EFFECT OF EXERCISES ON ABDOMINAL RECOVERY AND BLOOD GLUCOSE LEVEL IN WOMEN AFTER CESAREAN SECTION

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ABSTRACT

Background/aim: Cesarean section has direct effect on abdominal muscles causing weakness and separation between the rectus abdominus muscles. Later effect is elevation of blood glucose level. Purpose of the study: this study was designed to study the effect of aerobic exercise on strengthening of the abdominal muscles and reduction of blood glucose level in women after cesarean section.

Material and Methods: The study is a randomized controlled trial performed on 40 females who had undergo cesarean section 6 months ago randomly distributed into two equal groups. Group A (study group) consisted of 20 females who received aerobic exercise for eight weeks and Group B (control group) consisted of 20 females who just received assessment before and after eight weeks. The primary outcome measures were waist hip ratio, intra recti distance, and blood glucose level.

Results: The results revealed that there was statistically significant reduction in all measures including waist hip ratio, intra recti distance, and blood glucose level in group A compared with group B which had no significant reduction in all measures.

Conclusion: There was improvement in abdominal strength and reduction of blood glucose level after using aerobic exercise in women after cesarean section.

Key words: exercises, abdominal muscles, blood glucose level, and cesarean section.

I-INTRODUCTION

The hormonal process that begins during pregnancy and continues in the postpartum period leads to excessively weak and hypotonic abdominal muscles, making the ligaments and connective tissue softer and more elastic. These changes result in anatomical, physiological, and biomechanical alterations (Calguneri & Bird, 1982).

Immobility following a caesarean section has a variety of medical and mental effects on women. The physical effects may include urinary tract infection, deep vein thrombosis, intestinal obstruction, increased pain intensity, and pressure ulcer. In the presence of various levels of depression, a mental effect occurs. Early workouts, on the other hand, provide a number of advantages, including better functional mobility, muscular tone strengthening as pain intensity decreases, uterine involution, lochial discharge, gastrointestinal and urinary tract function, restart, and wound healing enhancement (Youness & Ibrahim, 2017).

Stretching of the abdominal muscles, primarily the rectus abdominis, occurs during pregnancy as a result of hormonal changes caused by relaxin, progesterone, and oestrogen mixed with uterine development. In addition,
anterior pelvic tilting, whether with or without lumbar hyperlordosis, alters the insertion angle of pelvic and abdominal muscles, as well as postural biomechanics, resulting in a deficiency in pelvic abdominal organ support. Furthermore, as the abdominal muscles lengthen during pregnancy, the force vector and contraction strength of the rectus abdominis muscles decrease (Rankin, 2008).

During pregnancy, two out of every three women have a separation of the rectus abdominis muscles, the long muscle in the center of the abdomen. A susceptibility to separation is caused by a combination of abdominal weakness, hormonal changes, weight gain, and a significant deal of tension on an already weaker structure (Stephenson & O’Connor, 2000).

The abdominal muscles usually take some time to regain their tone and strength. As after delivery, although the uterus immediately begins to shrink back to its pre-pregnancy size, the abdominal muscles remain in their over lengthened state. This often makes the belly feel 'soft and flabby' from muscle weakness, making it look 'enlarged' with the pressure of the intestines and abdominal organs distending the flexible muscles (Gilleard & Brown, 1996).

Cesarean section is one of the most common abdominal surgeries in women (Mathai et al, 2013). Many physiotherapy research in the literature focus on health issues that can be found in the early post-caesarean section period (Kayman-Kose et al, 2014), (Karakaya et al, 2012), and (Smith et al, 1986).

Pain, gastrointestinal issues, mastitis, nausea, vomiting, sadness, and anxiety are all common postnatal problems (Karakaya et al, 2012). In addition to these issues, following a caesarean incision, maternal abdominal muscular strength falls and the fat ratio in the waist region increases. According to Turan et al. (2011), recent abdominal surgery and delivery increases the chance of diastasis recti abdominis (DRA).

