



International Journal of Allied Medical Sciences and Clinical Research (IJAMSCR)

ISSN:2347-6567

IJAMSCR /Volume 6 / Issue 2 / Apr - Jun - 2018
www.ijamscr.com

Research article

Medical research

To study the added effect of modified dynamic core stability plank exercise program on diastasis recti abdominis closure and pelvic floor disability :a pilot study

*Cherry Pereira¹, Dr. Anuradha Sutar² (PT), Dr. Snehal Ghodey³ (PT)

MAEER'S Physiotherapy College, Talegaon Dabhade (Pune), Maharashtra, India.

*Corresponding Author: Cherry Pereira

Email id: cherry.pereira13@gmail.com

ABSTRACT

Background and Aim

During and after pregnancy, many women experience an increase in the inter-recti abdominal muscle due to stretching and thinning of the linea alba. Because of the synergistic relationship between the pelvic floor and abdominal muscles, a decrease in abdominal muscle function associated with DRA could affect the performance of the pelvic floor musculature. Aim was to study the added effects of a modified dynamic core stability plank exercise program on diastasis recti abdominis (DRA) closure and pelvic floor disability.

Materials Required

Digital nylon caliper, Pen, Measuring tape, Pelvic floor disability index, Towel, Plinth.

Methodology

An experimental study was carried out among 16 females (8 in each group), which were selected according to the inclusion and exclusion criteria. Each participant completed pre and post-test caliper measurements for DRA and pelvic floor disability index questionnaire. The intervention was given for 6 weeks (3 times/week).

Results and Conclusion

There was an extremely significant difference at the level of umbilicus and 4.5cm above the level of umbilicus seen post treatment, with the experimental group showing greater closure after treatment compared to the control group. The PFDI scores also showed significant improvement post treatment in both the groups.

Keywords: Diastasis recti abdominis, Pelvic floor disability, Digital nylon caliber, Plank exercise.

INTRODUCTION

Many women experience an increase in the inter-recti abdominal muscle distance due to stretching and thinning of the linea alba during and also after pregnancy [1]. In particular, the presence of a diastasis recti abdominis (DRA), defined as an impairment characterized by a midline separation of the rectus abdominis muscle along the linea alba

[2]. A widening of >2cm, 25mm², or 2 fingers width at one or more assessment points (at the level of the umbilicus or 4.5cm above or below the umbilicus) is considered significant [1, 3]. In a descriptive study by Boissonnault and Blaschak, the incidence ranged from 0% in non-pregnant and 1st trimester women, 27% in 2nd trimester and 66% in 3rd trimester. 36% of women between 5 week

and 3 months postpartum had observed continue to displacement of separation of diastasis recti. DRA is not exclusive to childbearing women but is seen frequently in this population [3]. The linea alba is a meshwork of connective tissue in which the tendinous insertions of the external oblique, internal oblique, and transverse abdominis muscle intermingle, providing structure and stability to the abdominal wall and trunk. A DRA can indicate connective tissue alterations of the linea alba, an increase in muscle length with consequent altered line of muscle pull, damage of the fixation of the rectus muscles in their sheaths, or a disruption of the entire musculofascial abdominal wall. The anisotropic, directionally dependent behavior of linea alba, in conjunction with craniocaudal differences in the width and thickness of the linea alba, necessitates IRD measurements both above and below the umbilicus to document the DRA width [4]. DRA occurs due to hormonal elastic changes of the connective tissue, mechanical stresses placed on the abdominal wall by the growing fetus, and displacement of the abdominal organs [4]. During pregnancy increased level of relaxin, progesterone and estrogen hormones causes softening of connective tissues and weakening of the linea alba [3]. Other risk factors of diastasis recti include age, women over the age of 35 years, high birth weight of child, multiple birth pregnancy, caesarean section, and excessive abdominal exercises after the first trimester of pregnancy, massive weight loss occurring spontaneously or after bariatric surgery, previous or repeated abdominal surgery, menopausal women, and those using hormone replacement therapy [2, 3]. Women with diastasis recti usually perceive no pain at rest, whereas discomfort, pain, corset instability and bulging of the abdominal wall are symptoms appearing during physical activities [3]. DRA is relatively common and can have negative consequences. The abdominal wall plays important functions in posture, trunk, and pelvic stability, respiration, trunk movement, and support of the abdominal viscera. An increase in the inter-recti distance puts these functions in jeopardy, and can weaken abdominal muscles and influence their functions. This may result in altered trunk mechanics, impaired pelvic stability and changed posture, which may leave the lumbar spine and pelvis more vulnerable to injury [1]. The pelvic floor and abdominal muscles function

