were prone bridging, side bridging add hip abduction then flexion then extension movements, and progression of bridging with head on physioball.<sup>18</sup>

Group II was provided with unsupervised core stability exercise programme. The subjects were trained at the first session and were then provided with written material for home. They were called regularly on phone. Assessment was done at baseline and then at 6th week after the completion of the given time period.

Primary outcome was measured with Oswestry Disability Index (ODI) and Core Muscle Strength And Stability Test (CMSST) scale, while the secondary outcome was measured with Numeric Pain Rating Scale (NPRS) and Goniometry.

ODI is an important tool for the evaluation of disability related to ADLs. In lower back issues, it is considered the standard tool having 10 questions; with each question having five scores. Questions are related to pain intensity, personal care, lifting, walking, sitting, standing, sleeping, sex life, social life and travelling. A score of 0-20% shows minimal disability, 20-40% moderate disability, 40-60% severe disability, 60-80% crippled, and 80-100% shows either the patient is bed-bound or overly expressing the symptoms.<sup>19</sup>

CMSST scale monitors the development of the abdominal and lower back muscles. Complete the test indicates good core strength. If the core strength is poor, the torso moves unnecessarily during motion and wastes energy. Good core strength indicates that the person can move with high efficiency.<sup>20</sup>

NPRS is a valid and reliable scale to measure pain intensity.<sup>21</sup> It consists of a horizontal line which is marked by whole numbers in ascending order from 0-10, in which 0 defines 'no pain' and 10 defines 'worst possible pain'. Respondents are guided about markings so that they can mark the number that perfectly defines their current pain status. Goniometer is used to find the range of movements. Thoracolumbar range of motion (ROM) given by the American Medical Association is 60° flexion, 25° extension, 25° right side and 25° left side bending and up to 30° rotations.<sup>22</sup>

Data was analysed using SPSS 21. Data normality was analysed using Shapiro-Wilk test; and both parametric Wilcoxon test and non-parametric Mann Whitney U test were applied, as applicable, for intra-group and inter-group analyses. Independent sample t-test, which is parametric test, was applied to both the groups. P<0.05







<p><b>Day wise plan</b></p> <p><b>Level I: 1-2 weeks</b></p> <p><b>Easy strengthening exercises</b></p>	<p><b>Supine abdominal draw in:</b></p> <p> With single knee to chest</p> <p> With heel slide</p> <p> With double knee to chest</p> <ul style="list-style-type: none"> <li>• Supine Twist</li> <li>• Prone Bridging on elbow</li> <li>• Side Bridging on elbow</li> <li>• Prone Cobra</li> <li>• Quadruped opposite arm/leg</li> </ul> <p><b>Supine Butt lift:</b></p> <p> With arm at side, across chest and with single leg lift</p>
<p><b>Level II: 2-4 weeks</b></p> <p><b>Medium strengthening exercises</b></p>	<p><b>Abdominal draw in:</b></p> <p> With feet on medicine ball</p> <p> With feet on ball-add movement</p> <ul style="list-style-type: none"> <li>• Supine Dead Bugs</li> <li>• Rolling like a Ball</li> <li>• Prone Bridging on elbows with single leg hip extension</li> <li>• Side bridging on elbows with single leg hip abduction</li> <li>• Quadruped opposite arm/leg raise-add weight or dumbbell</li> <li>• Abdominal Crunches on Physioball</li> <li>• Abdominal Crunches on Physioball with rotation</li> <li>• Bridging with head on Physioball</li> </ul>
<p><b>Level III: 4-6 weeks</b></p> <p><b>Difficult strengthening exercises</b></p>	<ul style="list-style-type: none"> <li>• Prone Bridging “around the World”</li> <li>• Side Bridging – add hip abduction then flexion then extension movements.</li> <li>• Seated Russian Twist with Medicine Ball</li> <li>• Seated on Physioball with Russian Twist on Medicine ball</li> <li>• Progression of Bridging with head on Physioball.</li> </ul>

Figure-1: Levels of Core Stability Exercise Programme.

was considered statistically significant.

