

## RESEARCH ARTICLE

## EFFECTIVENESS OF STABILITY BALL EXERCISES AND ERGONOMICS TRAINING IN PREGNANCY RELATED LOW BACK PAIN

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## ABSTRACT

**Objective:** to determine the effectiveness of stability ball exercises and ergonomics training to reduce pregnancy related low back pain. **Methodology:** A pretest-posttest, randomized clinical trial was conducted at Dr. Nousheen Nazir, gynaecology clinic in I-10/4 Islamabad, for a time period of 1 year. The participants with age criteria of 18-35 years and pregnant females up to 32 weeks were included in the study. Low back pain was assessed through Oswestry Disability Index (ODI). The level of significance was set at 95% CI ( $p \leq 0.05$ ). **Results:** The mean age of the study participants was  $26.48 \pm 4.54$  years. Ergonomic training (ET) showed significant improvement in overall low back disability ( $\chi^2(2) = 24.58$ ,  $W = 0.53$ ,  $p < 0.001$ ) but no significant improvement ( $p > 0.05$ ) observed from 0 to 2<sup>nd</sup> week and from 2<sup>nd</sup> to 4<sup>th</sup> week, large significant improvement was observed ( $p = 0.005$ ,  $r = 0.59$ ). Stability ball exercise showed large significant improvement ( $\chi^2(2) = 36.86$ ,  $W = 0.84$ ,  $p < 0.001$ ) from 0 to 2<sup>nd</sup> week ( $p = 0.000$ ,  $r = 0.84$ ) and from 2<sup>nd</sup> to 4<sup>th</sup> week ( $p = 0.000$ ,  $r = 0.77$ ). There was moderate significant difference in overall ODI score between SBE and ET group after 2<sup>nd</sup> {19(9.5) vs 24(13),  $p = 0.012$ ,  $r = -0.37$ } and 4<sup>th</sup> week {9(10) vs 18(10),  $p = 0.002$ ,  $r = 0.472$ }. **Conclusion:** Both protocols such as ergonomics training and balancing ball exercises were effective for pregnancy related low back pain. But stability ball exercises were more effective in reducing the disability.

**Keywords:** Balancing ball exercise, Ergonomic training, Low back pain, Postural training, Pregnancy.

## INTRODUCTION

the most common complaint reported in women during pregnancy is low back pain (LBP), which adversely effects the quality of life.<sup>1</sup> It has been estimated that 50% women experienced pregnancy related low back pain (PR-LBP) either during post-partum or pregnancy,<sup>2</sup> of which one third reported severe pain.<sup>3</sup> A study conducted in Pakistan, 62.1 % females reported with a complaint of lumbo-pelvic pain.<sup>4</sup> Mostly women affected from PR-LBP during first pregnancy.<sup>3</sup> PR-LBP usually starts at 18<sup>th</sup> week of gestation and gradually increases and reaches to maximum at 36<sup>th</sup> week of pregnancy.<sup>4</sup>

Low back pain during pregnancy is multifactorial in nature such as hormonal, biomechanical and vascular.<sup>5</sup> Hormone changes softens the ligaments and joints of pelvic girdle for parturition.<sup>6,7</sup> Due to the repetitive stress on spine, injury to the zygoapophyseal joints, muscles ligaments and disc may occurs which also leads to poor posture. Stability of spine is compromised due to hormones such as estrogen, relaxin and progesterone, released during pregnancy, which causes ligaments laxity.<sup>6</sup> Moreover, hyperlordosis, and hyperkyphosis may develop because during pregnancy centre of gravity shifts to the heel, therefore stress on zygoapophyseal joint increases and injury may occurs.<sup>8</sup>

The most common risk factors are chronic lumbago, LBP during previous pregnancy and pelvic trauma.<sup>9</sup> The number of pregnancies also increases the risk of LBP.<sup>10</sup> However, the risk of LBP is not possible to estimate but females with a complaint of back pain before pregnancy are prone to severe and persistent low back pain after the childbirth.<sup>11</sup> Additionally, in some studies it has been suggested that being overweight may also contribute to PR-LBP.<sup>12</sup>

The management of LBP with analgesics, NSAIDs and opioids isn't often recommended because of the harmful side effects. But, non-pharmacological treatments are used for the management of LBP. The first line management of LBP is postural education, stabilization exercises and soft tissue manipulation often given by the physiotherapist.<sup>12</sup> Other treatment options included nerve stimulation, yoga, acupuncture, relaxation and some medications may also be used.<sup>13</sup> Although, low back pain can be prevented through postural education, weight reduction and proper exercise without stressing back.<sup>12</sup>