The midline separation of the rectus abdominis (RA) muscles at the linea alba in the abdominal wall is known as diastasis recti abdominis (DRA). DRA is defined as a palpable midline gap of more than 2.5 cm or any apparent bulging on exertion (Parker et al, 2009).

DRA-related abdominal wall weakness impairs the capacity of the abdominal muscles to maintain the trunk, which can result in poor posture and an umbilical hernia (Acharry & Kutty, 2015), (Aguirre & Santosa, 2005), and (Spitznagle & Leong, 2007).

Regular physical activity is important to the health of women throughout their lifespan. The benefits of physical activity for women are well documented in the scientific literature, and include improved aerobic fitness (Dewey & McCrory, 1994), and (Lovelady & Nommsen, 1995) decreased body fat (Murphy & Hardman, 1998), improved bone mineralization (Clapp & Littlem, 1995), and decreased risk of colon cancer, hypertension, diabetes, osteoporotic fractures, and perhaps breast cancer (Manson & Lee, 1996).

The abdominal muscles' ability to maintain the pelvis against resistance deteriorates throughout this time. Because of this loss of functional ability, abdominal muscular activities should be undertaken with caution, and workouts that require a lot of torque should be avoided. Pelvic stability must be maintained to avoid the occurrence of lower back stiffness, and abdominal exercise technique is critical (Gilleard & Brown, 1996).

II- MATERIALS & METHODS

- **Aim of the study:**
  To determine the effect of aerobic exercises on the recovery of abdominal muscles and blood glucose level in women after cesarean section.

- **Design of the study:**
  We utilized a randomized control trial design. After a caesarean section, 40 ladies volunteered to participate and were divided into two groups, each with twenty subjects. Patients with cancer, renal failure, hemiplegia, parkinsonism, fractures of the extremities, and respiratory diseases were excluded from the study, as were patients with primary and secondary hypertension, left ventricular hypertrophy, recent myocardial infarction, three or more CVD risk factors, and patients taking multiple antihypertensive drugs.
• Subjects

Forty females following cesarean section aging from 25-35 years old. They were selected from Beni Suef specialized Hospital, Beni Suef, Egypt. All subjects were investigated and diagnosed by gynecology and obstetrics doctor. They received this treatment program between April and July 2021 and randomly assigned into two equal groups, group (A), and group (B).

• Group (A): It included 20 females who received aerobic exercises for eight weeks

• Group (B): It included 20 females who just received assessment before and after eight weeks.

• Inclusion criteria:

All patients were chosen as six months after cesarean section

• Exclusion criteria:

Patients with these diseases were excluded from the study: Cancer, renal failure patients, hemiplegia, parkinsonism, fractures of extremities and respiratory diseases, we excluded diagnosed Patient with primary or secondary hypertension, left ventricular hypertrophy, Recent myocardial infarction, three or more risk factors of CVD, Patients using more than one antihypertensive drug.

• Evaluation

All participants were assessed by a physician to select eligible subjects. Before inclusion in this study, a complete medical history and drug history were used for the patients. All tests were performed before the sessions (pre-) and after (post-) sessions period for each participant including Body Mass Index (BMI), Waist hip ratio (WHR), Random Blood glucose level test, and intra recti distance measurement. To determine the effect of aerobic exercise, all results were measured at one month after the starting of the treatment sessions.

• Waist Circumference (WHR): Measured by using tape measurement to measure the waist circumference at the mid abdominal level (umbilical level) and measurement of hips circumference then calculating the waist hip ratio.

• Random blood glucose level: laboratory measurement of blood glucose level

• Intra recti distance measurement: Each woman was asked to assume crock lying position and the therapist palpated the medial edge of the two recti muscle borders and placed the arms of the dial caliper perpendicular the recti border just above umbilicus; then the therapist asked the woman to raise her head and shoulders out of the plinth, at this point the distance between the two recti was measured to the nearest centimeters. This point was marked with a soluble marker to ensure standardization with repeated measures. Three trials were taken for each assessment and the mean was recorded (El-Mekawy & Eldeeb, 2013).

