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EFFECTIVENESS OF RUSSIAN CURRENT VERSUS ELECTRICAL STIMULATION ALONG WITH ABDOMINAL EXERCISES IN LATER POSTPARTUM DIASTASIS RECTI

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ABSTRACT:

Background: Diastasis of rectus abdominis is a conventional term used to define the split between the two-rectus abdominis muscle. Any pathology in this muscle may lead to lower back pain, poor posture, shallow breathing, weakness of pelvic floor and core muscles, difficulty in heavy weight lifting & uterine prolapse. Literature suggests that, Careful exercises and re-education of abdominal musculature will helpful to restore and improve strength & function.

Aim of the study: the aim of the study is to find out the effectiveness of russian current versus electrical stimulation along with abdominal exercises for decreasing inter recti distance and improving strength by using digital nylon caliper and MMT in later postpartum diastasis recti.

Objectives : To find out the effectiveness of russian current versus electrical stimulation along with abdominal exercises on inter recti distance in postpartum diastasis recti To find out the effectiveness of russian current versus electrical stimulation along with abdominal exercises on abdominal strength in later postpartum diastasis recti.

Methodology: A total sample of 30 postpartum women was enrolled during the study period. Of which 15 women were allocated in the russian current group (Group A) and 15 women were allocated in the electrical stimulation group (Group B)

Outcome measures: Digital Nylon Calipers were used for assessing inter recti distance. MMT were used for Abdominal strength.

Results: The present study results showed statistically significant in both russian current and electrical stimulation along with the abdominal exercise in and for reducing later postpartum diastasis recti. According to the statistical analysis there was more significant reduction of IRD and more significant increase in the abdominal muscle strength (MMT) in Russian current group when compared to electrical stimulation group.

Conclusion: As per the results both the russian current and electrical stimulation along with abdominal exercises improves in reduction of IRD and increase the abdominal strength in later postpartum diastasis recti. The Russian current is very effective than the electrical stimulation along with exercise in postpartum diastasis recti.

KEYWORDS:

DIASTASIS RECTI, LATER POSTPARTUM, RUSSIAN CURRENT, ELECTRICAL STIMULATION, ABDOMINAL EXERCISES.

INTRODUCTION

The postpartum period is defined as the time immediately following birth and is often without a definitive end point. However, many of the physiological and morphological changes of pregnancy persist for four to six weeks postpartum[1]. The time periods can be divided into hospital-based (during hospital stay), immediate postpartum (hospital discharge to six weeks postpartum), and later postpartum (six weeks to one year, corresponding to cessation of breastfeeding)[2,3].

Due to the expansion of the abdominal wall that occurs during pregnancy to accommodate the growing fetus, one of the most prominent physiological changes that persists in the postpartum period is a separation (or diastasis) of the rectus abdominis muscle. Diastasis recti abdominis (DRA) refers to the separation of the rectus abdominis muscle and is quantified by the inter-recti distance [4].

DRA exists in 90% of non-exercising women in the early postpartum period and is associated with negative outcomes related to core function, urinary incontinence, pelvic girdle/low back pain, and body dissatisfaction[5,6] Though DRA heals on its own in some women, research suggests that approximately 60% of women have unresolved DRA that persists after the early postpartum period (~six weeks),thereby affecting quality of life well beyond childbirth [7]. Moreover, as many as 39% of women are still affected by DRA at 6 months postpartum[8]. In the