Moreover, stability ball exercises are also used for PR-LBP which not only reduced low back pain but also enhances the activities of daily living. Regular stability ball exercises in third trimester improves posture and muscular alignment which contributes the changes in body's centre of gravity which

reduces stress on lower back and thus decreases pain.<sup>14</sup>

Literature support the use of stability exercises for the management of PR-LBP, but in Pakistan there is paucity in the literature. It was observed that there is no trend of prescribing exercises to pregnant women during pregnancy or even for back pain and keep the on rest. In this study stability ball exercises and postural training was used, which were not being used simultaneously in a recent previous literature. The objective of the study was to determine the effectiveness of stability ball exercises and postural training in PR-LBP.

## METHODOLOGY

A randomized clinical trial was conducted at Dr. Nousheen Nazir, gynecology clinic in I-10/4 Islamabad, after taking approval from administrator of the clinic. The participants with the age criteria of 18-35 years and pregnant females up to 32 weeks were included in the study. However, pregnant females with any complication such as diabetes, hypertension etc, who had any deformity and co-morbidity, pregnancy above 32 weeks, and any indication of preterm labour were excluded from the study. Informed consent was taken from patients in accordance to Declaration of Helsinki, and assured them confidentiality of the data.

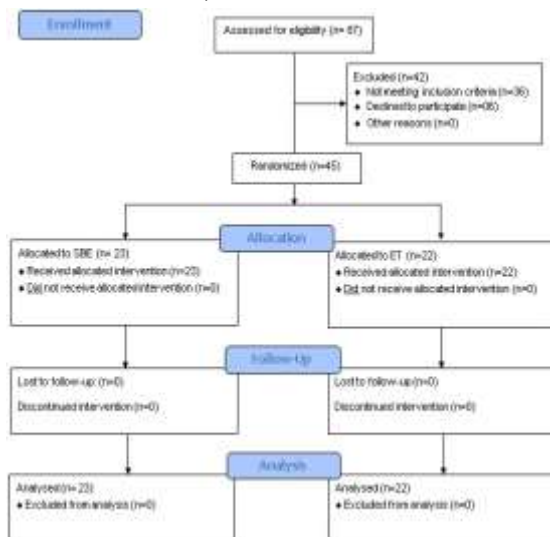


Figure 1: CONSORT diagram

A total of n=45 participants fulfilled the inclusion criteria were recruited for study through non-probability convenient sampling technique. Envelope sealed method was used for random allocation of participants into two interventional groups. Each participant in both groups was given

30-45 minutes, 6 sessions in a week for duration of one month. In ergonomic training (ET) group (n=23) training of the use of proper posture and biomechanics during activities of daily living was given. In stability ball exercise (SBE) group (n=22) ball wall squats and gym ball balancing were performed daily.

The pre-interventional data was collected at first day and post-interventional data was collected at the end intervention i.e. after four weeks. However, participants were also re-assessed after two weeks of intervention. General demographic information, including women age, history of low back pain and trimester, was obtained. Oswestry Disability Index was used for the assessment of functional disability due to low back pain, which has considerable validity and reliability.<sup>15</sup> The data was compared at baseline and after one month of the intervention. The level of significance was set at 95% CI ( $p < 0.05$ ) and data was analysed through SPSS version 20.

## RESULT

The mean age of the study participants was  $26.15 \pm 4.62$  years. Previous history of back pain was experienced in n=18(40%) participants, while n=27(60%) participants had no history of back pain. A total of n=19 participants were in 2<sup>nd</sup> trimester and n=26 were in 3<sup>rd</sup> trimester.

In ergonomic training (ET), the intensity of pain showed a significant improvement  $\{X^2(2) = 16.79, W=0.37, p < 0.001\}$  with small effect size, the pair wise comparison showed no significant improvement from 0 week to 2 weeks ( $p=0.078, r=0.37$ ) but from 2<sup>nd</sup> to 4<sup>th</sup> week, a large significant improvement was observed ( $p=0.009, r=0.55$ ). The personal care shows significant improvement  $\{X^2(2) = 16.71, W=0.36, p < 0.001\}$  with small effect size, pair wise comparison showed no significant change from 0 to 2<sup>nd</sup> week ( $p \geq 0.05$ ) but significant large improvement in 2<sup>nd</sup> to 4<sup>th</sup> week ( $p=0.002, r=0.64$ ) was observed. While no significant ( $p > 0.05$ ) improvement was observed in lifting ability.