• Aerobic exercises protocol:

All women in group (A) were participated in an exercise program for 30 minutes, three sessions per week (one every other day for 6 weeks). The exercise program consists of Static abdominal contraction, Posterior pelvic tilt, Reverse Sit- Up exercise, Trunk Twist and Reverse Trunk Twists exercise (Artal & O’Toole, 2003). The woman was asked to hold contraction for 5 seconds then relax 10 seconds, 20 repetitions for each exercise (Ivancic & Cholewicki, 2002). Also, the participants were instructed to repeat the same exercise program at the other days as a home routine program (El-Mekawy & Eldeeb, 2013).

• Statistical Analysis:

A statistical package program was used to evaluate the data obtained from the study. Descriptive statistical methods (mean, median, and standard deviation) were utilized in the evaluation of research data as well as the Kolmogorov– Smirnov distribution test for evaluating normal distribution. In comparing quantitative data, the unpaired samples t-test was utilized in intergroup comparison of parameters. The Paired samples t-test was done for intragroup comparisons. The results were computed at the 95% confidence interval, P < 0.05 significance level and P < 0.01 advanced significance level.
III. RESULTS

Forty females after cesarean section were voluntarily participated and randomly assigned into two groups with twenty females in each group. No study participant left the study project for any reason. No side effects or complications were observed during the treatment.

Table 1. Baseline characteristics among the studied groups

<table>
<thead>
<tr>
<th>Demographic data</th>
<th>Group A (Study) (N=20)</th>
<th>Group B (Control) (N=20)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>age</td>
<td>27.8±3.12</td>
<td>26.2±2.31</td>
<td>0.1215 NS</td>
</tr>
<tr>
<td>BMI</td>
<td>31.06±2.47</td>
<td>31.94±2.78</td>
<td>0.3654 NS</td>
</tr>
<tr>
<td>WHR</td>
<td>0.907±0.06</td>
<td>0.91±0.023</td>
<td>0.8879 NS</td>
</tr>
<tr>
<td>Intra recti distance</td>
<td>3.0±0.26</td>
<td>3.16±14</td>
<td>0.71 NS</td>
</tr>
<tr>
<td>Blood glucose level</td>
<td>98.13±10.41</td>
<td>100.33±18.07</td>
<td>0.6860 NS</td>
</tr>
</tbody>
</table>

The average age was 27.8±3.12 years in group (A) and 26.2±2.31 years in group (B). The mean (BMI) of group (A) was 31.06±2.47 kg/m2 while in group (B) was 31.94±2.78 kg/m2. The mean WHR of group (A) was 0.907±0.06 while in group (B) was 0.91±0.023. The mean Intra recti distance of group (A) was 3.0±0.26 cm while in group (B) was 3.16±14 cm. The mean Blood glucose level of group (A) was 98.13±10.41 mg/dl while in group (B) was 100.33±18.07 mg/dl Table 1

The decrease in WHR in group (A) at the end of the treatment was statistically significant as compared with the baseline (P<0.001). The decrease in WC in group (B) at the end of the treatment was not statistically significant in comparison to the baseline (P=0.88). Table 2

Table 2. Comparison between pre and post treatment in both groups regarding waist hip ratio

<table>
<thead>
<tr>
<th>WHR</th>
<th>Pre-treatment</th>
<th>Post-treatment</th>
<th>P value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>0.907±0.06</td>
<td>0.850±0.058</td>
<td>0.001 S</td>
</tr>
<tr>
<td>Group B</td>
<td>0.91±0.023</td>
<td>0.918±0.33</td>
<td>0.88 NS</td>
</tr>
<tr>
<td>P value**</td>
<td>0.8879 NS</td>
<td>0.001 S</td>
<td></td>
</tr>
</tbody>
</table>

The decrease in Intra recti distance in group (A) at the end of the treatment was statistically significant as compared with the baseline (P<0.001). The decrease in Intra recti distance in group (B) at the end of the treatment was not statistically significant in comparison to the baseline (P=0.91). Table 3

