

Postpartum Females -Effects of Deep Core Stability Exercises Versus Pilates Exercises for Diastasis Recti. -A Randomized Controlled Trial of Coastal Patients

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Vidhya Sri. M¹, Shanmugananth. E², Thamizharasi. V³ Ezhumalai.G⁴

¹Research Scholar, Academic Department Of Physiotherapy, Mahatma Gandhi Medical College And Research Institute, Sri Balaji Vidyapeeth, Puducherry, India.

²Professor and Head, Academic Department Of Physiotherapy, Mahatma Gandhi Medical College And Research Institute, Sri Balaji Vidyapeeth, Puducherry, India.

³Clinician, Department Of Physiotherapy, Saravana Hospital, Cuddalore, Tamil Nadu, India.

⁴Senior research consultant, Sri Balaji Vidyapeeth, Puducherry, India

Corresponding Author: Shanmugananth. E

Professor and head, Academic Department of physiotherapy, Mahatma Gandhi medical college and research institute, Sri Balaji Vidyapeeth, Puducherry, India.

Email: shankutty1981@gmail.com Ph.no: +919328456980

Key Words:

Coastal life, Diastasis recti, postpartum females, education, deep core stability exercises, Pilates exercises.

Abstract

BACKGROUND: Diastasis recti, or the division of abdominal muscles, can occur in coastal patients as a result of factors such as pregnancy, weight gain, and physical activity. Diastasis rectus abdominis (DRA), or a gap of the inter-recti at the centre, is a common health problem which impacts all pregnant and postpartum women who have a split of more than 2 cm at one or more locations along the linea alba. Symptoms of diastasis recti may include a bulge or pooch in the abdomen, lower back pain, poor posture, and difficulty engaging the core muscles. Diastasis recti can also contribute to pelvic floor dysfunction and urinary incontinence. Pilates and deep core stability exercises is a form of exercise with goals of improving flexibility, core strength, Posture and coordinate movement. The study aimed to compare the effect of deep core stability exercises versus Pilates exercises to evaluate which of these treatment protocols prove to be more efficient in decreasing inter recti distance and waist hip ratio in postpartum females with diastasis recti.

OBJECTIVE: The objective of this study is to compare the deep core stability exercises versus Pilate's exercises to evaluate which of these treatment protocol is more effective in treating diastasis recti.

METHODOLOGY: In a study of 20 subjects with diastasis recti , postpartum females were randomly divided into 2 groups with 10 subjects each in Group A and Group B. Subject were selected between the age between 20- 35. Group A underwent deep core stability exercise along with conventional exercises (n = 10) and Group B underwent pilates exercises along with conventional exercises (n= 10). The subject were submitted to inter recti distance test by Vernier calliper and waist hip ratio by using inch tape before and after the 6 weeks intervention. The pre-test value and post-test value were calculated after the intervention.

RESULT: The data were analyzed and interpreted by using the SPSS version. There was a significant reduction in inter-recti distance and waist-hip ratio in both groups and a significant difference was found between the two groups ($p < 0.05$).

CONCLUSION: From the above study we conclude that Group A and Group B both were effective in decreasing the diastasis recti gap but compare to these two group pilates exercises (Group B) is more effective than deep core stability exercises (Group A) in reducing inter recti distance and waist-hip ratio caused by diastasis recti in this special population of postpartum females. The need for this type of special education needs to be emphasized.

Introduction:

Diastasis recti, or the division of abdominal muscles, can occur in coastal patients as a result of factors such as pregnancy, weight gain, and physical activity.