female population, DRA is common with pregnant and postpartum women. The female pattern of DRA is centred at the level of the umbilicus, but it can extend to and encompass the supraumbilical or infraumbilical region. It can persist in approximately 24–70%, even 100% of cases, during the postpartum period at different sites along the LA [9,10,11,12]. Two out of three women experience diastasis following maternity.3 Significant diastasis is observed in 62.5% of postnatal women within 92 hours of delivery, 50 to 60% after 6 weeks, and 39 to 45% after 6 months[13]. Diastasis is classified into three quantitative categories by Ranney: Mild—diastasis with an observed separation of more than 1 and less than 3 cm between the medial fibers of rectus abdominis; moderate—diastasis measuring 3 to 5 cm separation; and severe—diastasis measuring 5 or more centimetres separation[14]. The symptoms of diastasis recti during physical activity include discomfort, pain,corset instability, and bulging of the abdominal wall[15]. Causal factors for DRA are likely hormonally mediated or result from the mechanical effects of pregnancy on the abdominal musculature. The role of a woman's abdominal musculature is crucial during pregnancy and the postpartum period as it's tasked with trunk control and function. If proper interventions and biomechanical adjustments are not implemented the abdominal musculature are compromised due to DRA, mechanical control of the abdomen and its functions may be inhibited. These include posture, trunk stability, respiration, parturition, elimination, trunk flexion, trunk rotation, trunk side bending, and support of the abdominal viscera[5].

Therapeutic exercises also activate both slow twitch (ST) and fast twitch (FT) fibres of the skeletal muscles, with increased fibre as the high content of FT fibres improves muscle strength[16]. Though studies have proven the positive impact of exercises on DRA, the evidence is scarce. The exercise methods concentrate on recruiting the rectus abdominis (RA) and/or transverse abdominis (TrA) muscles. Until now, there have been no general protocols followed for therapeutic exercises

Russian current is a medium frequency electrotherapy modality, modulated sinusoidal alternating current with 25,000Hz delivered in a series of the bust (50% DUTY CYCLE).it has been reported that the most commonly used electro physical agent to increase muscle strength[17,18]. Electrical stimulation is the application of long duration interrupted direct current i.e. faradic current to a motor nerve to produce contraction of the muscle which it supplies. Recent studies on the effects of electrical stimulation for muscle re-education and strengthening along with exercises of abdominal muscles with results stating that electrical stimulation and exercises when given in combination helps improving muscle strength faster. Electrical muscle stimulation (EMS), also known as neuromuscular electrical stimulation (NMES), is the application of an electric current to elicit a muscle contraction. The principle of electro stimulation mimics the process observed during voluntary muscle contraction. The stimulator sends an electrical impulse to the nerve fibers to excite them which results in muscular contraction. EMS application has grown significantly in recent years and has been widely used for muscle rehabilitation, training and re-education. EMS was found to be effective for muscle strengthening Application of repetitive electrical stimulation increases muscle contraction along with the recruitment of the non-contractile tissue thus increasing the strength of the muscle[19,20,21]. Physiotherapy is considered to be a first-line treatment for DRA. Diastasis can be corrected conservatively and surgically. Conservative treatment includes functional daily activity, back care or lifting, bracing, Tupler technique, stimulation[22],and exercises[23]. Postnatal supporting belt and belly binding have been used for supporting abdomen. visceral manipulation, kinesiotaping, Bloom method.

NEED OF THE STUDY

With the high prevalence rate of DRAM and its complications along with Lack of literature evidence on the effect of Russian current versus electrical stimulation along with abdominal exercises in managing diastasis leads us to do this study.

AIM OF THE STUDY:

The aim of the study was to find out the effectiveness of Russian current versus electrical stimulation along with abdominal exercises to reduce IRD and improve abdominal strength in later postpartum diastasis recti.

OBJECTIVES:

To find out the effectiveness of Russian Current along with abdominal exercises on inter recti distance in postpartum diastasis recti using digital nylon callipers.

To find out the effectiveness of Russian Current along with abdominal exercises on abdominal strength in postpartum diastasis recti using MMT.

To find out the effectiveness of Electrical Stimulation along with abdominal exercises on inter recti distance in later postpartum diastasis recti using digital nylon callipers.

To find out the effectiveness of Electrical Stimulation along with abdominal exercises on abdominal strength in later postpartum diastasis recti using MMT.

MATERIALS AND METHODOLOGY:

MATERIALS USED: Digital nylon callipers

Paper &pen

Couch

Pillow

Russian current

Electrical stimulation

Stop watch

METHODOLOGY:

STUDY SETUP: the study was performed in the department of physiotherapy in GH and in Apollo college of physiotherapy, chittoor, AP.

