

Effectiveness of Core Muscle Strengthening on Prevention of Low Back Pain in 2nd Trimester Primigravid Females - A Hypothesis

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Institute at which research was conducted: Sancheti Institute College of Physiotherapy, Pune.
University Affiliation of Thesis: Research Hypothesis(Synopsis)submitted for MPTTh Registration to Maharashtra University of Health Sciences(MUHS), Nashik.
Year of Acceptance: 2014.

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Abstract

Background: Pregnancy comes with number of physiological changes. The effect of increasing size of uterus weakens core abdominal muscles. It is superimposed by the effect of hormone Relaxin which affects static stability of joints. On account of these musculoskeletal changes there is prevalence of low back pain during pregnancy. The aim of this study is to assess the effectiveness of core muscle strengthening exercises on prevention of low back pain in 2nd trimester primigravid females.

Hypothesis: In the present study it is assumed that specific core strengthening exercises will increase the core abdominal muscle strength which will, in turn, prevent the incidence of low back pain in the given population. The study is a randomized control trial with total sample size of 210 which will be recruited by computerized random table allocation technique. The study has three sub groups including primi gravid intervention (Group A), primi gravid control group (Group B), and a group of age matched nulli-gravid females (Group C) selected purposively for matching the exercise intensity effects. Exercises intervention for core strengthening will be given for 6 weeks/ 5 days per week to A and C. Abdominal core muscle strength will be assessed Pre and post intervention by using a pressure biofeedback device while presence and intensity of low back pain will be scored by the Rolland Morris disability index. Statistical analysis for intra group core strength will be done by paired 't' test and inter group by One way ANOVA while back pain by the test for intra group by Wilcoxon sign rank test and Kruskal Wallis test for inter group with alpha set at $p < 0.05$.

Clinical Importance: This exercise protocol will prevent the incidence of low back pain in pregnancy period. As the use of NSAID is rigorously restricted in pregnancy, exercises will be definitely a better solution for this population.

THESIS SUMMARY

Introduction

The female body undergoes many hormonal and anatomic changes which affect musculoskeletal system during pregnancy period. The abdominal muscles have to stretch in width and length to accommodate the growing uterus. The two sides of the rectus abdominis, obliques, and transversus abdominis (TA) expand and, in some cases, may separate by 3-6 inches. It creates lumbar lordosis which causes a shortening of the spinal extensors, lengthening of the abdominals and hip flexors. Studies have shown that during pregnancy the abdominal muscles become insufficient.

Exercises during pregnancy have been shown to improve maternal fitness and well being. But very few studies have evaluated the efficiency of exercises during pregnancy on increasing the core abdominal muscle strength. Local core muscle consists of transverse abdominis, multifidii, pelvic floor muscles and diaphragm. It is observed that there is a correlation between core muscle strength and incidence of low back pain. Several studies have shown that at least 50% of women experience some kind of back pain during some period of pregnancy. The etiology and pathogenesis of back pain related to pregnancy is unclear. Most hypotheses have been focused

on changed load resulting from increased weight and decreased stability of the pelvic girdle due to hormonal changes. Some studies have revealed a correlation between circulating levels of the hormone relaxin and pelvic pain in pregnancy; while others have found no such correlation. The three factors related to the development of back pain were abdominal sagittal diameter, transverse diameter and depth of the lumbar lordosis. Ostgaard et al. showed that rate of these complications in athletic women was less than nonathletic women. Meanwhile it is unclear in non-athletic pregnant women if exercise can reduce the intensity of low back pain. The study shows that no strong evidence exists concerning the effect of physical therapy interventions on the prevention and treatment of back and pelvic pain related to pregnancy.

It is suggested in Cochrane review done on interventions for preventing and treating pelvic and back pain in pregnancy that more research in areas of education in early pregnancy on specially-adapted exercises, preventive studies beginning early in pregnancy will be helpful.

Thus the purpose of the current study is to find out whether core muscle strengthening helps in prevention of low back pain. If not there is a scope of further research in formulating better exercise programs for this population.

Need for study

As we all know in 2nd trimester the abdominal girth increases progressively contributing to weakness of core muscle which in return compromises posture trunk stability and motion, respiration etc. These biomechanical changes in musculoskeletal system are superimposed by effect of hormone relaxin thus the chances of developing low back pain during 2nd trimester increases. The effect of relaxin reduces static stability. And increasing size of uterus leading to elongation and weakness of abdominal muscles reduces dynamic stability. There are no strong measures to increase the static stability that is stability given by ligaments. Thus it is worthwhile to see the effect of improving the dynamic stability by strengthening exercises which is the essential step towards prevention of low back pain.

Hypothesis

It is observed that more than two thirds of pregnant women have back pain. And this pain increases as the pregnancy advances and interferes with activities of daily living. Exercises are given in antenatal period for low back pain but prevention of low back pain with exercises would be of great help for all pregnant mothers.

