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Effect of abdominal supporting belt on post-partum abdominal strength following vaginal delivery

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Abstract
Background: This study was conducted to determine the effect of abdominal exercises on abdominal efficiency among Postpartum Women.
Objective: To find the effectiveness of Abdominal support belt among the postpartum women following vaginal delivery.
Procedure: 14 patients on the second day of delivery were approached and after consent were conveniently divided in to two groups. Group A subjects were treated with Abdominal support belt and Abdominal strengthening exercises while Group B subjects were treated with Abdominal strengthening exercises alone. The outcome measures were Manual Muscle Testing, Waist and Hip Circumference and Measurement of Diastasis Recti.
Results: The Results of the 14 subjects were analysed in the SPSS software and found with $p>0.05$ which shows that there is no significant difference in manual muscle testing, waist circumference hip circumference, and diastasis recti between Group A subjects treated with Abdominal belt and Abdominal exercises and Group B subjects treated with Abdominal exercises alone among Postnatal women for a period of four weeks.
Conclusion: There was no significant effect of abdominal belt over abdominal efficiency among postpartum women.

Keywords: abdominal support belt, abdominal strengthening exercises, postpartum

Introduction

Normal pregnancy produces a lot of changes in maternal anatomy and physiology. Major alterations in cardiovascular system, musculoskeletal system are involved to support foetal growth and development. Metabolic adaptations of pregnancy tend to promote weight gain, increased fat deposition in trunk, thighs and substantial proportion of maternal fat is deposited [1, 5].

During pregnancy hormonal changes caused by relaxin, progesterone and oestrogen combined with uterine growth may cause stretching of the abdominal muscles, affecting mainly the rectus abdominis muscles. The rectus abdominal muscles, which extend along the entire length of the anterior abdomen from the xiphoid process to the symphysis, undergo changes during pregnancy [6]. As the foetus grows, linea Alba, elongates and curve round as the abdominal wall expands, with most separation occurring at the level of umbilicus. Abdominal muscles stretches more than 50% of original length. The length tension relationship is altered and this happens commonly in second and third trimester. (after 14 weeks)of pregnancy.

Also during pregnancy, it is common to have anterior pelvic tilt with or without lumbar hyperlordosis. These postural changes can affect the insertion angle of pelvic and abdominal muscles, influencing postural biomechanics. They can also generate a deficit in the support of the pelvic abdominal organs. Furthermore, as the pregnancy progresses and the abdominal muscles lengthens, there is a loss in the force vector of these muscles, and there may be a decrease in contraction strength. Thus, the biomechanical changes and stretching of these muscles felicitate the appearance of diastasis of the rectus abdominis muscles [6].

Postpartum is the period in which the body begins its period of recovery and its return to Pre pregnant state. The pregnancy results in a gradual change of body shape and function. At term the women have an enlarged abdomen, enlarged breasts, possibly oedema on the face, hands and legs, deposits of fat on upper arms, hips buttocks and thighs.

The puerperium is the period of 6-8 weeks following delivery in which the woman's body returns to a non-pregnant state. Once the placenta separates from the uterus, placental hormone production ceases causing a dramatic decline in maternal blood levels of oestrogen's and progesterone and consequently in the physiological effects of these on maternal respiration, cardiovascular system, digestion and metabolism.

Certain changes that occurs during Puerperium are the pregnant term uterus (not including baby, placenta, fluids, etc.) weighing approximately 1000 g recedes to a weight of 50-100 g in 6 weeks post-delivery. The cervix also begins to rapidly revert to a non-pregnant state. The resumption of normal function by the ovaries is highly variable and is greatly influenced by breastfeeding the infant.

The abdominal wall remains soft and poorly toned for many weeks. The abdominal muscles usually take some time to regain their tone and strength. As after delivery, although the uterus immediately begins to involute to its pre-pregnancy size but the abdominal muscles remain in their over lengthened state. This often makes the abdominals feel 'soft

and flabby' from muscle weakness, making it look 'enlarged' with the pressure of the intestines and abdominal organs distending the flexible muscles.