Furthermore, walking ability also showed significant improvement  $\{X^2(2) = 16.71, W=0.36, p < 0.001\}$  with small effect size, the pair wise comparison showed significant medium improvement from 0 to 2<sup>nd</sup> week ( $p=0.033, r=0.45$ ) and from 2<sup>nd</sup> to 4<sup>th</sup> week ( $p=0.046, r=0.42$ ). The ability of sitting show significant improvement  $\{X^2(2) = 14.04, W=0.31, p < 0.001\}$  with

small effect size and the pair wise comparison showed significant large improvement from 0 to 2<sup>nd</sup> week ( $p=0.005$ ,  $r=0.59$ ) but no significant change ( $p>0.05$ ) was observed from 2<sup>nd</sup> to 4<sup>th</sup> week. But in standing ability no significant change ( $p>0.05$ ) was observed throughout the treatment duration. Sleeping showed significant improvement  $\{X^2(2) = 14.04$ ,  $W=0.31$ ,  $p<0.001\}$  with small effect size in sleeping ability but from 2<sup>nd</sup> week to 4<sup>th</sup> week in pair wise comparison, no significant changed ( $p>0.05$ )

was observed, but from 2<sup>nd</sup> to 4<sup>th</sup> week large significant improvement ( $p=0.014$ ,  $r=0.51$ ) observed. The sex life  $\{X^2(2) = 10.29$ ,  $W=0.22$ ,  $p<0.001\}$  and social life  $\{X^2(2) = 14.68$ ,  $W=0.32$ ,  $p<0.001\}$  both domains showed significant improvement with small effect size, but in pair wise comparison there is no significant change ( $p>0.05$ ) was observed in 0 to 2<sup>nd</sup> week, from 2<sup>nd</sup> to 4<sup>th</sup> week significant improvement  $\{(p=0.012$ ,  $r=0.52)$ ,  $(p=0.002$ ,  $r=0.65)\}$  was observed.