STUDY DESIGN: Experimental design

SAMPLING METHOD: Purposive sampling

STUDY DURATION: 6 Weeks

SAMPLE SIZE: 30 Subjects

INCLUSION CRITERIA:

patient's age, which had to be between 22 and 35, BMI under or equal to 29kg/m2

After six weeks postpartum multi para women with the presence of diastasis rectus abdominis.

EXCLUSION CRITERIA

Subjects suffering from any heart or respiratory condition, including excessive coughing or Sneezing, Any pelvic or abdominal surgery, Caesarean section, Trauma , Not willing subjects.

By signing informed consent forms, all the participants agreed to take part in the study. They were instructed not to do any other exercise programs throughout the duration of the study. The subjects who fulfilled inclusion criteria underwent pre intervention assessment of digital nylon calipers and MMT.

OUTCOME MEASURES

Digital nylon calliper**-** To measure inter recti distance MMT- To measure abdominal strength

DIGITAL NYLON CALIPERS: which is reliable, and valid, was used to assess the amount of intra-recti separation before and after the 6week treatment for the women in both groups since it can measure distances between two recti up to 150 mm in increments of 0.1 mm. Each woman assumed a crock lying position and then the medial edge of the two recti muscle borders was palpated and the arms of the calliper were positioned perpendicular to the recti border, 4.5 cm above umbilicus; then the woman would raise her head and shoulders out of the plinth, and the distance between the two recti was measured to the nearest millimetre. A soluble marker was used for that point to ensure standardization for repeated measures. Each assessment took the mean of the three trials. The mean IRD at 3 cm above the umbilicus in the general population is 22 mm.

MMT FOR ABDOMINAL MUSCLES: Position: Subject was in supine position ask subject to lift her head, shoulders, and arms off the table and subject was asked to hold position for 10-15 seconds. Grading: Grade 5 (Normal): subject completes range of motion until inferior angle of scapula clear the mat with hands clasped behind head. Grade 4 (Good): subject completes range of motion and raises the trunk until scapula clear the mat resistance of arm will be reduced in the cross-chest position. Grade 3 (fair): subject completes range of motion and flexes trunk until inferior angles of scapula off the mat. Grade2 (poor): subject will able to raise head only. Grade1 (Trace): subject will need assistance to lean forward.

INTERVENTION:

After the pre intervention assessment all the subjects underwent physiotherapy treatment. **Subjects:** A total of 30 subjects having later postpartum diastasis recti were recruited randomly. Group 1 (Russian current group) –15subjects, Group 2 (electrical stimulation group) – 15 subjects. All participants underwent an initial baseline assessment of all the dependent variables

RUSSIAN CURRENT INTERVENTION PROTOCOL: Before starting the treatment session, each woman was asked to evacuate her bladder for comfort and relaxation. The abdominal area was cleaned with alcohol to remove any debris on the skin and to decrease its resistance to the electrical current. Russian current stimulation is given in relaxed supine lying position, and a duty cycle of 20:40 (stress-to-relax) was given for 30 minutes, 5 days/week for 6 weeks, by using four electrodes; 2 cm paramedian, two electrodes above the umbilicus, and other two electrodes below it; the intensity increased gradually according to the client's tolerance. Russian current intervention protocol For improving Abdominal strength training protocol with Russian current: (10/50/10), 10 = Muscle contractions, lasting for 10 seconds,50= off time (no contraction) for 50 seconds, 10= cycle repeated for 10 times, Amplitude/intensity: 70mA strong but comfortable muscle contraction, Pulse rate (burst frequency):50-70 Hz, Pulse duration: 150-200us,Treatment time-15 minutes, Frequency of treatment: once daily, for 6 weeks, Electrode placement: Arranged parallel to the direction of muscle fibres.