synergistically, each muscle group enhances the effectiveness of the other during contraction. As a result of this synergistic relationship, a decrease in abdominal muscle function associated with DRA could affect the performance of the pelvic floor musculature [2]. Abdominal exercises if taught in the postpartum period are postulated to help restore the anatomical width of the linea alba [5]. Exercises to strengthen core muscles include the crunch exercise, and the plank exercise. The plank exercise is a posture designed to use body weight to resist gravity; it can be performed on various surfaces, in variable positions, with devices, and impacts multiple joints [6]. Abdominal hollowing and bracing prior to performing abdominal curls facilitates activation of the transversus abdominis and internal oblique's throughout the abdominal curling activity [7]. DRA is measured by placing palpating fingers between the medial borders of the right and left rectus abdominis muscles, parallel to the linea alba. DRA size is determined by indicating the number of fingers that fit between the 2 muscle bellies at locations above, below, and at the umbilicus while the individual performs a partial curl-up. Clinically, this palpation technique is easy to perform but has not demonstrated adequate reliability and validity. A modification of this palpation technique using nylon dial or digital calipers to measure the IRD has been shown to be reliable in pregnant and postpartum women [4]. Despite DRA being a common and significant clinical problem there is still insufficient research about protocols concerning the influence of diastasis of the rectus abdominis [1]. The purpose of this study was to determine the added effects of a modified dynamic core stability plank exercise program on DRA closure and pelvic floor disability.

MATERIALS REQUIRED

Digital nylon caliper, Pen, Measuring tape, Pelvic floor disability index, Towel, Plinth.

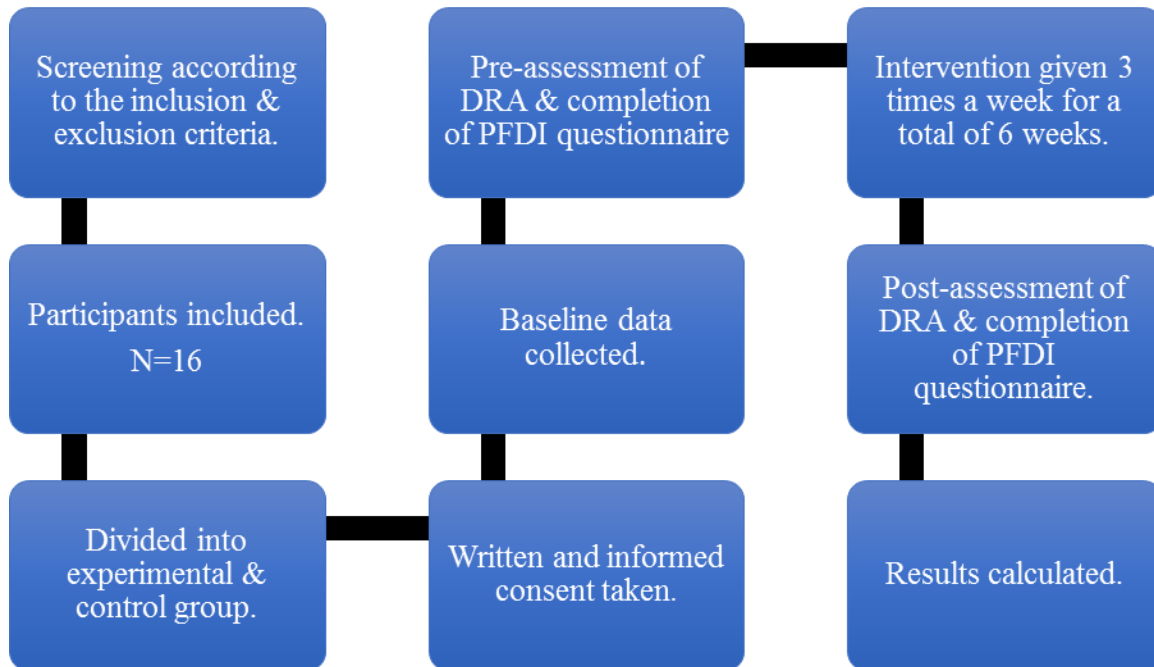
METHODOLOGY

The study conducted was an experimental study using purposive sampling. The study was carried out at Bhausaheb Sardesai Talegaon Rural Hospital on 16 subjects for a duration of 6 weeks. The subjects were selected according to the inclusion