**Table 1: with-in group analysis of Oswestry disability index**

	Ergonomic Training (n=23)							Stability Ball Exercises (n=22)					
	M	IQR	MR	Z	p-value	r	M	IQR	MR	Z	p-value	r	
Pain Intensity	0 week	3	2	2.5	-1.76	0.078*	-0.37 <sup>a</sup>	3	2	2.82	-3.76	0***	-0.8 <sup>a</sup>
	2nd week	2	1	2	-2.63	0.009**	-0.55 <sup>b</sup>	2	2	2	-3.67	0***	-0.78 <sup>b</sup>
	4th week	2	1	1.5	-	-	-	0	1	1.18	-	-	-
Personal Care	0 week	2	2	2.4	-1.55	0.12	-0.32 <sup>a</sup>	2.5	2	2.84	-3.87	0***	-0.83 <sup>a</sup>
	2nd week	2	2	2.1	-3.07	0.002**	-0.64 <sup>b</sup>	1	1.25	1.86	-3	0.003***	-0.64 <sup>b</sup>
	4th week	1	1	1.5	-	-	-	0	1	1.3	-	-	-
Lifting	0 week	4	2	2.3	-0.96	0.336	-0.2 <sup>a</sup>	4	2	2.3	-1.64	0.1	-0.35 <sup>a</sup>
	2nd week	4	1	2.1	-1.66	0.097	-0.35 <sup>b</sup>	4	1	2.14	-3	0.003***	-0.64 <sup>b</sup>
	4th week	3	1	1.6	-	-	-	3	1	1.57	-	-	-
Walking	0 week	2	0	2.4	-2.14	.033**	-0.45 <sup>a</sup>	2	1	2.55	-2.52	.012*	-0.54 <sup>a</sup>
	2nd week	2	1	2	-2	.046**	-0.42 <sup>b</sup>	1	1.25	2.11	-3.45	.001***	-0.74 <sup>b</sup>
	4th week	1	1	1.6	-	-	-	0	1	1.34	-	-	-
Sitting	0 week	3	1	2.3	-2.84	.005**	-0.59 <sup>a</sup>	3	1	2.77	-3.82	0***	-0.81 <sup>a</sup>
	2nd week	3	1	2.2	-0.92	0.356	-0.19 <sup>b</sup>	2	0	1.89	-2.97	0.003***	-0.63 <sup>b</sup>
	4th week	2	1	1.5	-	-	-	1	1	1.34	-	-	-
Standing	0 week	3	0	2.3	-0.92	0.356	-0.19 <sup>a</sup>	3	1	2.75	-3.56	0***	-0.76 <sup>a</sup>
	2nd week	3	1	2	-1.81	0.071	-0.38 <sup>b</sup>	2	1	2	-3.4	0.001***	-0.72 <sup>b</sup>
	4th week	3	1	1.7	-	-	-	1	1	1.25	-	-	-
Sleeping	0 week	2	1	2.4	-1.71	0.088	-0.36 <sup>a</sup>	2	1.25	2.77	-3.94	0***	-0.84 <sup>a</sup>
	2nd week	2	1	2	-2.46	0.014*	-0.51 <sup>b</sup>	1	1.25	1.73	-1.93	0.053	-0.41 <sup>b</sup>
	4th week	1	1	1.5	-	-	-	1	1.25	1.5	-	-	-
Sex Life	0 week	2	2	2.3	-1.23	0.217	-0.26 <sup>a</sup>	2	2	2.64	-3.18	0.001***	-0.68 <sup>a</sup>
	2nd week	2	2	2.1	-2.5	0.012*	-0.52 <sup>b</sup>	1	0.25	1.91	-2.64	0.008**	-0.56 <sup>b</sup>
	4th week	1	1	1.6	-	-	-	1	1	1.45	-	-	-
Social Life	0 week	3	1	2.3	-0.37	0.71	-0.08 <sup>a</sup>	3	3.25	2.75	-3.47	0.001***	-0.74 <sup>a</sup>
	2nd week	2	2	2.2	-3.1	0.002**	-0.65 <sup>b</sup>	2	1	1.98	-3.45	0.001***	-0.74 <sup>b</sup>
	4th week	1	2	1.5	-	-	-	1	1.25	1.27	-	-	-
Travelling	0 week	3	1	2.3	-1.55	0.12	-0.32 <sup>a</sup>	3	2	2.77	-3.49	0***	-0.74 <sup>a</sup>
	2nd week	3	1	2	-1.98	0.048**	-0.41 <sup>b</sup>	2	3	1.95	-2.78	0.005**	-0.59 <sup>b</sup>
	4th week	2	2	1.6	-	-	-	1	1	1.27	-	-	-
ODI Score	0 week	27	7	2.5	-1.91	0.057	-0.4 <sup>a</sup>	26	16	2.91	-3.93	0***	-0.84 <sup>a</sup>
	2nd week	24	13	2.1	-3.42	0.001***	-0.71 <sup>b</sup>	19	9.5	1.91	-3.63	0***	-0.77 <sup>b</sup>
	4th week	18	10	1.3	-	-	-	9	10	1.18	-	-	-

Significance Level:  $p<0.05$ \*,  $p<0.01$ \*\* ,  $p<0.001$ \*\*\*.

Correlation coefficient (r) for effect size

Also, Travelling ability was significantly improved  $\{X^2(2) = 9.96$ ,  $W=0.22$ ,  $p<0.001\}$  with small effect size but in pair wise no significant improvement ( $p>0.05$ ) from 0 to 2<sup>nd</sup> weeks and significant change was observed from 2<sup>nd</sup> to 4<sup>th</sup> week ( $p=0.048$ ,  $r=0.41$ ). The ODI total score  $\{X^2(2) = 24.58$ ,  $W=0.53$ ,  $p<0.001\}$  showed significant improvement but no significant improvement ( $p>0.05$ ) in the pair wise comparison was observed from 0 to 2<sup>nd</sup> week while from 2<sup>nd</sup> to 4<sup>th</sup> week, significant improvement ( $p=0.005$ ,  $r=0.59$ ) as shown in Table 1.