In 66 % of women, the vertical abdominal muscles have separated and take at least six weeks to heal [5]. The diastasis of the rectus abdominis muscle or Diastasis Recti is defined as the abnormal separation of the right and left rectus abdominis, appearing as an increase in the width of the linea alba, or inter recti distance. The occurrence of diastasis of the rectus abdominis muscles is more common in pregnancy and immediate puerperium, having many predisposing factors like obesity, multi parity, foetal macrosomia, flaccid abdominal muscles, polyhydramnios and multiple pregnancies [7].

Diastasis recti tends to reduce the contribution of the abdominal muscles in trunk movements as a result trunk stability is altered and pelvic alignment is also altered which leads to excessive lordosis and waddling gait. It may also lead to umbilical hernia.

Some authors consider Diastasis Recti as any separation between the rectus abdominis, others consider only a distance greater than 1 cm, 2 finger breadths or 3 cm. It may vary from 2 to 3cm wide and 2 to 5 cm long to 20 cm wide and extending along the entire length of both rectus muscle. In severe degree the bulging of the abdominal wall will be very noticeable.

The simplest way to evaluate Diastasis Recti is to measure the number of finger breadths between the medial edges of the muscles, but the use of specific equipment such as calliper's has been recommend for a more reliable outcome

In India, as a part of ancient culture they use to tie the cloth around the abdomen, this has been in practice for a long period of time especially in south India Post Vaginal delivery. They would tie a lengthy cotton cloth around the abdomen like a band covering from below xiphisternum down up to anterior superior iliac spine immediately post-delivery. The belief behind this concept is the abdomen will be pushed in by the pressure of the cloth and help in returning to Prep regnant abdominal size.

Later Abdominal belts were introduced and is being used for many centuries in abroad and use of abdominal belt post-delivery also has gained its popularity in India for past few decades. The use of abdominal belt post delivery gained its importance as it was thought to make the abdomen reduce and also it allow to fit in prepregnancy clothes[4]. Regular use of a postpartum support belt may relieve back pain and strain on muscles and ligaments by transferring the weight of the abdomen to the spine where it can be carried naturally and also assist in maintaining proper posture during breastfeeding.

In other countries lot of different types of abdominal girdles are available, In India only few types are available in market. No studies has so far proven the effect of one over other. Nowadays even certain hospitals recommends the use of belt in postpartum period.

The myth is that it helps in providing a support and reduce the size of abdomen. And again so far only a very few studies have evaluated the effects of abdominal belt in post-partum period.

In India, still in many areas educating abdominal exercises post-delivery is not practised and there is no standardised method or protocol to treat the postnatal mothers and still no clear ideas prevails on the type of belt to be used and the time to be used and so on. So this study aims to find the effect of the abdominal belt that is used commonly in Indian hospital setup among postnatal women.

The need for this study is during the course of pregnancy, the abdominal muscles will stretch over 50% of their original length. Post-delivery it appears flabby and get lengthened and weak. Diastasis Recti also prevails in post-partum period due to weak abdominal muscles. Abdominal exercises during postpartum are found to have the following advantages such as diminished respiratory and vascular complications, minimise future prolapse and stress incontinence and give a better cosmetic appearance later on. But no studies support the above and also no framed protocol for abdominal training is available. Certain protocols are available to correct diastasis recti but no protocol for abdominal strengthening is documented. Furthermore abdominal belt is advised commonly nowadays, yet no studies prevails in India to prove the efficiency of the abdominal belt in postpartum abdominal strength. Few studies document the effect of abdominal exercises on abdominal strength but no studies are documented in Indian population. So there becomes a need to analyse the efficacy of abdominal belt, is it to be given essentially along with the abdominal exercises, does it give any benefits over abdominal muscle strength. The aim of the study is to find, "The effectiveness of Abdominal Belt in Postnatal women over abdominal strength following vaginal delivery".

Methodology

This study was Quasi experimental, pretestposttest type of 14 subjects collected conveniently from SRM Medical College Hospital and Research Centre, Kattankulathur and Primary Health Care Centre, Maraimalai Nagar, India.