“Pregnancy” is considered as the most important stage in a women’s life [1]. Pregnancy is a normal physiological process that healthy women typically go through once in their lives. The majority of patients

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who are pregnant or have just given birth come with specific clinical challenges based on gender for physical therapists^[1]. The four paired major muscles that make up the anterolateral abdominal wall—rectus abdominis (vertical fibres), transverse abdominis (horizontal fibres), external and internal oblique (oblique fibres), and others—span from the thoracic cage to the pelvis. These muscles are attached to the spinal column by a fascia that resembles a corset, called the thoracolumbar fascia^[2]. The rectus abdominis and the other three main abdominal muscles on both sides, consisting of the internal oblique, external oblique, and transversus abdominis, all insert at the linea alba, which is the central seam connecting the fascia that protects the rectus abdominis muscles^[3]. A muscular cylinder that supports the spine and pelvis is formed by the transversus abdominis, pelvic floor, deep multifidus, and diaphragm.³ These muscles work together to create and maintain trunk stability. Before the end of pregnancy, the uterus expands from a pre-pregnancy size of 5 by 10 cm to 25 by 36 cm; each uterine muscle cell increases by several times its pre-pregnancy length. As it rises and leaves the pelvis, the uterus transforms from a pelvic organ to an abdominal organ.^[4]

Diastasis recti is a medical condition in which the rectus abdominis muscle splits at the linea Alba in the middle of the muscle. A diastasis is a gap of more than 25 mm between the recti abdominal muscles. Any distance greater than 2 cm, or the breadth of two fingers, is regarded as significant. It can develop above, below, or at the umbilicus level^[5]. There is discrepancy over the precise measurement that is considered abnormal, with instances being divided into mild (2, 3 or 4 cm) and severe cases (5-20 cm)^[6] Pregnancy hormones such as relaxin, progesterone, and oestrogen soften connective tissues and weaken the linea Alba, which are the primary causes of diastasis recti^[4]. DRA is a separation of the rectus abdominis muscle flaps that occurs as a result of persistent, long-term pressures on the linea Alba. The linea alba, a connective tissue that runs down the body's midline, connects the two bellies of the rectus abdominis muscle such that they are anatomically positioned parallel to one another. The linea alba softens and expands during pregnancy as a result of hormonal changes, accommodating the increasing weight of the developing foetus due to an expanded inter-recti distance (IRD)^[7]. The muscles in the rectus abdominis separate in two out of every three

women. Separation can occur at any time in the second half of pregnancy, but it is most dangerous right after delivery when the abdominal wall is already compromised. Abdominal separation, also known as diastases recti, weakens the structural integrity and functional strength of the abdominal wall^[8]. The incidence was 0% in the first trimester and among non-pregnant women; 27% and 66% in the second and third trimesters, respectively. 36% of women with persisting diastasis recti separation displacement were 5 weeks to 3 months postpartum^[9]. DRAM resolution and maximum recovery occur between one day and six weeks following delivery, after which time recovery plateaus.^[10] In some women, this spontaneous resolution does not occur after giving delivering child, thus becoming a pathological situation that may be maintained even last for years after giving birth^[6] Lower back ache in postpartum mothers that develops and continues is one of the health issues caused by DRA. Women with DRA are more prone to develop abdominal and pelvic pain after giving birth. Six months after delivery, four out of ten women report ongoing LBPP (low back pelvic pain)^[3]. There have been examples of men experiencing an increase in intra-abdominal pressure as a result of obesity or chronic obstructive pulmonary disease.^[11] Women who have diastasis recti abdominal muscle are frequently referred to physiotherapy for nonsurgical care; nonetheless, they report rates of 66% to 100% during the third trimester of pregnancy and up to 53% after delivery^[4]. When it comes to treating diastasis recti abdominis, physiotherapy is generally used first. If the problem is still present, surgical intervention is then frequently used. Exercise therapy is one type of intervention that can be given to patients with diastasis recti abdominis. In addition to posture and back care instruction, external support, and cardiovascular workouts are frequently used non-surgical therapies in women with DRAM^[10]. Deep core stability exercise is one kind of physical exercise that can be performed on diastasis recti abdominis and this exercise is isometric. Regular core stability exercises have been shown to be successful in treating diastasis recti abdominis, minimising the space between diastasis recti abdominis, and reducing back pain caused by diastasis recti abdominis. In terms of the fact that completing core stability exercises can help postpartum women reduce diastasis recti abdominis and boost their abdominal muscles' maximal strength. The effectiveness of the deep core stability training