The stability ball exercise (SBE), showed significant improvement  $\{X^2(2) = 34.56$ ,  $W=0.79$ ,  $p<0.001\}$  in intensity of pain with medium effect size and the pair wise comparison also showed significant improvement from 0 week to 2<sup>nd</sup> weeks ( $p=0.000$ ,  $r=0.8$ ) and from 2<sup>nd</sup> to 4<sup>th</sup> week ( $p=0.000$ ,  $r=0.78$ ). The personal caring ability is also significantly improved  $\{X^2(2) = 31.97$ ,  $W=0.73$ ,  $p<0.001\}$  with medium effect size, pair wise comparison showed significant improvement from 0 to 2<sup>nd</sup> week ( $p=0.000$ ,  $r=0.83$ ) and from 2<sup>nd</sup> to 4<sup>th</sup>

week ( $p=0.003$ ,  $r=0.64$ ). Lifting ability was significantly improved  $\{\chi^2(2) =12.86$ ,  $W=0.29$ ,  $p<0.001\}$  with small effect size but no significant improvement ( $p>0.05$ ) was seen in 0 to 2<sup>nd</sup> week in pair wise comparison.

As the ability of walking show significant improvement  $\{\chi^2(2) =23.26$ ,  $W=0.53$ ,  $p<0.001\}$  with medium effect size and the pair wise comparison also showed significant improvement from 0 to 2<sup>nd</sup> week ( $p=0.012$ ,  $r=0.54$ ) and from 2<sup>nd</sup> to 4<sup>th</sup> week ( $p=0.001$ ,  $r=0.74$ ). On the other hand sitting ability was also significantly improved  $\{\chi^2(2) =30.64$ ,  $W=0.7$ ,  $p<0.001\}$  with medium effect size, the pair wise comparison show significant improvement from 0 to 2<sup>nd</sup> week ( $p=0.000$ ,  $r=0.81$ ), and from 2<sup>nd</sup> to 4<sup>th</sup> week ( $p=0.003$ ,  $r=0.63$ ). There was significant improvement  $\{\chi^2(2) =33.00$ ,  $W=0.75$ ,  $p<0.001\}$  in standing ability with medium effect size and also the significant improvement was shown in pair wise

comparison between 0 to 2<sup>nd</sup> week ( $p=0.000$ ,  $r=0.76$ ) and 2<sup>nd</sup> to 4<sup>th</sup> week ( $p=0.001$ ,  $r=0.72$ ). Sleeping ability showed significant improvement  $\{\chi^2(2) =30.24$ ,  $W=0.69$ ,  $p<0.001\}$  with medium effect size, in pair wise comparison significant improvement was observed from 0 to 2<sup>nd</sup> week ( $p=0.000$ ,  $r=0.84$ ) but no significant change ( $p>0.05$ ) was observed from 2<sup>nd</sup> to 4<sup>th</sup> week. Significant improvement  $\{\chi^2(2) =26.46$ ,  $W=0.6$ ,  $p<0.001\}$  was seen in sex life with medium effect size and the pair wise comparison also showed significant improvement from 0 to 2<sup>nd</sup> week ( $p=0.001$ ,  $r=0.68$ ) and from 2<sup>nd</sup> to 4<sup>th</sup> week ( $p=0.008$ ,  $r=0.56$ ). In social life significant improvement  $\{\chi^2(2) =31.55$ ,  $W=0.72$ ,  $p<0.001\}$  was observed with medium effect size, significant improvement was seen from 0 to 2<sup>nd</sup> week ( $p=0.001$ ,  $r=0.74$ ) and from 2<sup>nd</sup> to 4<sup>th</sup> week ( $p=0.001$ ,  $r=0.74$ ) in pair wise comparison.

Table 2: Between the group Analysis (Oswestry disability index)

