Research Article

Role of physiotherapy intervention on the functional adaptation of abdominal muscles in post-birth period

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Abstract

During pregnancy, various structural and functional changes occur in the musculoskeletal system of the pregnant woman. The weight of growing uterus causes overloading of spine, over-stretching of abdominal muscles which increase the spinal lordosis. Weakness due to over-stretching of abdominal muscles may make the spine prone to be overloaded and for possible injury. The purpose of this study was to observe the effect of physiotherapeutic exercises on the functional abilities of abdominal muscles as these are greatly influenced during pregnancy. 100 primiparous females with full term normal delivery aging from 19 to 30 years (mean age25.2+2.8 years) were selected randomly and divided in two groups, group A and group B, each having 50 subjects(n=50). Group A subjects were treated with curl-up exercise with hand crossed on abdomen in crook lying position with trunk elevated by 45^0 , abdominal hallowing and abdominal bracing with 10 repetition each for 5 times per week. Outcome of interest include grade of strength of upper abdominal and lower abdominal muscles (as functional abilities)at the end of first week, sixth week, twelfth week, eighteenth week and twenty-forth week. Data was analyzed using paired and unpaired t test. Both group showed significant increase in the functional abilities of abdominal muscles periodically. However group A showed more significant improvement. The result of this study revealed that physiotherapeutic exercises are beneficial in post-childbirth (postnatal) period to improve the functional abilities of abdominal muscles.

Keywords: Pregnancy, Functional ability, Abdominal muscles, Postpartum, Altered posture.

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INTRODUCTION

Pregnancy is a time of tremendous musculoskeletal, physical and emotional change and yet is a condition of wellness. The influence of pregnancy on musculoskeletal system changes the posture, locomotion and balance of pregnant woman. Postural adaptation, lengthening of abdominal muscles and pelvic floor muscles are considered as the common physiological changes associated with pregnancy. The over-lengthening of abdominal muscles during pregnancy leads it to weaken and lose their hold on the pelvis, due to which it tilts anterior. Another cause for anterior tilt of pelvis is the shifting of center of gravity of a woman anterior as a result of increased bulge of abdomen. Altered position of pelvis and length of abdominal muscles causes the back extensors to shorten, fatigue, fibrotic and full of trigger points. The imbalance created between the over-lengthened abdominal muscles and shortened back extensor muscles and anterior tilt of pelvis alters the position of spine and ultimately the entire posture of pregnant woman. If altered posture during pregnancy is not corrected in postnatal period, it may lead to various regional musculoskeletal pains. Konkler *et al* (1996) demonstrated that, altered posture during pregnancy is not found to correct spontaneously in postnatal period. Backache is commonly experienced due to postural changes of pregnancy, increased joint laxity and decreased abdominal function in postnatal period. In this study, the efforts were made to achieve the lost function of abdominal muscles on the pelvis and lumbar spine

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stability i.e. core stability in postnatal period, because the strong abdominal muscles help to reduce the load on lumbar spine by approximately 30% and on thoracic spine by 50% as a result of the increased intra-thoracic and intra-abdominal pressures caused by the contraction of these muscles. Building core stability is absolutely essential before, during and after pregnancy to prevent back injury.

MATERIAL AND METHOD

An experimental study was conducted at physiotherapy school and center, Government Medical College and Hospital, Nagpur, Maharashtra, India. 100 primiparous female with full term vaginal delivery were included in the study. Exclusion criteria included females having high risk pregnancy, multigravidous status, multiparity, pre-term delivery, caesarian sections, previous major abdominal surgery, lumbar spine and pelvic surgery, history of low back pain or hip joint and pelvic girdle pain within the past six months, obesity as categorized by body-mass index and receiving antenatal physiotherapy. Total 100 females having full-term normal delivery were selected for the study during the period of two months through purposive sampling based on the inclusion and exclusion criteria. 100 females were randomly allocated into two groups, group A and group B, each having 50 subjects. All the subjects participating in the study were well explained about the technique and procedure used in the study and written consent was obtained.

Data analysis

Statistical analysis including mean, standard deviation and standard error were calculated for all measurements. Data was analyzed by using paired' test and unpaired' test. In between groups (group A and group B comparison) significance was calculated by using unpaired 't' test and within the groups (periodical assessment comparison of group A and group B) significance was calculated by using paired 't' test to compare the strength of upper and lower abdominal muscles in primiparous females with full term vaginal delivery.

RESULTS

Table 1: Comparison of Mean±S.D. of grades of upper and lower abdominal muscle strength within and in between Group A and Group B

Test sessions	Group A		Group B	
	Upper abdominals	Lower abdominals	Upper abdominals	Lower abdominals
1st week	2.5±0.5118	0.3±0.463	2.090±0.2942	0.14±0.3505
6th week	2.73±0.4523	0.62±0.49	2.4±0.4962	0.42±0.6091
12th week	3±0.5872	1.22±0.507	2.678±0.4755	1.04±0.57
18th week	3.461±0.6003	1.94±0.586	3.030±0.5854	1.28±0.6712
24th week	3.723±0.772	2.58±0.883	3.116±0.7306	2.1±0.8630

Table 2: p- value of abdominal muscle strength Grade of group A vs. Group B at various test sessions

Test sessions	Upper abdominals	Lower abdominals
1st week	0.0023(H.S.)	0.054(N.S.)
6th week	0.0166(SIG)	0.074(N.S.)
12th week	0.026(SIG)	0.098(N.S.)
18th week	0.003(H.S.)	0.000(H.S.)
24th week	0.000(H.S.)	0.000(H.S.)