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programme in reducing diastasis recti and improving postpartum women's quality of life [11]. Pilates is an exercise regimen that aims to strengthen the core muscles that affect posture and aid in maintaining the health and quality of the spine. It shows great posture, body awareness, and simple movement. Pilates enhances flexibility, agility, and movement efficiency [12]. Pilates focuses on “core” strength, posture, and breathing coordination with movement in order to increase overall body flexibility and wellness [8]

The focus of the present research is on the facilitation and strengthening of abdominal muscles to investigate the impact on diastasis recti reduction in postnatal women. As a result, the current study sought to compare the effects of deep core stability exercises against pilates exercises on diastasis recti in postpartum females.

Methodology:

The study was a study with convenient sampling. This study was conducted at Mahatma Gandhi medical college and hospital and Community-based in the South Indian coastal area. Informed consent was obtained from the patients. The current research included a total of 20 participants. This study comprised patients aged 20 to 35, six weeks to six months postpartum with diastasis rectus abdominis, BMI less than or equal to 29 kg/m², and LSCS. The subjects that are excluded are those suffering from any heart or respiratory condition, including excessive coughing or sneezing, any pelvic or abdominal surgery except LSCS, any neurological conditions, and normal delivery. After the selection process, the selected participants were signing the informed consent and were randomly allocated into two groups. Deep core stability exercises (Group A) and Pilates exercises (Group B) by lottery method. The pre-test of inter-recti distance and the waist-hip ratio was assessed by using a Vernier calliper and an inch tape before the 6 weeks of treatment duration. Group A received Deep core stability exercises and conventional exercises. Group B received Pilates exercises and conventional exercises. After the 6 weeks of treatment duration, the post-test of the inter-recti distance and waist-hip ratio was assessed as it had been in the pre-test. Based on the data analysis, the results were obtained.

Measurement Tools:

Table 1 lists the outcome measures that will be used to determine the treatment's efficacy. The result contains the inter recti distance and the waist-hip ratio. All measurements will be taken at the start of the intervention (week 0) and at the end (week 6).

Variables	Tools
Inter recti distance (IRD)	Vernier calliper
Waist hip ratio (WHR)	Inch tape

Vernier calliper:

A Vernier calliper is used to measure inter-recti separation. The calliper arms were inserted at the level of the umbilicus, perpendicular to the border, and the medial edge of the two recti muscle borders were palpated while the patients were in the crock-lying position. The patient was then lifted from the plinth, and the distance between the two recti was measured to the nearest millimetre. A soluble marker was used to create standardisation for subsequent measurements. For each evaluation, the average of the three trials was used.

Inch tape:

Examine the smallest feasible area. Take your waist measurement at its narrowest point, which is usually immediately below your belly button. This is a waist measurement. Take note of the number. Second, use a tape measure to measure your hips at their widest point. This is the circumference of your hips. Take note of the number. Determine the difference in your waist and hip sizes

Intervention Procedure:

Deep core stability exercise [3]

Group A (n = 10) participants completed a deep core stability training programme that included diaphragmatic breathing, isometric abdominal contraction, pelvic floor contraction, plank or modified plank, and abdominal bracing. Twenty repetitions were performed with a holding time of 10 seconds followed by a 5-second rest. This programme ran three times a week for six weeks..

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Pilates exercises^[5]

All the participants in Group B (n = 10) underwent Pilates exercises that consisted of spine stretching, sawing, mermaids, double leg stretch, and crisscross. Twenty repetitions were done with a holding time of 10 seconds followed by a 5-second relaxation. This program was conducted 3 times per week, entirely for 6 weeks.