Multiparous postpartum women undergone vaginal delivery aged 20-40 years were included in this study. Women having undergone high risk delivery or Postpartum Haemorrhage, disabilities, depression, skin disease or sensitivity that interfere with the use of abdominal belt were excluded from this study

Outcome Measures of the Stud

1. Abdominal muscle strength by manual muscle testing.
2. Waist and hip circumference in Centimeters.
3. Width of diastasis recti using digital calliper in Centimeters.

Procedure

Postnatal women were assessed prior to the study and 14 women were selected according to inclusion and exclusion criteria. The selected women were well explained about the study and its importance.

The procedure was explained to subjects and written consent form was taken from the women who were motivated and willing to participate in the study and was willing to give regular follow up. All the 14 subjects were explained about the procedure of the study and conveniently grouped in to two groups (Group A and Group B).

Group A: consisted of 7 postpartum women who used abdominal belt from the 2nd day following the delivery, till

the end of 4 weeks, along with the abdominal exercises program starting on the 2nd day following the delivery, 3 times per week, for 4 weeks.

Group B: consisted of 7 postpartum women who performed abdominal exercises program starting on the 2nd day following the delivery, 3 times per week, for 4 weeks.

Abdominal Exercises Treatment Protocol

- Pelvic Tilt
- Pelvic Tilt +Transverse Abdominis Activation
- Pelvic Tilt +Transverse Abdominis Activation+ Alternate Leg Sliding
- Pelvic Tilt +Transverse Abdominis Activation+ Knee Fall Out
- Pelvic Tilt +Transverse Abdominis Activation+ Curl Ups
- Kegels Exercises
- 10 times a session and 3 session/week.

The pre-test values of each patient was taken using three outcome measures and were noted. At the end of four weeks the post-test values of all the outcome measures were taken and was compared with pre-test values.

Table 1: Comparison Of Pretest And Posttest Values Of Manual Muscle Testing, Waist Circumference, Hip Circumference, Diastasis Recti Among Group A Subjects Treated With Abdominal Support Belt And Exercises.

Variables	n	Pre test		Post test		T value	.sig
		mean	Std. deviation	mean	Std. deviation		
MMT	7	2.29	.756	3.57	.787	-6.000	0.000
Waist circumference	7	38.43	4.860	35.86	4.298	6.000	0.001
Hip circumference	7	36.86	1.864	36.57	1.988	1.000	0.356
Diastasis recti	7	2.71	.445	2.43	.431	7.071	0.000

$p<0.05$, $p>0.05$

In this table $p<0.05$ which shows that there is statistically significant difference in manual muscle testing, waist circumference, and Diastasis Recti among Group A subjects treated with Abdominal support belt and exercises, but there is no statistically significant difference in hip circumference as the $p>0.05$ that shows there is no reduction in hip circumference following Abdominal support belt and exercises among Postnatal women for a period of four weeks.