		Ergonomic setting (n=23)			Stability ball exercises (n=22)			U	r	p-value
		Median	IQR	MR	Median	IQR	MR			
Pain Intensity	0 week	3	2	34.35	3	2	31.34	228.5	-0.08	0.557
	2nd week	2	1	40.33	2	2	31.64	188	-0.229	0.123
	4th week	2	1	47.17	0	1	28.36	110.5	-0.502	0.001
Personal Care	0 week	2	2	32.28	2.5	2	32.66	251	-0.007	0.962
	2nd week	2	2	41.37	1	1.25	28.52	156	-0.344	0.021
	4th week	1	1	45.57	0	1	30.11	135	-0.423	0.005**
Lifting	0 week	4	2	34.28	4	2	31.5	233.5	-0.069	0.640
	2nd week	4	1	37.3	4	1	33.73	225	0.106	-0.475
	4th week	3	1	40.35	3	1	34	207	-0.178	0.232
Walking	0 week	2	0	37.74	2	1	30.39	196.5	-0.207	0.164
	2nd week	2	1	40.67	1	1.25	30.09	175.5	0.288	0.053
	4th week	1	1	48.02	0	1	28.41	110	-0.519	0***
Sitting	0 week	3	1	33.91	3	1	32.95	246	-0.026	0.861
	2nd week	3	1	45.63	2	0	28.59	123.5	-0.484	0.001**
	4th week	2	1	48.87	1	1	29.09	110.5	-0.51	0.001**
Standing	0 week	3	0	33.33	3	1	34.41	244.5	-0.032	0.828
	2nd week	3	1	45.15	2	1	33	158.5	-0.346	0.020*
	4th week	3	1	50.22	1	1	28.16	92.5	-0.57	0***
Sleeping	0 week	2	1	33.89	2	1.25	31.95	237	-0.058	0.693
	2nd week	2	1	41.52	1	1.25	28.59	155.5	-0.35	0.019
	4th week	1	1	46	1	1.25	33.3	156	-0.350	0.019
Sex Life	0 week	2	2	32.65	2	2	30.48	234	-0.067	0.650
	2nd week	2	2	44.98	1	0.25	31.89	153.5	-0.378	0.011*
	4th week	1	1	46.3	1	1	32.91	144	-0.39	0.008**
Social Life	0 week	3	1	33.26	3	3.25	34.09	245	0.028	0.850
	2nd week	2	2	44.93	2	1	30.09	143	-0.389	0.009**
	4th week	1	2	45.02	1	1.25	32.89	159	-0.333	0.026*
Travelling	0 week	3	1	33.09	3	2	31.09	236.5	-0.058	0.694
	2nd week	3	1	41.83	2	3	30.89	170.5	-0.293	0.049
	4th week	2	2	46.54	1	1	33.91	156	-0.338	0.023*
ODI Score	0 week	27	7	34.83	26	16	32.43	234	-0.06	0.665
	2nd week	24	13	44.96	19	9.5	30.45	142.5	-0.374	0.012*
	4th week	18	10	48.54	9	10	31.89	114.5	-0.472	0.002**

Significance Level:  $p<0.05^*$ ,  $p<0.01^{**}$ ,  $p<0.001^{***}$ .

Correlation coefficient (r) for effect size

The ability of travelling was significantly improved  $\{X^2(2) = 31.65, W=0.72, p<0.001\}$  with medium effect size and the pair wise comparison also showed significant improvement from 0 to 2<sup>nd</sup> week ( $p=0.000, r=0.74$ ) and 2<sup>nd</sup> to 4<sup>th</sup> week ( $p=0.005, r=0.59$ ). Total ODI score of stability ball exercise show significant improvement  $\{X^2(2) = 36.86, W=0.84, p<0.001\}$  with large effect size and also significant improvement showed in pair wise comparison from 0 to 2<sup>nd</sup> week ( $p=0.000, r=0.84$ ) and from 2<sup>nd</sup> to 4<sup>th</sup> week ( $p=0.000, r=0.77$ ) as shown in Table 1.

When comparing the stability ball exercise (SBE) and ergonomic setting (ES), the pain intensity ( $U=110.5, p<0.001, r=-0.502$ ), and walking ability ( $U=110, p<0.001, r=-0.519$ ) was significantly improved after 4 week intervention in stability ball exercises as compared to ergonomic training group. Moreover, significant improvement was also observed in stability ball exercises group as compare to ergonomic training group regarding the ability of personal care with medium effect size ( $U=156, p=0.021, r=-0.344$  &  $U=135, p=0.005, r=-0.423$ ) after 2<sup>nd</sup> & 4<sup>th</sup> week, sitting ( $U=123.5, p=0.001, r=-0.484$ ) and standing ( $U=158.5, p=0.020, r=-0.346$ ) with medium effect size after 2<sup>nd</sup> week and after 4<sup>th</sup> week sitting ( $U=110.5, p=0.001, r=-0.51$ ) and standing ( $U=92.5, p<0.001, r=-0.57$ ) improved significantly with large effect size. The social life ( $U=143, p=0.009, r=-0.389$  &  $U=159, p=0.026, r=-0.333$ ) and over all disability ( $U=142.5, p=0.012, r=-0.374$  &  $U=114.5, p=0.002, r=-0.472$ ) in 2<sup>nd</sup> & 4<sup>th</sup> week were also improved with medium effect size respectively. The traveling was significantly improved with small effect size after 2<sup>nd</sup> week ( $U=170.5, p=0.049, r=-0.293$ ) but after 4<sup>th</sup> week ( $U=156, p=0.023, r=-0.338$ ) improved with medium effect size. The lifting ability in the participant did not showed any significant difference between the groups throughout the intervention period. There was moderate significant difference in overall ODI score between SBE and ET group after 2<sup>nd</sup> {19(9.5) vs 24(13),  $p=0.012, r=-0.37$ } and 4<sup>th</sup> week {9(10) vs 18(10),  $p=0.002, r=0.472$ }. (Table 2)