Conventional Exercises:

All the participants in both Group A and Group B underwent conventional exercises along with the experimental exercises, which consisted of pelvic bridging, straight leg raises, pelvic tilting, quadruped or Superman exercises, and trunk twists. Twenty repetitions were done with a holding time of 10 seconds followed by a 5-second relaxation. This program was conducted 3 times per week, entirely for 6 weeks.

Statistical Analysis:

The statistical analysis was performed using SPSS software. All results are presented together with the mean and standard deviation. All outcome measures baseline scores were displayed. A paired t-test was used for all the outcome measures to compare within-group changes, or pre-intervention changes and post-intervention changes on day 1 and at the end of 6 weeks.

Result Analysis:

The analysis of inter recti distance on deep core stability exercises group was obtained through Vernier calliper whereas the mean value before intervention was 29.3 ± 1.15 and the mean value obtained after the intervention was 21.2 ± 1.81 respectively. The obtained t-value is 19.9 and the P value 0.0001 ($p < 0.05$) which shows significance (**Table 2**).

The inter recti distance analysis on the pilates exercise group was acquired using a Vernier calliper, with the mean value before intervention being 29.41.64 and the mean value after intervention being 19.6 0.94. The t-value obtained is 25.21, and the P value is 0.0001 ($p < 0.05$), indicating significance (Table 3).

The waist-hip ratio for the deep core stability training group was measured using an inch tape, with the mean value before intervention being 0.8810.019 and the mean value after intervention being 0.8730.018. The t-

value obtained is 6 and the P value is 0.0002 ($p < 0.05$), indicating significance (Table 4). The analysis of the waist-hip ratio on the pilates exercise group was obtained through inch tape whereas the mean value before intervention was 0.882 ± 0.016 and the mean value obtained after the intervention was 0.859 ± 0.015 the obtained t-value is 15.06 and the P value 0.0001 ($p < 0.05$) which shows significance (**table 5**).

TABLE 2 Analysis of pre and post value of IRD on Group A

GROUP	TEST	N	MEAN	STANDARD DEVIATION	T VALUE	P VALUE
A	PRE TEST	10	29.3	1.15	19.9	0.0001
	POSTTEST	10	21.2	1.81		

TABLE 3 Analysis of pre and post value of IRD on Group B

GROUP	TEST	N	MEAN	STANDARD DEVIATION	T VALUE	P VALUE
B	PRE TEST	10	29.4	1.64	25.21	0.0001
	POST TEST	10	19.4	0.94		

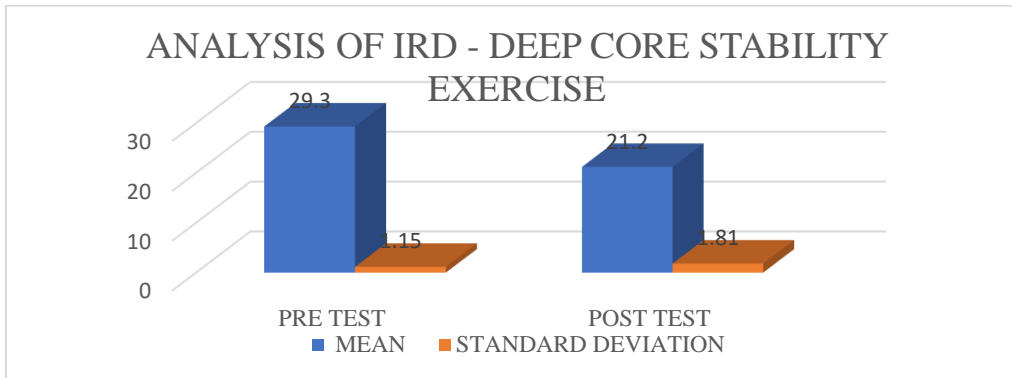
TABLE 4 Analysis of pre and post value of WHR on Group A