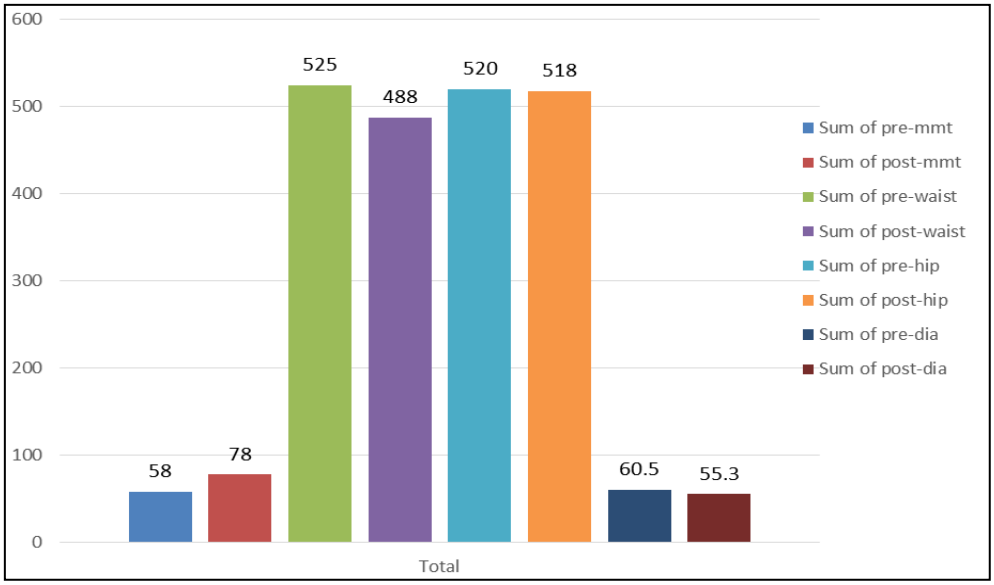

Fig 1: Comparison of Pretest and Posttest of Manual Muscle Testing, Waist Circumference, Hip Circumference, Diastasis Recti among Group B Subjects Treated With Abdominal Exercises

In this graph $p<0.05$ which shows that there is statistically significant difference in manual muscle testing, waist circumference, and Diastasis Recti in Group B subjects treated with Abdominal exercises, but there is no statistically significant difference in hip circumference as the $p>0.05$ that shows there is no reduction in hip circumference following Abdominal exercises among Postnatal women for a period of four weeks.

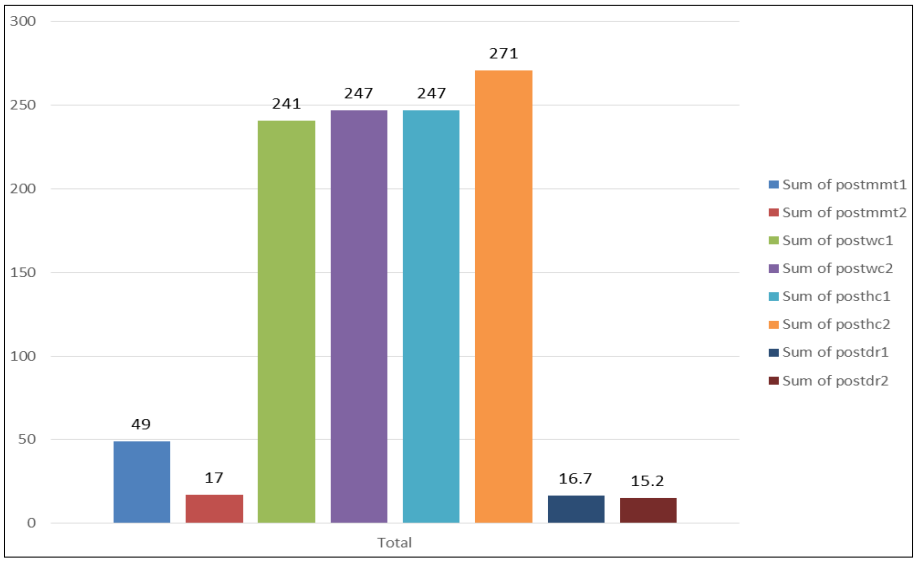

Fig 2: Comparison Of Post-test Values Of Manual Muscle Testing, Waist Circumference, Hip Circumference, Diastasis Recti Betweeen Group A Subjects Treated With Abdominal Support Belt And Exercises And Group B Subjects Treated With Abdominal Exercises Alone.

In this graph p>0.05 which shows that there is no significant difference in Manual Muscle Testing, Waist circumference, Hip circumference, and Diastasis Recti between Group A subjects treated with abdominal support belt and exercises and Group B subjects treated with Abdominal exercises alone among postnatal women for a period of four weeks.

Discussion

During pregnancy hormonal changes caused by relaxin, progesterone and oestrogen combined with uterine growth may cause stretching of the abdominal muscles, affecting mainly the rectus abdominal muscles [6].