ELECTRICAL CURRENT INTERVENTION PROTOCOL: Neuro-Muscular Electrical Stimulation (NMES): Electrical stimulation was applied followed by core stabilization exercises. Before application of electrical stimulation to reduce skin resistance, the area was cleansed with alcohol and cotton wool, and 1. The two large rectangular electrodes used for the electrical stimulation were applied on the treatment area over water based ultrasonic gel, bilaterally to the rectus abdominis. The electrodes were fixed in their position with belt. The active electrodes were located at 3 cm from each other.. Intensity was increased gradually until a visible muscle contraction was observed, without affecting subject's comfort. The intensity of the current increases to the point that the maximum tolerable contraction. The subjects were instructed to relax their abdominal muscles during EMS application. Treatment duration was 30 min according to subject's condition, comfort and tolerance. A frequency of 80 pulses/min and with a pulse width of 0.1-0.5ms, were the parameter settings applied in this study. The total time for the application of stimulation was 30mins and until a good enough observable muscle contraction was achieved a gradual increase in intensity was performed1,23

BOTH THE GROUPS RECEIVED ABDOMINAL EXERCISES INCLUDES:

SIT-UP: The exercise is performed by the subject lying with arms straight, knees bent and feet in a flat position. The abdominal muscles are then engaged, while as light lift of the head, neck and shoulders is performed. The position

is held for 10 s and then are turn to the starting position.

CURL-UP: The exercise is performed by the subject lying with arms straight, knees bent and feet in a flat position. The abdominal muscles are then engaged, while a major lift of the head, neck and shoulders is performed. The position is held for 10 s and then a return to the starting position.

TA SIT-UP: The transverse abdominis muscle contraction is done along with sit-up.

TA CURL-UP: Transverse abdominis muscle contraction is done along with curl-up.

TAPFM CURL-UP: The transverse abdominis muscle and pelvic floor muscle contraction is done along with curl-up.

TA SLR: The transverse abdominis muscle contraction is done along with straight leg raise. In the straight leg raise, the subject lies flat initially. One leg is raised above and the position held for 10 s and then relax back to the starting position.

REVERSE CURL-UP: In a reverse curl up, the subject initially lies flat. Then both legs are curled up together with knees towards chest. Hold the position for 10 s and then relax back to the starting position.

All the women in this groups were asked to perform three sets of 20 repetitions for each exercise, holding a contraction for 5 seconds, followed by 10 seconds of relaxation, for each repetition. , 3 times a week, for a total duration of 6 weeks

STATISTIC ANALYSIS AND RESULTS:

STASISTICAL ANALYSIS:

Stastical analysis was performed using MS Excel 2007 and GRAPH PAD software version 20.0. descriptive statistical data has presented in the form of mean standard deviation and mean difference percentage were calculated and presented.

Between the group: unpaired t test was performed to assess the statistical significant difference in mean values between the groups for IRD and MMT for pre and post test values.

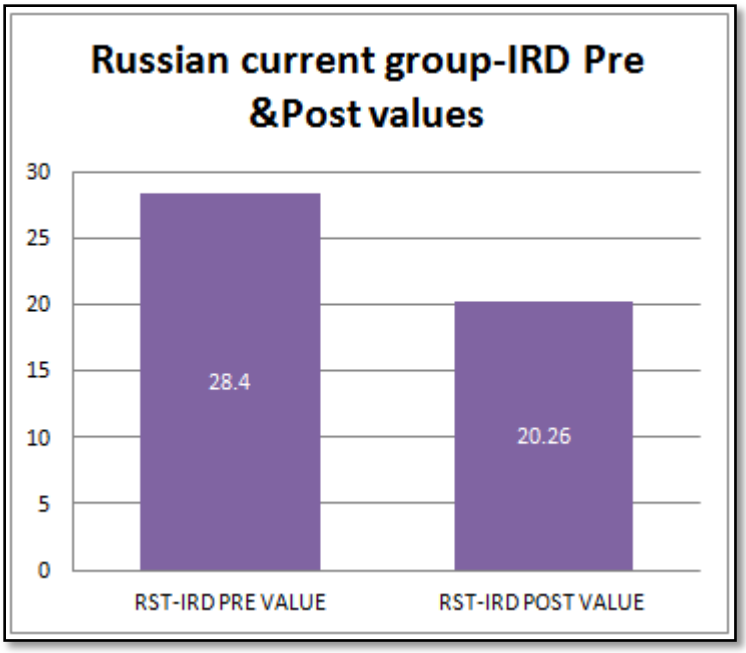
Within the groups: paired t test was performed to assess the statistical difference in mean values between the groups of IRD and MMT for pre and post test values.