GROUP	TEST	N	MEAN	STANDARD DEVIATION	T VALUE	P VALUE
A	PRE TEST	10	0.881	0.019	6	0.0002
	POST TEST	10	0.873	0.018		

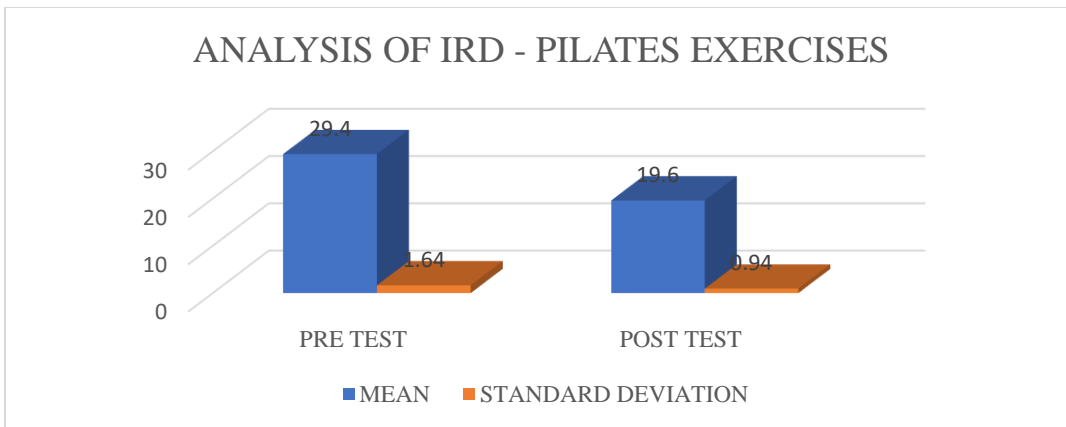
TABLE 5 Analysis of pre and post value of WHR on Group B

GROUP	TEST	N	MEAN	STANDARD DEVIATION	T VALUE	P VALUE
B	PRE TEST	10	0.882	0.016	15.06	0.0001
	POST TEST	10	0.859	0.015		

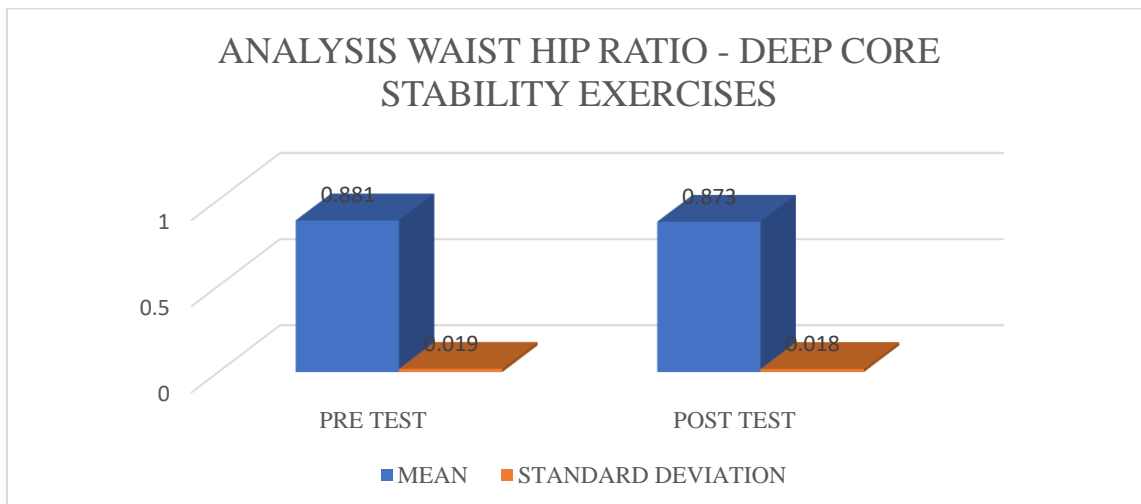
Graph 1 Displays the pre and post value of deep core stability exercise of inter recti distance evaluated by vernier calliper.