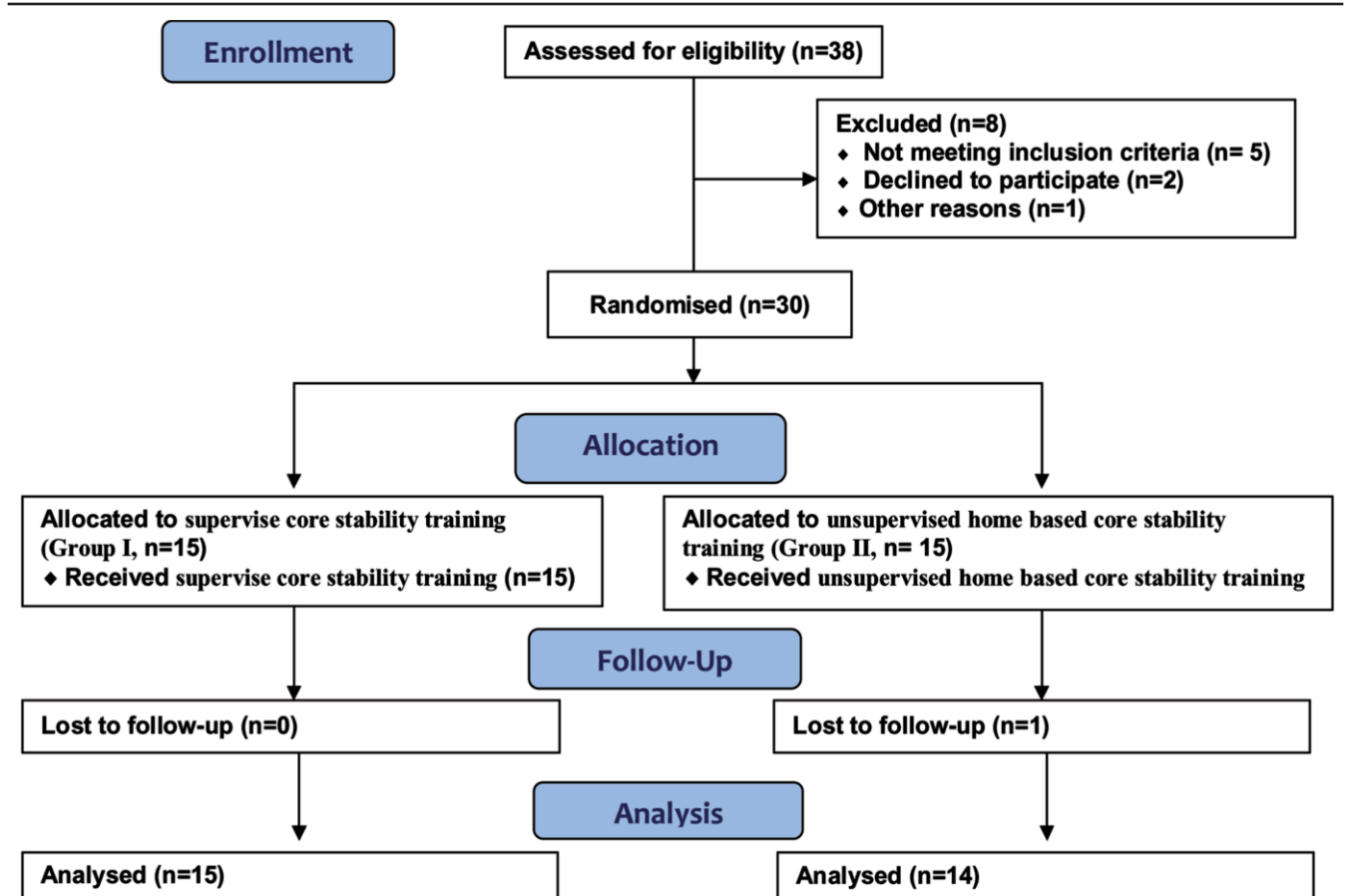
**Results**

Of the 30 subjects, there were 15(50%) in each of the two

groups (Figure-2). Group I had mean age 32.8±4 years and body mass index (BMI) 32.4±4.2 kg/m<sup>2</sup>, while corresponding values for group II were 32.3±4.2 years and 32.9±1 kg/m<sup>2</sup> (Table-1).