## DISCUSSION

The aim of the study was to determine the effectiveness of ergonomic training and stability ball exercises on Oswestry Disability index, in women with pregnancy related low back pain. The

hypothesis of the study was that the stability ball exercises are more effective as compared to ergonomic setting. The results of the study showed significant improvement in the group of ergonomic settings after the second week of intervention while clinically significant results was found in stability ball exercises group after the first week of intervention with larger effect size. Hence, null hypothesis was accepted.

The post interventional analysis of the current study showed significant improvement in pain intensity, personal care, walking, sitting, sleeping, sex life, social life, and travelling in ergonomic settings. The previous study conducted by Sabino J et al, demonstrated that proper posture plays an important role in the management of low back pain, similar to the results of current study,<sup>9</sup> and maintaining proper posture decreases the mechanical load on the spine.<sup>16</sup> Furthermore, load on facet joint increases during pregnancy leads to the pain and functional limitations.<sup>17</sup> In previous study, proper postural training in which performing activities in neutral spine position reduces extra mechanical load on lower back.<sup>18</sup> Similar to the results of current study, postural training and ergonomics is important for maintaining balance and reducing pain, which ultimately boost daily life functions.<sup>17, 18</sup>

Also, clinically significant improvement was observed in pain intensity, personal care, lifting, walking, sitting, standing, sleeping, sex life, social life, and travelling in the group of stability ball exercises. In pregnancy, increased trunk mass leads to the changes in the posture that effect the centre of gravity, which is considered as a main cause of pregnancy related low back pain.<sup>14</sup> However, the previous studies reported the efficacy of stability ball exercise, which improved muscular alignment, and posture as well as centre of gravity during pregnancy. Hence contributes to reduce the low back pain and improves daily life activities, similar to the results of present study.<sup>19</sup> Forward shifting of centre of gravity during pregnancy requires good core muscle strength to stabilize the lumbar spine and pelvic girdle.<sup>20</sup> Stability ball exercises strengthens the core muscle and stabilize the trunk, which reduces the chance of back injury and also declines the back pain,<sup>14</sup> thus, improves functional status which correlates with the current findings.<sup>21</sup>

Moreover, exercises on balancing ball increases the sense of balance and has positive effects on muscle endurance, flexibility and power, increase coordination and stability and improves proprioception.<sup>22</sup> Also, previous studies reported significant improvement in walking, lifting, sitting, standing, static and dynamic balance after Swiss ball training in geriatric population,<sup>23</sup> and ankylosing spondylitis.<sup>24</sup> However the results of current study showed significant improvement in reducing pregnancy relate lumbago, which might be a reason of improvement in walking, lifting, sitting, and standing as discussed in the previous literature.

When both groups were compared significant difference was observed in pain, personal care, walking, sitting, standing, sleeping, sex life, social life, and travelling which corresponds with the previous study. In which exercises on stability ball improves posture and thus reduces PR-LBP which ultimately improves tasks of everyday life.<sup>19</sup>

It was single-centered study and sample size was not enough to generalize the results. A group in which proper postural and ergonomic training was instructed for activities of daily living is a bit unreliable group, as it was not confirmed whether the participants followed the instruction at home or not. The other limitation is that only few females were willing for stability ball exercises as it was totally new experience for them.

## CONCLUSION

It was concluded that both groups; ergonomic training and stability ball exercises were effective for low back pain and improves daily function tasks. But a stability ball exercise was more effective for PR-LBP and reduces disability during and after pregnancy. A multi-centered and larger sample size should incorporate in future researches. A body mass index and number of pregnancies should also be considered which may affect the results.

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