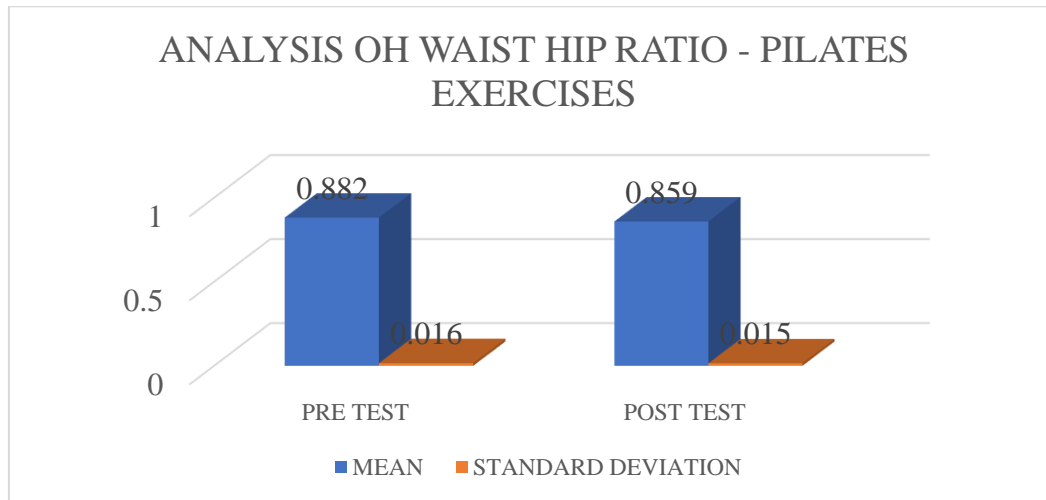
Graph 2 Displays the pre and post value of pilates exercise of inter recti distance evaluated by Vernier calliper.



Graph 3 Displays the pre and post value of deep core stability exercise of waist hip ratio evaluated by inch tape



Graph 4 Displays the pre and post value of pilates exercise of waist hip ratio evaluated by inch tape



Discussion:

The rectus abdominis muscles, which run down the front of the abdomen, become weakened and separated during in special population of females with pregnancy and childbirth, resulting in postpartum recti muscle weakness. This can cause several symptoms such as back pain, pelvic pain, and urinary incontinence.

While this condition can be disabling for some women, the degree of disability varies greatly depending on the individual and the extent of muscle weakness. Some women may be able to manage their symptoms with exercises and other non-invasive treatments, whereas others may require more aggressive treatments, such as surgery.

DRA is a prevalent medical disorder that affects pregnant women as well as new mothers. If left untreated, it can develop to a variety of health problems, including low back pain, diminished function, and a lower quality of life. The current study sought to compare the effects of deep core stability exercises and pilates exercises on diastasis recti in postpartum females. When we look at the data from this study, we can observe that postpartum women with diastasis recti in both groups A and B saw a reduction in the inter recti gap. Nonetheless, as can be seen, groups A and B have made significant progress..

Given that the muscles' metabolic capacities were constantly surpassed, the results of the research may be attributed to adaptive changes in the muscles caused by exercise. The muscle, a contractile tissue, becomes

stronger as a result of muscle fibre hypertrophy and increased activation of its motor units. Furthermore, it has a significant impact on the metabolic cost of producing a specific muscle force, increasing muscular strength and endurance [13]. Therapeutic activities engage both the slow-twitch (ST) and fast-twitch (FT) fibres in the skeletal muscles, with the FT fibre content rising as muscular strength increases [14]. Furthermore, therapeutic activities have been shown to improve lung function by increasing forced vital capacity and forced expiratory volume [15]. The addition of a core training programme to abdominal bracing while exercising may be beneficial in treating DRA, closing DRA, and reducing back pain caused by DRA [16]. In another study, co-contraction exercises for the pelvic floor and transverse abdominis were found to be essential for any postpartum patient within the first six weeks following birth [17].