Table 3. Comparison between pre and post treatment in both groups regarding Intra recti distance

<table>
<thead>
<tr>
<th>Intra recti distance</th>
<th>Pre-treatment</th>
<th>Post-treatment</th>
<th>P value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>3.2±0.26</td>
<td>2.05±0.30</td>
<td>0.001 S</td>
</tr>
<tr>
<td>Group B</td>
<td>3.16±14</td>
<td>3.1±0.12</td>
<td>0.91 NS</td>
</tr>
<tr>
<td>P value**</td>
<td>0.71 NS</td>
<td>0.001 S</td>
<td></td>
</tr>
</tbody>
</table>

The decrease in Blood glucose level in group (A) at the end of the treatment was statistically significant as compared with the baseline (P<0.001). While the decrease in Blood glucose level in group (B) at the end of the treatment was not statistically significant in comparison to the baseline (P=0.321). Table 4

Table 4. Comparison between pre and post treatment in both groups regarding systolic blood pressure

<table>
<thead>
<tr>
<th>Blood glucose level</th>
<th>Pre-treatment</th>
<th>Post-treatment</th>
<th>P value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>98.13±10.41</td>
<td>87.4±9.51</td>
<td>0.0001 S</td>
</tr>
<tr>
<td>Group B</td>
<td>100.33±18.07</td>
<td>99.73±16.00</td>
<td>0.321 NS</td>
</tr>
<tr>
<td>P value**</td>
<td>0.6860 NS</td>
<td>0.001 S</td>
<td></td>
</tr>
</tbody>
</table>
IV- DISCUSSION

Our clinical study showed that aerobic exercise is safe and effective in recovery and strengthening of abdominal muscles and reduction of blood glucose level in women after cesarean section. There was significant reduction of waist hip ratio and intra recti separation. Also, there was a significant reduction in blood glucose level.

The results of our study were consistent with Katch et al, (1984), who stated that patients are advised to conduct abdominal workouts in order to lower their waist circumference and abdominal fat. In keeping with the findings of Vispute et al., who found that abdominal exercise training was helpful in improving abdominal strength (Calguneri & Bird, 1982).

Our results agreed with Entisar et al. who concluded that, early and progressive exercises have an effective role in improving post cesarean section women recovery (Youness & Ibrahim, 2017).

Also, according to Michelle F. Mottola, exercise during the postpartum time provides numerous benefits for both the mother and the infant, including enhanced cardiovascular fitness, facilitated weight loss, increased energy, and improved psychological well-being for the mother. Women who are more active have a lower risk of developing diastasis recti (Mottola, 2002).

Our findings back up the findings of Hanan S. El-Mekawy et al, (2013) who found that postpartum women who performed abdominal exercises for 6 weeks after delivery had a larger gain in abdominal muscle strength and a smaller inter-recti distance than those who used a post-natal supportive belt.

Furthermore, the findings of this study corroborate those of Mahalakshmi V. et al., who discovered that workouts conducted by primiparous women with diastasis recti abdominis in their postpartum phase for 6 weeks following birth were beneficial in lowering DRA (Mahalakshmi & Sumathim, 2016).

Further studies are required to study the effect of the aerobic exercise for longer period and compare it with other methods that strengthen the abdominal muscles to figure out the best way to reduce rectus diastasis and control the weakness.

V- CONCLUSION

Aerobic exercise is effective, safe, and well tolerated non-invasive procedures for the reduction of waist hip ratio, inter recti distance, and blood glucose level in women after cesarean section.

Limitations and future studies

For the future studies, we recommend that the sample size will be expanded, and the study will include longer period of time

Acknowledgment

We would like to thank all the participants who shared in this study as well as our family members who supported us and anyone who assisted in this work.

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11) Murugan, G., & Khatriº, S. M. Effectiveness of Thoracic Screw Thrust Technique in T4 Syndrome.