As shown in table 1, at the end of first week postpartum, the means and standard deviations for the strength of upper abdominal muscles were 2.5±0.5118 and 2.090±0.2942 for group A and group B respectively. As per table 4, there was statistical significant difference (p 0.0023), when compared between two groups. At the end of sixth, twelfth, eighteenth and twenty-fourth weeks of postpartum, the means for strength of upper abdominals were 2.73±0.4523, 3±0.5872, 3.461±0.6003 and 3.723±0.772 respectively for group A, whereas, in group B, they were found 2.4±0.4962, 2.678±0.4755, 3.030±0.5854 and 3.030±0.5854 respectively (table1). As per table 4, statistical high significant differences were found in the strength of upper abdominal muscles, when compared between group A and group B at consequent test sessions (p values-0.0166, 0.026, 0.003 and 0.000 respectively). As shown in table.1, the mean abilities of lower abdominal muscles with standard deviation for group A were calculated 0.3±0.463, 0.62±0.49, 1.22±0.507, 1.94±0.586 and 2.58±0.883 at the end of first, sixth, twelfth, eighteenth and twenty-forth weeks of postpartum respectively. For group B those were 0.14±0.3505, 0.42±0.6091, 1.04±0.57, 1.28±0.6712 and 2.1±0.8630 respectively. As per table.2, statistical significant differences were seen in the functional abilities of lower abdominal muscles, when compared between group A and group B at the end of eighteenth and twenty-forth weeks of postpartum (p values are 0.000 each) but at end of first, sixth and twelfth weeks of postpartum no statistical significant differences in the ability were observed (p values are 0.054, 0.074 and 0.098 respectively).

Table 3: Comparison of increased Mean±S.D. of grades of upper and lower abdominal muscle strength within and in between group A and Group B at various test sessions as compared the first week postpartum

Test sessions	Group A		Group B	
	Upper abdominals	Lower abdominals	Upper abdominals	Lower abdominals
6th week	0.32±0.7938	0.32±0.5126	0.28±0.6401	0.28±0.4535
12th week	0.7±1.0738	0.92±0.4445	0.59±0.9110	0.9±0.4164
18th week	1.6±1.3401	1.64±0.5979	1.08±1.1036	1.14±0.5349
24th week	2.4±1.2289	2.28±0.8580	1.76±1.1168	1.96±0.7548

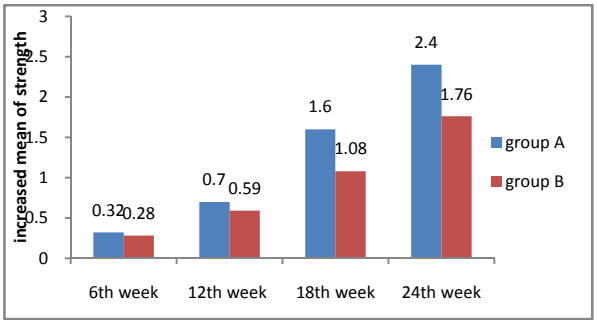
As per table.3, in group A, when mean strength of upper abdominal muscles seen at the end of first week postpartum compared at that of other test sessions, the

mean rates of increase in the abilities were found 0.32±0.7938, 0.7±1.0738, 1.6±1.3401 and 2.4±1.2289 at the end of sixth, twelfth, eighteenth and twenty-fourth weeks of postpartum.

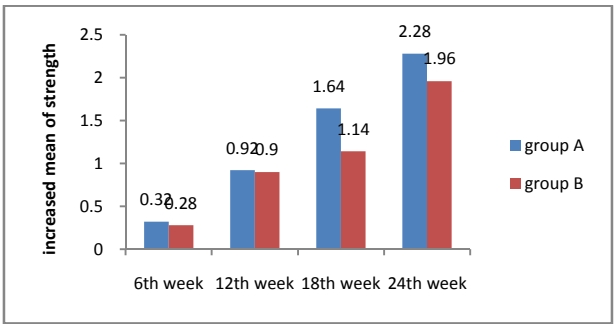
Table 4: p- value of abdominal muscle strength grade at various sessions as compared to first test session within and in between Group A and Group B

Test sessions	Group A		Group B	
	Upper abdominals	Lower abdominals	Upper abdominals	Lower abdominals
6th week	0.1041(N.S.)	0.001(H.S.)	0.014(SIG)	0.005(H.S.)
12th week	0.0023(H.S.)	0.000(H.S.)	0.000(H.S.)	0.000(H.S.)
18th week	0.000(H.S.)	0.000(H.S.)	0.000(H.S.)	0.000(H.S.)
24th week	0.000(H.S.)	0.000(H.S.)	0.000(H.S.)	0.000(H.S.)