**Table-1:** Characteristics of the participants.

Variables	Categories	Overall n(%)	Group I n(%)	Group II n(%)
Occupation of Participants	Housewives	20 (67.7%)	11 (64.7%)	10 (71.4%)
	Working	10(33.3%)	4(35.4%)	4(29.6%)
Parity of Participants	Primiparous	12(41.9%)	5 (25.3%)	7 (50%)
	Multiparous	18 (58.1%)	11 (75.7%)	7 (50%)
Duration of pain	2-6 months	3 (9.7%)	0 (0%)	1 (7.1%)
	7-12 months	7 (22.6%)	3 (17.6%)	4 (28.6%)
	13-18 months	10 (32.3%)	4 (23.5%)	6 (42.9%)
	18-24 months	10 (32.5%)	8 (47.1%)	3 (21.4%)
Aggravating factors	Standing	8 (25.6%)	4(23.5%)	3 (21.4%)
	Sitting	8 (25.8%)	5 (34.4%)	3 (21.4%)
	Forward Bending	6 (19.4%)	3 (19.4%)	1 (7.1%)
	Walking	5 (16.1%)	1(5.9%)	4 (28.6)
	stair climbing	1 (3.2%)	2(11.8%)	1 (7.1%)
	weight lifting	2 (6.5%)	0(0.00%)	2 (14.3%)
	lying and rest	20 (64.5%)	10 (71.8%)	10 (71.4%)
Relieving factors	Medication	5 (16.1%)	4 (23.5%)	3(21.4%)
	Sitting	5 (16.1%)	1(3.5%)	1 (7.1%)
	Walking	0(0.00%)	0(0.00%)	0(0.00%)
	Other	0(0.00%)	0(0.00%)	0(0.00%)
Body Mass Index	Underweight	1 (2.2%)	0(00%)	0(00)%
	Normal	10 (41%)	5 (34.8%)	8 (56.9%)
	Overweight	9 (28%)	6 (35.3%)	4 (28.7%)
	Obese	10 (29.8%)	4 (31.4%)	2 (14.7%)



**Figure-2:** Consolidated Standards of Reporting Trials (CONSORT) flow diagram.

**Table-2:** Inter-group analyses at the baseline.

Variables	Groups	Mean±SD	P-value
NPRS Pre	Group I	6.86±1.1	0.49
	Group II	6.52±1.55	
NPRS Post	Group I	2.29±1.32	<0.001
	Group II	5.82±1.62	
LF Pre	Group I	33.64±8.43	0.623
	Group II	31.94±10.66	
LF Post	Group I	52.50±6.43	<0.001
	Group II	33.823±11.67	
ODI Pre	Group I	33.86±5.58	0.02
	Group II	26.94±9.39	
ODI Post	Group I	8.42±6.13	<0.001
	Group II	26.00±7.44	

SD: Standard deviation; NPRS: Numeric pain rating scale; LF: Lumbar flexion; ODI: Oswestry disability index.

**Table-3:** Intra-group analysis.

Variable	Groups	Pre Mean±SD	Post Mean±SD	P-Value
NPRS	Overall	6.68±1.36	4.22±2.31	<0.001
	Group I	6.86±1.1	2.29±1.32	<0.001
	Group II	6.52±1.54	5.82±1.62	.002
LF	Overall	32.70±9.6	42.26±13.40	<0.001
	Group I	33.64±8.43	52.6±6.43	<0.001
	Group II	31.94±10.66	33.82±11.67	0.05
ODI	Overall	30.06±8.52	18.07±11.18	<0.001
	Group I	33.85±5.58	8.42±6.13	<0.001
	Group II	26.94±9.39	26±7.44	0.06

SD: Standard deviation; NPRS: Numeric pain rating scale, LF: Lumbar flexion, ODI: Oswestry disability index.