The Pilates group included activities that required multifidus activation, such as leg pulls prone and equivalent exercises. As a result of these continuous and persistent contractions during exercise, the multifidus and transverse abdominals strength may have increased.

Ali A. Thabet et al. (2019) studied postpartum women having diastasis recti abdominis to establish an effective deep core stability training programme. A randomised controlled trial is being conducted. This study concluded that the deep core stability training programme is beneficial in treating diastasis recti and increasing the quality of life of postpartum women [13].

Another study, conducted by Maria Walton et al. (2019), compared the benefits of a 6-week dynamic core stability plank training programme to a standard supine core stability strengthening programme on diastasis recti abdominis closure. This is a controlled, randomised group. They concluded that both the experimental and control groups experienced considerable DRA decreases. In postpartum females, the traditional programme is marginally more effective in reducing diastasis recti.^[9]

Other study Vaishnavi Ravikantiwar et al. (2021) conducted a study to find the effectiveness of pilates exercises on diastasis recti in postpartum women. They concluded that the study shows pilates exercises are effective in reducing diastasis recti in postpartum women^[5]. "Pilates selected exercises effects on muscle strength, trunk joints range of motion, and flexibility in women with hyper lordosis in immediate post-partum" was done by Mahdavine Jad R et al. (2015). He came to the conclusion that Pilate's exercises might have a role in the postpartum body restoration of women and that it would be beneficial for health professionals to adopt this activity to aid women in their postpartum recovery^[17]. After four weeks of Pilates practice, Nidhi Agarwal et al. found a substantial difference between pre and post readings in the plank test. According to the findings of this study, pilates exercises have been found to be an effective method of training for increasing the endurance of core muscles, but there is no statistically significant difference between pre and post-readings in the plank test, even though there is a clinical difference. This may be due to the small sample size and the fact that Pilates was given every other day for four weeks^[18].

In this study deep core stability exercises group of inter recti distance decreased from with mean (29.3±1.15) to (21.2±1.81) and waist-hip ratio means from (0.881±0.019) to (0.873±0.18) as compared to pilates exercises group of inter recti distance decreasing from mean (29.4±1.64) to (19.6±0.94) and waist-hip ratio mean from (0.882±0.016) to (0.859±0.015) period of 6 weeks. According to the result of this study, the Pilates exercises group showed significantly more compare to deep core stability for diastasis recti in postpartum females. Therefore, we can accept the alternative hypothesis that there is a significant effect of deep core stability exercises and Pilates on decreasing inter recti distance and waist hip ratio in diastasis recti women.

Limitations

The results of the current study indicate that the Pilates exercise group showed a greater difference than the Deep Core Stability exercise group, and there was no adverse effect. The current study may have some limitations. Because there aren't enough patients, this study only involved LSCS postpartum women. There is no control group in this study. The current study did not involve a long-term follow-up. Due to time constraints, only a 6-week program was given.

Future Recommendations

A future study must be conducted with long-term follow-up and a large sample size. Various alternative workout regimens can be included in future research on diastasis recti, and their efficacy can be evaluated. Future research should include normal delivery postpartum women to see the difference in the results.

Conclusion:

In coastal patients as a result of factors such as pregnancy, weight gain, and physical activity can worsen diastasis recti. In this study, we concluded that after 6 weeks of training, both Group A and Group B were effective in decreasing inter-recti distance and waist-hip ratio, but compared to these two groups, pilates exercises (Group B) were more effective than deep core stability exercises (Group B) in reducing inter recti distance and waist-hip ratio caused by diastasis recti in postpartum females. The need for this type of special education needs to be emphasized

CONFLICT OF INTEREST- NIL

SOURCE OF FUNDING- NIL

Ethics – issues addressed

AUTHOR CONTRIBUTION STATEMENT

Vidhya sri primary author, participated in the study design, data collection and drafted the manuscript. V. Thamizharasi contribution in the data collection. E. Shanmuganath contribution in the study design, and revised the manuscript critically. All authors read and approved the final manuscript.

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