and exclusion criteria. Inclusion criteria: 3 months and above post-partum [8], Age 18 years and above [8], Presence of diastasis recti greater than 25mm [3], Post-menopausal women [2]. Exclusion criteria: Subjects with any heart condition,

respiratory condition, pelvic surgery, neurological diseases, traumatic bowel or bladder, prior history of physical therapy for pelvic floor issues & depression [8].

PROCEDURE



ASSESSMENT OF DIASTASIS RECTI ABDOMINIS: [3]

Inter-recti distance is measured by caliper technique, the participant is in crook lying position with pillow beneath head and feet resting on plinth and arm alongside of body. The desired measurement locations are marked 4.5cm above the umbilicus midpoint and 4.5cm below the umbilicus midpoint. Each participant raises the head until the spine of the scapula is off the table surface. The participant is asked to maintain this position while

the examiner palpates the medial borders of the right & left rectus abdominis muscle bellies at marked locations. The inside measurement jaws of the digital nylon caliper, are positioned at the locations of the palpating fingers, perpendicular to direction of muscles and adjusted to perceived inert recti distance width. Three trials are taken for each assessment and then mean is recorded. Participants are allowed to rest between measurements and also permitted to rest if she feels fatigue.

EXERCISE PROTOCOL

EXPERIMENTAL GROUP	CONTROL GROUP	NO. OF SETS	NO. OF REPETITIONS	HOLD DURATION	PROGRESSION
Abdominal bracing using a towel	Abdominal bracing using a towel	3	10	10 sec	-
Abdominal crunches	Abdominal crunches	3	10	10 sec	1 st & 2 nd week-grade 3.

Posterior pelvic tilt exercise	Posterior pelvic tilt exercise	3	10	10 sec	3 rd & 4 th week-grade 4.
Kegel exercise	Kegel exercise	3	10	10 sec	5 th & 6 th week-grade 5.
Russian twist exercise	Russian twist exercise	3	10	-	-
Plank exercise	-	3	10	10 sec	1 st to 3 rd week-knee planks. 4 th to 6 th week-toe planks.

STATISTICAL ANALYSIS AND GRAPH

The primary research question was to determine if there was an added effect of modified dynamic plank exercise program on DRA closure and pelvic floor disability. There was an extremely significant

difference at the level of umbilicus and 4.5cm above the level of umbilicus seen post treatment, with the experimental group showing greater closure after treatment compared to the control group. The PFDI scores also showed significant improvement post treatment in both the groups.

Table 1: Level of umbilicus (paired t-test results).

Name of group	Pre-treatment		Post-treatment		t value	p value
	Mean	SD	Mean	SD		
Experimental group	40.789	6.847	30.389	7.358	33.499	<0.0001
Control group	40.129	6.225	31.789	6.701	15.041	<0.0001

Paired t-test was applied in the pre and post treatment DRA measurements at the level of umbilicus of the experimental and control group

with p value < 0.0001 which is considered extremely significant.