The statistical significance was set at $p<0.05$ with 95% confidence interval.

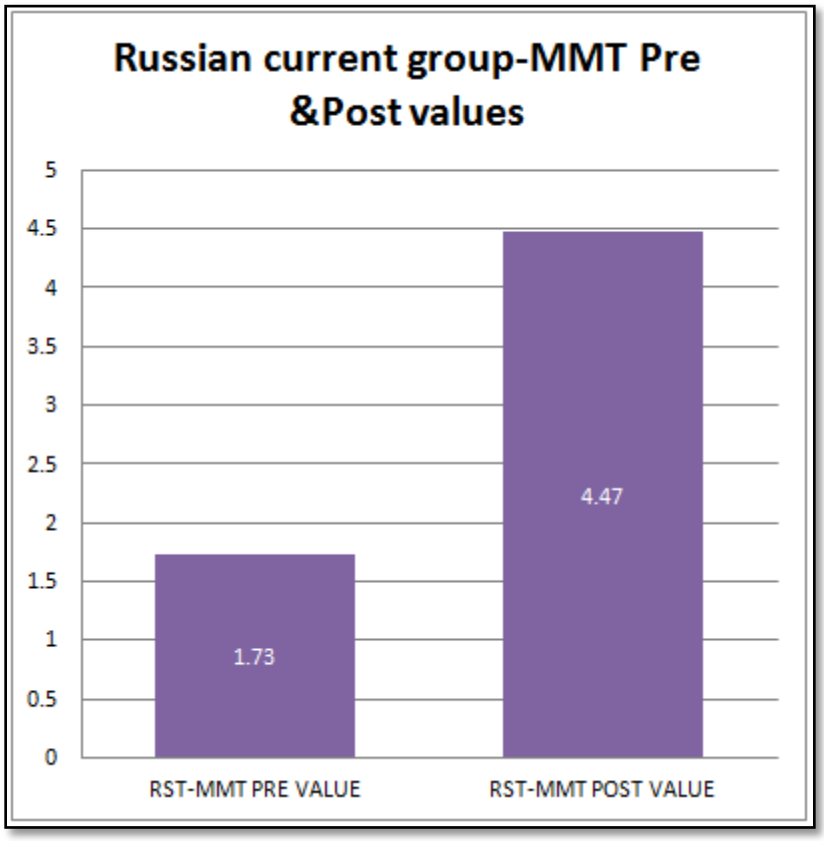
RUSSIAN CURRENT GROUP

INTER RECTI DISTANCE

GRAPH -1

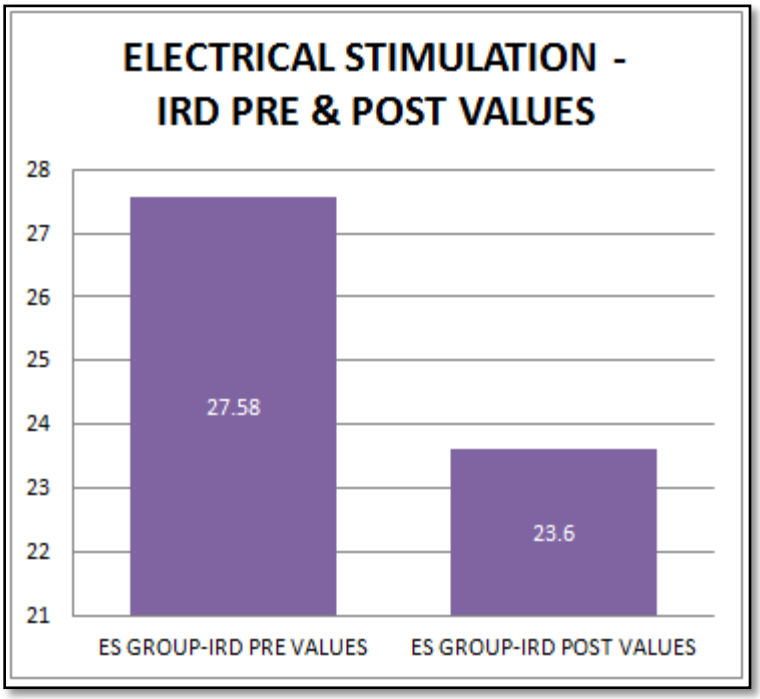


GRAPH -2



GRAPH- 3

ELECTRICAL STIMULATION



GRAPH- 4

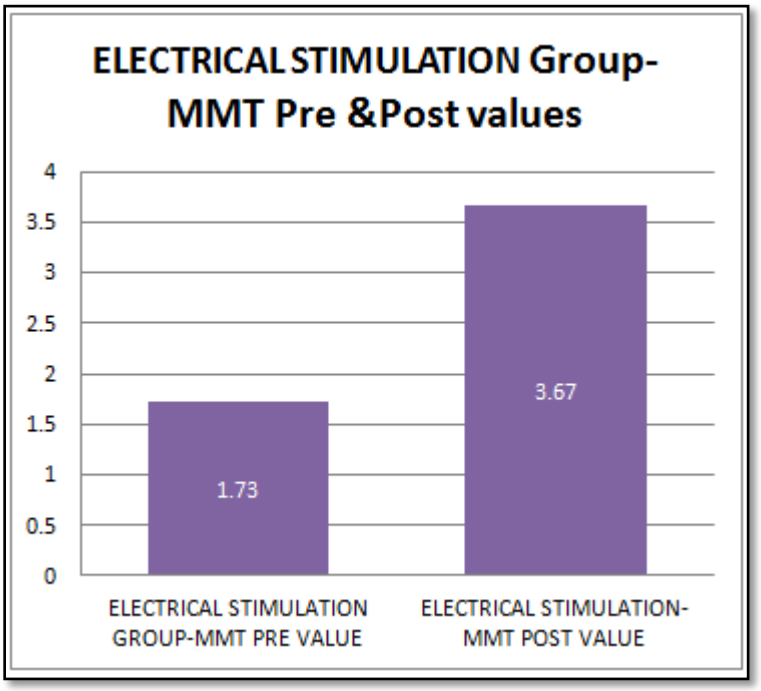


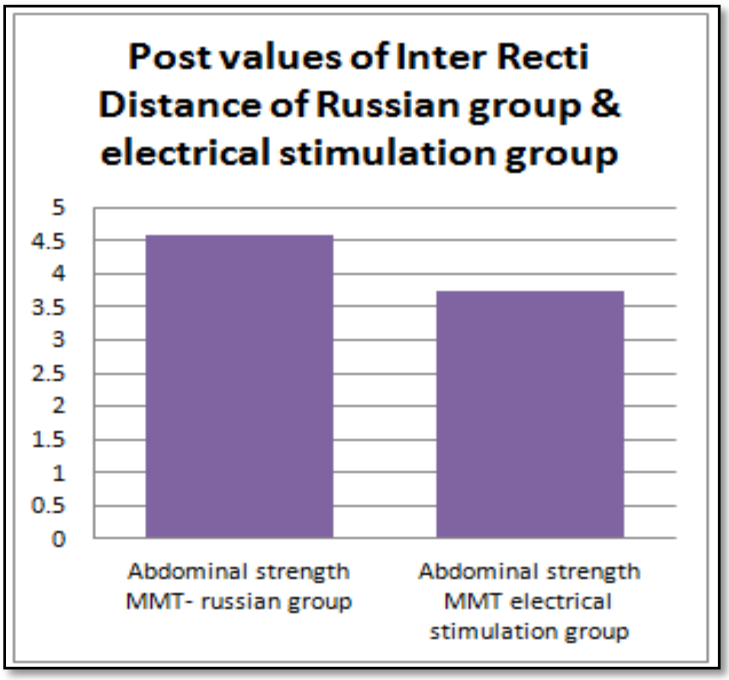
TABLE 1

GROUP	OUTCOME MEASURE		MEAN	STANDARD DEVIATION	t – VALUE	p- VALUE
RUSSIAN CURRENT GROUP	IRD	Pre value	28.42	1.001	17.578	0.0001
		Post value	20.26	1.285		
	Abdominal strength-MMT	Pre value	1.73	0.80	11.014	0.0001
		Post value	4.47	0.52		
ELECTRICAL STIMULATION GROUP	IRD	Pre value	27.58	1.125	13.630	0.0001
		Post value	23.6	0.598		
	Abdominal strength-MMT	Pre value	1.73	0.59	8.473	0.0001