Post-delivery, the body's ligaments and collagenous connective tissue will still be softer and more elastic than prepregnancy and it will take 4 to 5 months (Calguneri *et al.* 1982) for full recovery to take place. The abdominal muscles, which will have been stretched, are now elongated, and a separation between the two recti abdominal muscles (known as a diastasis or diversification) will almost certainly be apparent in any woman who was at 'term' prior to labour. This can vary between a small vertical gap 2–3 cm wide and 12–15 cm long to a space measuring12–20 cm in width and extending nearly the whole length of the recti Muscle.

No strong evidence in literature supports that there is a complete spontaneous resolution of diastasis recti during puerperium. It may be a transitory condition or may remain throughout life. As a result, the entire abdominal 'corset' will be weakened

In India, still in many areas abdominal exercises post-delivery is not practised and there is no standardised method or protocol to treat the postnatal mothers. So in this study, we have concentrated on the areas of core muscle training. We trained Transversus abdominis, Diaphragm, Pelvic floor muscles. Co-contraction of Transversus abdominis and multifidus, co-contraction of Transverses abdominal and hip muscles.

Current evidence suggests that the muscles and fascia of the lumbopelvic region play a significant role in musculoskeletal function as well as continence and respiration and the combined prevalence of lumbopelvic pain, incontinence and breathing disorders is slowly being understood (Pool-Goudzwaard *et al.* 2005, Smith *et al.* 2007a).

It is also clear that synergistic function of all trunk muscles is required for loads to be transferred effectively through the lumbopelvic region during multiple tasks of varying load, predictability and perceived threat (Hodges & Cholewicki 2007) [8].

Optimal strategies for transferring loads will balance control of movement while maintaining optimal joint axes, maintain sufficient intra-abdominal pressure without compromising the organs (preserve continence, prevent prolapse or herniation) and support efficient respiration. Non-optimal strategies for posture, movement and/or breathing create failed load transfer that can lead to pain, incontinence and/or breathing disorders.

The concept behind using abdominal belts after pregnancy is that they will provide extra support to the torso to help do the work of the muscles and to alleviate some of the resulting low back pain. Abdominal belts come in different styles and sizes to fit all body types. Most are easy to adjust and remove with Velcro or strap. They are made of a lightweight spandex or nylon material. And again so far only a very few studies have evaluated the effects of abdominal belt in post-partum period.

So this study was done to examine the effect of abdominal belt in Post-natal period. The results of this study, shows that there is statistically significant difference in Manual Muscle Testing, Waist Circumference, and Diastasis Recti in Group A subjects treated with abdominal support belt and exercises($p<0.05$)(Table-1).

This can be explained by the well-established fact that transversus abdominis plays a crucial role in optimal function of the lumbopelvis and that one mechanism by which this muscle contributes to intersegmental (Hodges *et al.* 2003) [8] and intrapelvic (Richardson *et al.* 2002) stiffness is through fascial tension [8].

This result is supported by Pela *et al.*., who concluded that wearing the binder immediately after the vaginal delivery

provides greater stability to the woman's body as it provides support to the stretched ligaments and muscles, as well as supports the spine and improves posture.

Mokhtar, who reported that the postpartum body garments provide support to abdominal wall, assist in abdominal muscles retraction, improve posture, stabilize loosened ligaments and provide support to the torso while vital organs returned to their pre-pregnancy position

Warren *et al..*, and Ivancic *et al..*, who reported that the abdominal belt improves the strength of abdomen, thereby increases the intra-abdominal pressure that contributes to mechanical spine stability through co activation of trunk flexors and extensors musculature. Thus it might reduce the Diastasis and Waist circumference

Research suggests that the abdominals flex the spinal column for about the first 30 to 45 degrees of movement which is approximately equivalent to lifting your shoulder blades off the ground (Laban, Raptou, & Johnson, 1965; Plowman, 1992; Rasch & Burke, 1978; Ricci, Marchetti, & Figura, 1981). So the exercise schedule activates abdominals effectively. The mechanism by which exercise enhances strength is by hypertrophy, enhanced muscle protein synthesis and incorporation of these proteins into cells cause hypertrophy or the enlargement of cells, and neural adaptations that enhance nerve-muscle interaction. Thus the strength of the abdominals are enhanced.