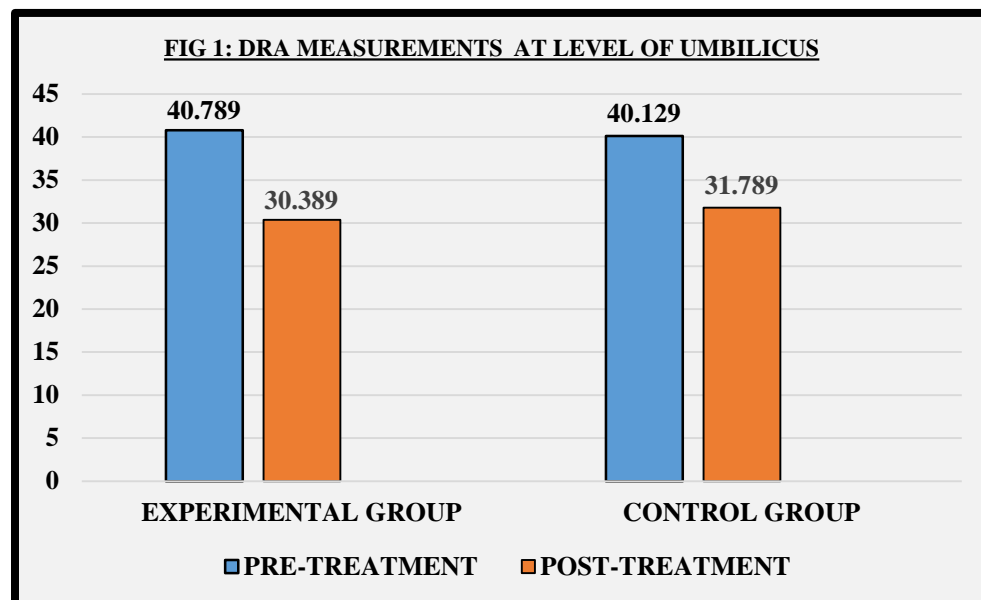
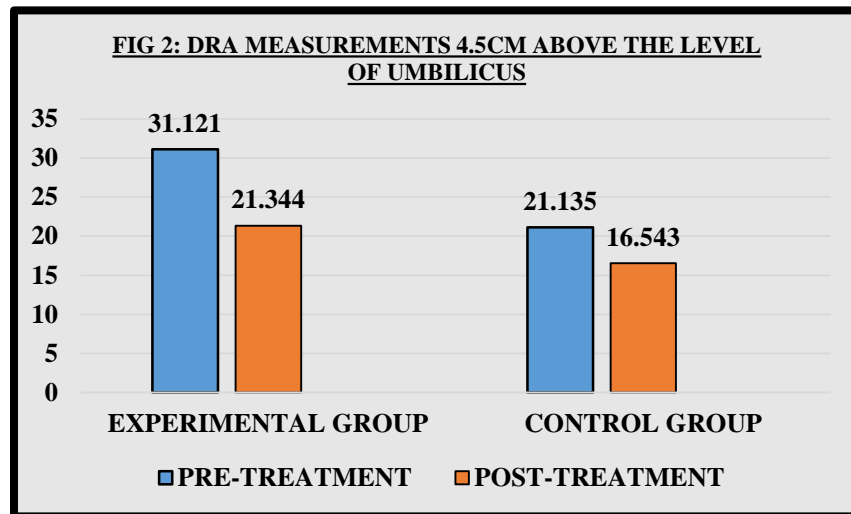


Table 2: 4.5cm above the level of umbilicus (paired t-test results).

Name of the group	Pre treatment		Post treatment		t value	p value
	Mean	SD	Mean	SD		
Experimental group	31.121	14.108	21.344	11.114	5.386	0.0005
Control group	21.135	18.402	16.543	14.578	3.277	0.0068

Paired t-test was applied in the pre and post treatment DRA measurements 4.5cm above the level of umbilicus with p value 0.0005 for

experimental group which is considered extremely significant and p value 0.0068 for control group which is considered very significant.

**Table 3: Level of umbilicus (unpaired t-test results).**

Parameter	Mean	SD	p value	t value
Experimental group	10.398	0.8779	0.0030	3.238
Control group	8.340	1.568		

Unpaired t test was applied for statistical analysis between the mean difference of experimental group and control group at the level of umbilicus, with p value 0.0030 which is

considered very significant. The mean difference of experimental group shows greater closure of inter recti distance compared to control group.