		Post value	3.67	0.62		

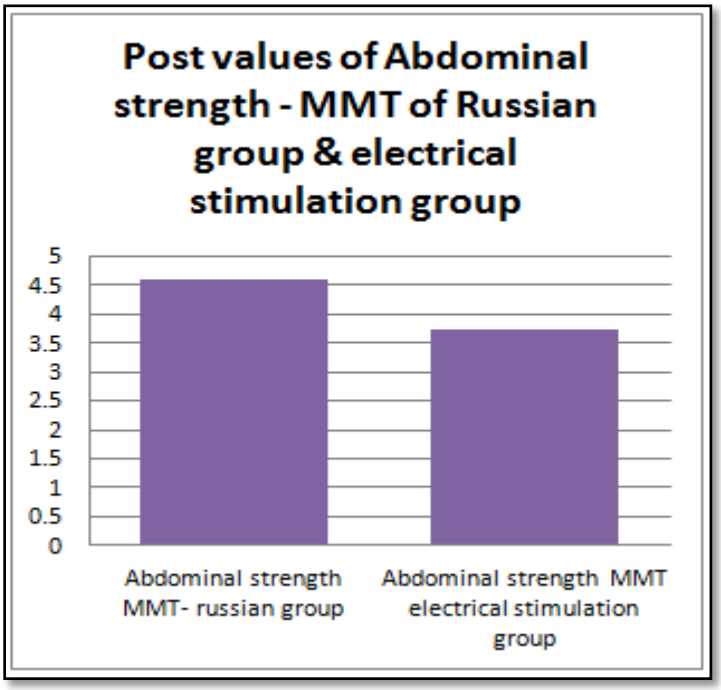
TABLE 2

OUTCOME MEASURE	GROUP		MEAN	STANDARD DEVIATION	t – VALUE	p- VALUE
INTER RECTI DISTANCE	Russian current group	Post value	20.267	1.28	9.11	0.0001
	Electrical stimulation group	Post value	23.600	0.59		
ABDOMINAL STRENGTH-MMT	Russian current group	Post value	4.60	0.51	4.29	0.0002
	Electrical stimulation group	Post value	3.73	0.59		

GRAPH 5



GRAPH 6



RESULTS:

In Russian current group the pre mean value of IRD 28.4mm and post mean value of IRD was 20.6mm and the pre mean value of abdominal strength 1.73 and post mean value of MMT was 4.47.the statistical values shows that there was significant difference between the pre and post mean values of IRD and MMT. In electrical stimulation group the pre mean value of IRD 27.58mm and post mean value of IRD was 23.6mm and the pre mean value of abdominal strength 1.73 and post mean value of MMT was 3.67.the statistical values shows that there was significant difference between the pre and post mean values of IRD and MMT

DISCUSSION

The aim of the present study is to find out the effectiveness of Russian current versus electrical stimulation along with abdominal exercises in later postpartum diastasis recti.

Group-A with 15 postpartum diastasis recti individuals underwent treatment of russian current along with abdominal exercises and Group-B with 15 individuals

underwent treatment of electrical stimulation along with abdominal exercises for 6 weeks.