The result shows that there is statistically significant difference in manual muscle testing, waist circumference, and diastasis recti in Group B subjects treated with abdominal exercises. ($p<0.05$)(Graph-1)

This goes in hand with Lewit and Simons (1999) who stated that core strengthening is a factor which could bring back normal muscle power by placing emphasis on position, amount of feedback and duration.

Dhamo *et al.* (1996) demonstrated that core strengthening is effective in people with abdominal muscle weakness which emphasize on the Posture, Right plane and Alignment

Also the contraction of the core muscles helps in closing or reduction of Diastasis. Postnatal physiotherapy should be given importance and physical therapist should give more importance to strengthening of abdominals as it helps and aids in correction and prevent worsening of diastasis recti. This view goes in hand with Chiarello *et al.* demonstrated that group of pregnant women who underwent abdominal exercises have a significant lower diastasis recti measurement than sedentary women [9, 10].

The reduction which occurs in waist circumference after performing the abdominal exercise program could be explained by Boutcher, who mentioned that therapeutic exercise burns glycogen, fat and other nutrients stored in the muscle. This is supported by Irving *et al..*, who reported that abdominal exercises provides high boosting intensity workouts which induce acceleration of fat burning, especially abdominal fats, resulting in significant reduction of waist circumference.

The results are in contradictory with Mohamed Serag El-dein Mahgoub Mostafa (2014) documented a significant reduction of waist circumference post abdominal exercises for a period of six weeks.

But there is no statistically significant difference in hip circumference as the $p>0.05$ that shows there is no reduction in hip circumference in both the groups post training for 4 weeks(Graph 2).

The results goes in hand with Abdominal exercises, however, have no significant effect on weight, fat percentage or other measures of body composition, according to a 2011 study in the Journal of Strength & Conditioning Research, and a period of four week training is quite less and the exercises target the hip muscle training less, This may explain why the abdominal training has no effect over hip circumference. Furthermore abdominal belt doesn't cover the hip region also.

But when both groups are compared, there is no significant difference in manual muscle testing, waist circumference hip circumference, and diastasis recti between Group A subjects treated with abdominal support belt and exercises and Group B subjects treated with Abdominal exercises alone among postnatal women for a period of four weeks which shows there is no significant effect with the use of Abdominal Belt. ($p>0.05$)

But the gain in abdominal strength and reduction of Diastasis could have been due to the physiology of Puerperium, so further studies should be done with a control group. So as per the results this study finds no additional effect from Abdominal Belt to Abdominal exercises that prove beneficial for postnatal women. The abdominal belt achieved immediate waste reduction as the soft fleshy tissue compressed, squeezed and redistributed above and below the waistline. But it doesn't affect the abdominal muscle strength.

Future studies can be done with a large sample size, Long term follow up can be applied. (eg-Six months to one year), Diastasis recti measurements can be measured with a different scales. The effect of Abdominal exercises over Abdominal efficiency in postpartum can be compared between mothers who exercised and who had not exercised during pregnancy. Future studies should add a control group to eliminate the spontaneous resolution due to the physiology of Puerperium.

So abdominal exercises are very important in Postnatal Exercise program and this study had also broken a myth prevailing abdominal Belt alone is quite enough in postnatal period.

Conclusion

This study concluded that postnatal women following an Abdominal Exercise program and an advised Abdominal Belt found no significant improvement than Abdominal Exercise program alone for a period of 4 weeks. Abdominal exercises resulted in a greater increase in abdominal muscles strength and greater decrease in inter-recti distance and waist circumference. So, abdominal exercises should be taught to postnatal mothers from second day after delivery and it is found to be effective in restoring postpartum abdominal efficiency. Abdominal Belt is found to have no significant effect in postnatal women over abdominal strength following vaginal delivery, so advising abdominal belt alone without Abdominal Exercises does not improve or have an added effect on the abdominal muscle efficiency among Postnatal Mothers.

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