**Table-4:** Inter-group analysis with median (IQ), mean rank, Z and P values.

Variables	Groups	Median(IQ)	Mean Rank	Z-Value	P-Value
LE Pre	Group I	17.5(10)	15.29	-0.414	0.679
	Group II	18(5)	16.6		
LE Post	Group I	23.5(6.2)	19.7	-2.11	0.035
	Group II	20(5)	13.00		
RSF Pre	Group I	15(5)	11.25	-2.9	0.004
	Group II	15(4)	20.00		
RSF post	Group I	20(5)	17.7	-1.034	0.301
	Group II	15(5)	14.7		
CSA Pre	Group I	17.5(10)	13.9	-1.22	0.679
	Group II	18(5)	17.8		
CSA Post	Group I	23.5(6.3)	20.39	-2.6	0.22
	Group II	15(5)	12.38		

IQR: Interquartile range; LE: Lumbar extension; RSF: Right side flexion; CSA: Core stability assessment.

Baseline NPRS, lumbar flexion (LF) and ODI values for both groups were noted and compared (Table-2). Mean and median values were compared for intra-group and inter-group analysis (Tables-3-5). Significant difference was

**Table-5:** Intra-group comparison with median (IQ), Z and p values.

Variables	Groups	Median(IQ)	Z-value	P-Value
LE	Overall	Pre 18.0(5.0) Post 20.0(10.0)	-3.90	<0.001
	Group I	Pre 17.5(10) Post 23.5(6.3)		
RSF	Overall	Pre 15.2(0) Post 18(5.0)	-3.60	<0.001
	Group I	Pre 15(5) Post 20(5)		
LSF	Overall	Pre 18(5.0) Post 20(10)	-2.77	0.006
	Group I	Pre 15(5) Post 22.5(5)		
CSA	Overall	Pre 1(0.0) Post 1.0(0.0)	-3.40	<0.001
	Group I	Pre 1.0(0.0) Post 3.0(1.0)		
	Group II	Pre 1.0(0.0) Post 1.0(0.0)	0.00	1.00

IQR: Interquartile range; LE: Lumbar extension; RSF: Right side flexion; CSA: Core stability assessment.

noticed between the groups for NPRS and core stability assessment. Group I showed significant improvement compared to group II (p<0.05).

### Discussion

The findings indicate that after supervised core stability exercise training for LBP, there was significant reduction in pain, disability and core stability and strength (p<0.05) compared to the unsupervised home-based core stability training, which is in line with literature.<sup>21</sup>

Core strength training mainly focuses on the strengthening of the deep trunk musculature, especially multifidus and transversus abdominis muscles that get weak during pregnancy. A 2016 study compared two exercise programmes; one was multifidus retraining programme that focused on deep core multifidus muscle, and the other was a regular back exercise programme. Time duration was 6 weeks, and the multifidus training programme had better outcome compared to the regular back exercise group. The findings of the current study are consistent with the earlier findings.<sup>23</sup>

A 2015 study correlated different methods of training in which trunk stabilisation exercises, trunk balancing

exercises, segmental stabilisation and motor control exercises were compared with other resistance exercises. It found that core stability training programme was more effective than conventional resistance training programme in reducing LBP.<sup>24</sup>

A 2014 study concluded that the group provided with core exercises showed more decrease in pain intensity and increase in ROM compared to the control group.<sup>25</sup> Another 2014 study stated there was significant reduction in pain and disability after stabilisation exercises in lumbar spondylolisthesis.<sup>26</sup> All these findings support the results of the current study.

In the current study, most females were overweight and obese and all of them experienced LBP during and after delivery. Weight-gain during pregnancy and even after delivery is a common problem in females. This increased weight holds for 6-12 months and leads to increase in BMI. Women who are overweight or obese are more prone to experience LBP.<sup>27</sup>

A 2011 study supported the findings of the current study, as the supervised exercise group showed more improvement and resulted in decrease in pain intensity and functional disability compared to the unsupervised group.<sup>28</sup> The current study has several limitations as only pre- and post-intervention evaluations were recorded. Multiparous women were more in Group II compared to Group I, and this might have affected the outcome measures. The short 6-week duration was not sufficient enough to obtain better results and retain the outcomes. It is recommended that further work on this topic should be done on larger sample size and over a longer time period, involving more participants and diverse settings.

## Conclusion

Supervised core stability exercise programme was more effective in reducing pain, disability and in improving ROM compared to unsupervised home-based core stability exercise programme.

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**Conflict of Interest:** None.

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