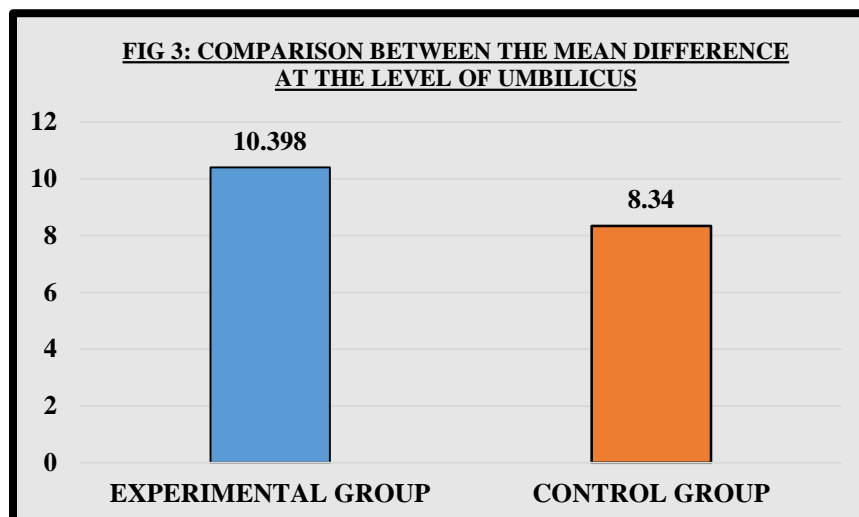
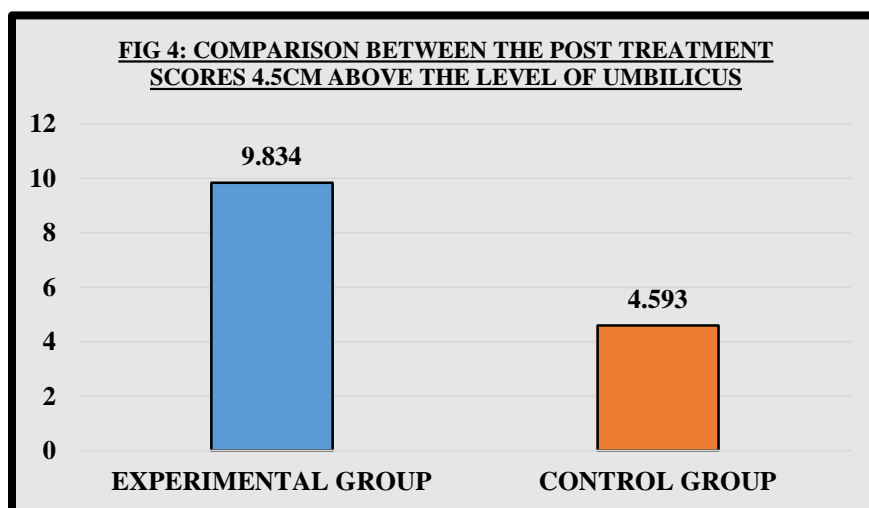


Table 4: 4.5cm above the level of umbilicus (unpaired t-test results).

Parameter	Mean	SD	p value	t value
Experimental group	9.834	5.140	0.0193	2.284
Control group	4.593	3.964		

Unpaired t test was applied for statistical analysis between the mean difference of experimental group and control group 4.5cm above the level of umbilicus, with p value 0.0193 which is

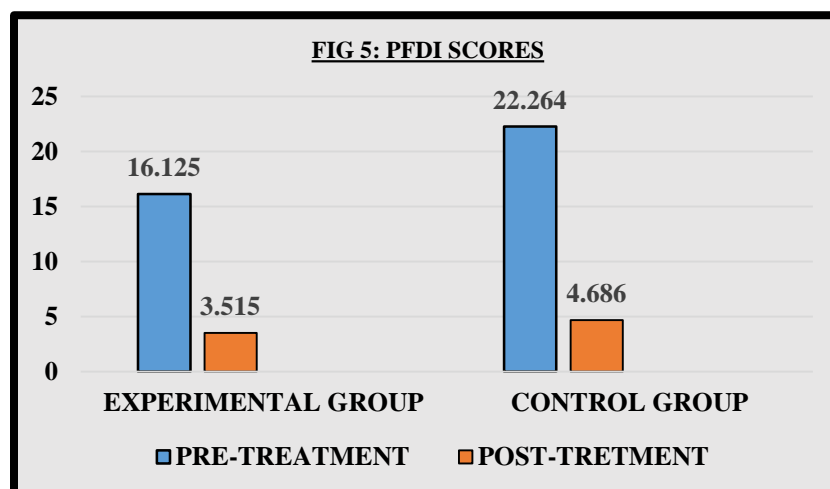
considered significant. The mean difference of experimental group shows greater closure of inter recti distance compared to control group.