As shown in table.4, there was no statistical significant difference (p 0.1041) in the mean rate of increase in the strength of upper abdominal muscles in group A at the end of sixth week postpartum as compared to first week. However, there were statistically high significant differences (p 0.000) observed at the end of twelfth, eighteenth and twenty-fourth weeks postpartum. In group B, there were statistically significant differences observed at all test sessions as compared to first week postpartum. As per table.3, in group A, when mean strength of lower abdominal muscles seen at the end of first week postpartum was compared at that of other test sessions, the mean rates of increase in the abilities were found 0.32±0.5126 , 0.92±0.4445 1.64±0.5979, and 2.28±0.8580 at the end of sixth, twelfth, eighteenth and twenty-fourth weeks of postpartum. Whereas, in group B, mean rate of increase were found 0.28±0.4535, 0.9±0.4164, 1.14±0.5349 and 1.96±0.7548 respectively. According to table.4, statistical significant differences in mean rates of increase in the ability of lower abdominal muscles were found at all test sessions in both the groups when compared with first session.



Graph 1: Showing Comparison of increased Mean±S.D. of grades of upper abdominal muscle strength within and in between group A and Group B at various test sessions as compared the first week postpartum



Graph 2: Showing Comparison of increased Mean±S.D. of grades of lower abdominal muscle strength within and in between group A and Group B at various test sessions as compared the first week postpartum

Figure 1: Pelvic Stability test:- Level -1 (initial position)

Figure 2: Pelvic Stability test:- Level -1 (End Position)

Figure 3: Pelvic Stability test:- Level -2

Figure 4: Pelvic Stability test:- Level -4

Figure 5: Starting position for dynamic, inner range curl-up

Figure 6: Dynamic inner range curl-up

DISCUSSION

The present study was designed to investigate the role of physiotherapy intervention on the functional abilities of upper and lower abdominal muscles in primiparous females delivering full-term babies vaginally. There was statistical highly significant increase in the mean strength of upper abdominal muscles in the subject of group A at the end of first, eighteenth and twenty-fourth week of postpartum as compared to group B (p-value 0.0023, 0.003 and 0.000 respectively). Increase in the mean strength of lower abdominal muscles was found highly significant in group A as compared to group B at the end of eighteenth and twenty-fourth week of postpartum (p-value 0.000 and 0.0071), whereas similar increase was observed in both the group at the end of first, sixth and twelfth week of postpartum. (P-values 0.054, 0.074, 0.098 respectively). The exercises were not found effective in increasing the ability of lower abdominal muscles in group A till the end of twelfth weeks postpartum but at the end of eighteenth and twenty-fourth weeks postpartum, they showed highly significant improvement in the strength (p-0.001). During pregnancy the weight of uterus increases to 1000gms and its capacity to 5000ml. it reduces to 500gms at the end of first week of postpartum and takes six weeks postpartum to reduce to pre-pregnant weight. Secondly, after the delivery uterus accommodates in the pelvic cavity, which is not yet reduced to pre-pregnant weight. This increases the girth of lower abdomen, which might be responsible for lower abdominal musculature for not regaining its ability faster to function on pelvis. The weight gain is common during pregnancy and lower abdomen is the most prone site for the fat deposition. This makes the abdomen flabby and pendulous, which exerts the constant pull on abdominal muscles. This might be another reason for the delay in regaining the functional ability of lower abdominal muscles speedy like the upper abdominal in postpartum period. Norris (1999) as well as Richardson and Jull (1999) stated that the deep trunk muscles as a stabilizers of the spine are having more extensive apponeurosis rather than the long tendons therefore they have poor recruitment pattern. This might be the prime reason for not regaining the ability for lower abdominals speedy. These results suggest that the regular exercise program in

postpartum period is much essential to regain the functional abilities of abdominal muscles. In this study, the activity level of the subjects was not observed in antenatal as well as postnatal period, which may have great impact on the functional abilities of abdominal muscles.

CONCLUSION

After comparing the results, it is concluded that significant increase was found in the functional abilities of abdominal muscles in postnatal period in primiparous female with full-term normal delivery. The exercise program was found much effective in developing the functional abilities of abdominal muscles. In group A the upper abdominal muscles showed significant increase in the ability from the end of first week postpartum as compared to group B at all test sessions. The ability of lower abdominal muscles was similarly noticed in the subjects of both groups till the end of twelfth week postpartum but later on significant improvement in the functional ability was observed in group A as compared to group B. In postnatal period the significant increase was noticed in the functional abilities of abdominal muscles at all test session as compared to previous test session. During pregnancy, pelvic floor muscles also get stretched along with abdominal muscles. They work in co-ordination with lower abdominal muscles. Therefore further study is required to see the effects of abdominal muscle training on the strength of pelvic floor muscles in postpartum period.

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