PRE AND POST INTERVENTION MEAN VALUES OF IRD AND MMT OF GROUP A

In the present study it has been reported that postpartum diastasis recti of group A with Russian current along with abdominal exercises showed mean value of IRD from 28.4mm to to20.6mm and mean value of MMT from 1.73to 4.47,the values are significant. the study suggested that the aim of Russian current was to help patients adapt and make desirable changes in the present rather than to deal with issues in the distant past. The goal for long-lasting successful outcomes is for the patient to develop an internal locus of control. Russian current can reduce IRD and improve abdominal strength**.**

The significant increase in the abdominal muscles strength and endurance in the Russian stimulation group than the control group could be explained by the ability of neuromuscular electrical stimulation to recruit deep muscle fibers, as the stimulated nerve fibers are distributed throughout the muscle[24]. This explanation supported by Hartsell and Karmer[25] who confirmed that electrical nerve stimulation activates an extra flow of motor signals travelling from central nervous system to the muscles to cause them to contract. In addition, muscle contractions evoked by electrical stimulation firing a greater proportion of type II (fast) muscle fibers which produces very large increases in muscle force. While during voluntary exercise, it is the slow twitch muscle fibers which are recruited first producing a much lower peak force[26,27,28].

PRE AND POST INTERVENTION MEAN VALUES OF IRD AND MMT OF GROUP B

In the present study it has been reported that postpartum diastasis recti of group A with Russian current along with abdominal exercises showed mean value of IRD from 27.58mm to 23.6 mm and mean value of MMT from 1.73 to3.67,the values are significant. The study suggested that the aim of Russian current was to help patients adapt and make desirable changes in the present rather than to deal with issues in the distant past. The goal for long-lasting successful outcomes is for the patient to develop an internal locus of control. Russian current can reduce IRD and improve abdominal strength**.**

Alon et al studied the effect of EMS on abdominal muscles and found it was well tolerated and strengthened the muscles. They noted the combined use of electrical stimulation and exercise to be the most effective mode for isometric strength of the abdominal muscles [29].

Two recently published studies investigated the effect of electrical stimulation in combination with abdominal exercises on the recovery of abdominal muscle strength and reduction of DRAM in postpartum women[30,31]; both studies noted electrical stimulation in conjugation with exercises produced better outcomes than conventional exercises alone. Postnatal exercises are beneficial for the mother as well as the baby as it improves aerobic fitness and the overall cardiac health, helps in weight reduction and also promotes milk production thus, improving the breastfeeding process. Along with those strengthening of the core musculature during the gestational period as well as in the postnatal period is very beneficial in the reduction of diastasis recti and the further secondary problems associated with it. Studies reveal that strengthening exercises are effective in decreasing postural instability and also minimizing the low back pain at some level, increasing the tone of muscles and thus beneficial in the improvement and treatment of DRAM[32,33,34,35.]

LIMITATIONS AND RECOMMENDATIONS

LIMITATIONS:

This study did not include long term follow up.

This study sample size was relatively small to detect the difference between Russian and electrical stimulation groups.

RECOMMENDATIONS:

Follow up programs can be included to assess the short and long term effects of treatment.

Further study can be done to check the effects of these techniques on other conditions.

Effects of these trainings on other stages can be studied

Further study should include more measurement tools

CONCLUSION:

In this study Russian current along with abdominal exercise was very effective and beneficial in improving the abdominal muscle strength by motor nerve depolarization induce activation of fast type 2 motor unit ,high level electrical evoked muscle contraction, contraction against external load(isometric contraction) and reduction of inter recti distance and more statistically significant in pre and post values of IRD and abdominal strength in Diastasis recti subjects. The electrical stimulation along with abdominal exercise was effective and beneficial in improving the abdominal muscle strength and reduction of inter recti distance and statistically significant in pre and post values of IRD and abdominal strength in Diastasis recti subjects. The pre and post values of IRD and MMT in Russian current group is more statistically significant than the pre and post values of IRD and MMT in Electrical stimulation group

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