**Table 5: PFDI scores (paired t-test results).**

Name of the group	Pre treatment		Post treatment		p value	t value
	Mean	SD	Mean	SD		
Experimental group	16.125	22.489	3.515	6.562	0.0439	1.983
Control group	22.264	33.017	4.686	8.749	0.438	1.984

Paired t test was applied in the pre and post treatment PFDI scores, with p value 0.0439 for experimental group which is considered significant

and p value 0.0438 for control group which is considered significant.



DISCUSSION

The purpose of this study was to determine the added effect of modified dynamic core stability plank exercise program on DRA closure and pelvic floor disability. This research study found that following the plank exercise program along with conventional treatment for six weeks resulted in a significant closure of DRA at the level of umbilicus and 4.5cm above the level of umbilicus. Digital nylon caliper technique was used for evaluation of diastasis recti. Study done by **Cynthia M. Chiarello** stated that digital nylon caliper is a valid tool for measuring inter-recti distance [4]. So it was used in this current study. **D.R.Benlamina et.al** in a systemic review stated that the transverse abdominis muscle is the deepest abdominal muscle, and has strong fascial links with the rectus abdominis muscle and the linea alba, therefore activation and exercise of the transverse abdominis muscle draws the bellies of the rectus abdominis together, improves the integrity of the linea alba and increases fascial tension, allowing efficient load transference and torque production. Activation of the transverse abdominis could be protective of the linea alba and may help to prevent or reduce inter-recti distance and speed up recovery [1]. Abdominal exercises results in facilitation, concentric activation and stabilization of abdominis [3]. As stated in a study by **Sanjivani Khandale and Deepali Hande** that the improvement of muscle strength following abdominal exercises could be explained via adoptive changes in the muscle caused by exercises as metabolic capabilities of the muscle are progressively overloaded. Muscle is a contractile tissue, therefore it will become stronger as a result of hypertrophy of muscle fibers and increased recruitment of its motor unit. Also it has a profound influence of metabolic demand associated with producing a give muscle force causing increase in muscular endurance and power [3]. Also another study done by **A.G Pascoal et.al**, stated that inter recti distance decreases during abdominal isometric contraction , suggesting that abdominal strengthening exercises contributes to narrowing of inter recti distance in postpartum women. Abdominal exercises when coordinated with breathing control, exhalation accompanying

contraction of the abdominal muscles makes it possible to reduce intra-abdominal pressure while exercising [3]. The experimental group showed greater reduction in the inter recti distance, the reason being as stated in a study by **Jin Lee et.al**, plank exercises intensify the activities of the muscle and cooperation pattern among the stabilizing muscles. Also the exercise provide changed sensory inputs to the muscles and activate the proprioceptors and neuroadaptive mechanism. Based on previous studies plank exercise strengthens the core muscles (mainly transverse abdominis), and the muscle activity is related to the posture of the exercise and position of the muscle [6]. A significant difference was found from pre-test to post-test measurement in PFDI scores. As stated in a prevalence study by **Theresa M. Spitznagle et.al**, the pelvic floor and abdominal muscles function synergistically such that each muscle group enhances the effectiveness of the other during contraction [2].

CONCLUSION

There was an extremely significant difference at the level of umbilicus and 4.5cm above the level of umbilicus seen post treatment, with the experimental group showing greater DRA closure after treatment compared to the control group. The PFDI scores also showed significant improvement post treatment in both the groups.

ACKNOWLEDGEMENT

The poverty of words has never been so profound than now, when I wish to express my feelings. I am extremely grateful to **Dr. Snehal Ghodey**, Principal MAEER's Physiotherapy College for her advice and help. I am extremely thankful to **Dr. Anuradha Sutar** under whose guidance I was able to successfully complete this study. Her constant encouragement helped me immensely. I express my gratitude to my parents and Miss. Ruhi Pereira for being a constant source of encouragement and moral support. Last but not the least I express my special thanks to all the subjects who participated in this study and gave their full co-operation for the study.

REFERENCES

- [1]. R.Benjamin, A.T.M. van de Water, C.L.Peiris. Effects of exercise on diastasis of the rectus abdominis muscle in the antenatal and postnatal periods: a systemic review. *Physiotherapy* 100, (2014) 1-8.
- [2]. Theresa M. Spitznagle, Fah Che Leong, Linda R. Van Dillen. Prevalence of diastasis recti abdominis in an urogynecological patient population. *International Urogynaecology Journal* 2006.
- [3]. Sanjivani Ramesh Khandale, Deepali Hande. Effects of abdominal exercises on reduction of diastasis recti in postnatal women. *UHSR International Journal of Health Sciences and Research*.
- [4]. Cynthia M. Chiarello, J. Adrienne Mcauley. Concurrent validity of calipers and ultrasound imaging to measure inter-recti distance. *Journal of orthopaedic and sports physical therapy* 2013.
- [5]. Merry Hsia and Sue Jones Natural resolution of rectus abdominis diastasis. Two single case studies. *Australian journal of physiotherapy* 46, 2000, 301-307.
- [6]. Jin Leea, Kwanghyun Jeongb, Hyuna Leeb, Jaeyeon Shinb, Jaelim Choib, Seungbeom Kangb, Byoung-Hee Leeb. Comparison of three different surface plank exercises on core muscle activity. *Physical therapy rehabilitation science* 5(1), 2016, 29-33.
- [7]. Venu Akuthota, Andrea Ferreiro, Tamara Moore, and Michael Fredericson. Core stability exercise principles. *Curr. Sports Med. Rep.*, 7(1), 2008, 39Y44.
- [8]. Lori Maria Walton, Adislen Costa, Donna LaVanture, Sarah McIlrath and Brittney Stebbins. The effects of a 6 week dynamic core stability plank exercise program compared to a traditional supine core stability strengthening program on diastasis recti abdominis closure, pain, oswestry disability index (ODI) and pelvic floor disability index scores (PFDI). *Physical therapy and rehabilitation* ISSN 2055-2386, 3(3).
- [9]. Pascoal A. G, Dionisio S, Cordeiro F, Mota P. Inter recti distance in postpartum women can be reduced by isometric contraction of abdominal muscle; A preliminary case control study. Published by Elsevier. *Physiotherapy*: 100, 2014, 344-348.
- [10]. Biossonnault S J and Blaschak J M. Incidence of diastasis recti abdominis during the childbearing year. *Journal of American physical therapy association*. 68, 1988, 1082-1086.
- [11]. Kisner C, Lynn Allen Colby. *Therapeutic exercises, women's health: obstetrics and pelvic floor*. 5, 2007, 797-824.
- [12]. Sapsford R, Bullock-Saxton J, Markwell S. *Women's health: a text book for physiotherapists*. 1st edition. London: WB Saunders Company Ltd; 1998.
- [13]. Jessica Keller, Melissa Albrecht, Lauren Eberhardt, Laura Horn, Chantal Donnelly, Deborah Lowe. Diastasis Recti Abdominis: A survey of women's health specialists for current physical therapy clinical practice for postpartum women. *Journal of women's health physical therapy* 36(3), 2012, 131-142.
- [14]. A.T.M van De Water, D.R. Benjamin. Systemic review: Measurement methods to assess diastasis of the rectus abdominis muscle (DRAM): A Systemic review of their measurement properties and meta-analytic reliability generalization. *Elsevier manual therapy* 21, 2016, 41-53.
- [15]. Diane Lee BSR, FCAMT, CGIMS Physiotherapist. Diastasis Rectus Abdominis & Postpartum Health Consideration for Exercise Training. *Journal of Bodywork and Movement Therapies* 12, 333-348.

How to cite this article: Cherry Pereira, Dr. Anuradha Sutar (PT), Dr. Snehal Ghodey (PT). To study the added effect of modified dynamic core stability plank exercise program on diastasis recti abdominis closure and pelvic floor disability a pilot study. *Int J of Allied Med Sci and Clin Res* 2018; 6(2): 313-320.

Source of Support: Nil. **Conflict of Interest:** None declared.