There are many anatomical and physiological changes that take place in women's body during pregnancy. But it is said that pregnancy should not be considered as state of confinement. It is observed in that there is reduction in the core muscle strength in 2nd and 3rd trimester. But after 2nd trimester cardiovascular changes are seen in females after lying in supine position, thus in this study females in only 2nd trimester are included. Primigravid females without any complaints of low back pain will be the part of this study. According to guidelines of American college of obstetricians and gynecologists exercising during high-risk pregnancies may cause complications, such as increased fetal heart rate, intrauterine growth restriction, or fetal bradycardia, which can be caused by vagal reflex, cord compression, or fetal head malposition. Thus, females with pre-eclampsia, diabetes mellitus, placenta previa, incompetent cervix, multiple

pregnancies will be excluded. To understand the efficacy of our strengthening program an additional group of nulligravid will be included. Same protocol will be given to them. Core abdominal strength will be checked pre and post intervention by using pressure biofeedback unit. Rolland Morris questionnaire will be used as an outcome measure for low back pain.

Our main aim of the study is to understand if low back pain can be prevented by giving core strengthening program in 2nd trimester. Back pain in pregnancy has many contributing factors. The effect of pregnancy related hormone Relaxin and Estrogen affect the static stability of joints creating joint laxity. This is one of the important causes of low back pain and pelvic girdle pain during pregnancy. The ligament laxity is superimposed by progressive core abdominal muscle weakness from second trimester onwards. This is the time when the uterus starts growing in size, abdominal muscles get stretched and elongated which leads them to weakness. This is the main cause of low back pain during pregnancy. Along with this there is increase in the body weight which is one more contributing factor. Increase in the weight causes altered mechanics at lumbar level. There is forward shift of line of gravity which puts stress over intervertebral discs, ligaments, facet joints etc. This pain is more likely to persist throughout the pregnancy and sometimes after the delivery.

Out of all these contributing factors we cannot work on static stability but we can definitely improve the dynamic component of it that is muscle strength. It is observed in various studies done on general population that core muscle weakness correlates with low back pain. Core muscles strengthening have shown to reduce the incidence of low back pain in general population.

A study was carried out in pregnant population which concludes that there is correlation between low back pain and core muscle weakness. In present study the proven phenomenon of core strengthening to prevent low back pain is being tested in pregnant population. It was found out in one study that occurrence and size of diastasis recti abdominis is significantly more in females who didn't follow specific core strengthening program. In this study the incidence diastasis recti abdominis will be less as specific core strengthening exercises are given. In turn it will reduce the chances of pelvic pain in this population.

The present study is a randomized control trial with total sample size of 210 which will be recruited by computerized random table allocation technique. The study has three sub groups including primi gravid intervention (Group A), primi gravid control group (Group B), and a group of age matched nulli-gravid females (Group C) selected purposively for matching the exercise intensity effects. Exercises intervention for core strengthening will be given for 6 weeks/ 5 days per week to A and C. Abdominal core muscle strength will be assessed pre and post intervention by using a pressure biofeedback device while presence and intensity of low back pain will be scored by the Rolland Morris disability index. Statistical analysis for intra group core strength will be done by paired 't' test and inter group by One way ANOVA while back pain by the test for intra group by Wilcoxon sign rank test and Kruskal Wallis test for inter group with alpha set at $p < 0.05$

Non compliance shall be considered if the subjects perform less than 80% of the days of exercise training, i.e. less than 24 days out of the total 30 days of exercise training as logged in the exercise

diary.

Exercise protocol will include simple core strengthening exercises which will be safe to practice during pregnancy and easy to understand. Subjects will be provided with exercise charts. Exercise prescription given by guidelines of American college of obstetrics and gynecology

Intensity; measured on RPE up to somewhat hard

Repetition; 10 repetition of each exercise 1 set each per day with an increment of 20% per week

Frequency: 20 to 30 min based on RPE, each day 5 times in a week.

Exercises to be given: 11-13

1) Core activation

2) Core with head lift

3) Core with straight leg raise

4) Core with bend leg fall out

5) Pelvic floor muscle strengthening

6) Core with hip abduction in side lying

7) Core with hip knee flexion without heel touch

8) Quadruped with pelvic tilts

9) Quadruped with arm lift

Here we assume that patients in control group will have reduction in core strength. Also they might develop low back pain. Whereas patients in intervention group will not have any complaint of low back pain. The core strength may increase or may remain the same. And we expect nulligravid group to have definite increase in core strength assuming the protocol to be efficient enough.

Data will be analyzed using paired and unpaired 't' test.

Discussion

Low back pain during pregnancy and after delivery is one of the major issues. Patients usually get recurrent low back pain. Use of NSAID for pain management in pregnancy is should be rigorously restricted¹⁹. Thus the safer solution for this pain is physiotherapy. It is always better to give an intervention before the condition sets in rather than waiting for the condition and then treating the same.

Hence exercise intervention at this point of time can help the female to prevent low back pain during pregnancy⁶. Specific exercises targeting the core muscle group will be given for 6 weeks of duration¹⁷. In this duration subjects have been asked to follow the protocol as home exercise program. Here we should consider the fact that effect of relaxin and progressive weakness of abdominals on account of increase in the size of uterus are going to hamper the strengthening process. There could be increase in the strength of muscles or the strength might remain the same. Even if there is no detectable change in the strength it can be concluded that the core strength has increased. Because reduction in core strength is expected due to numerous physiological changes. Thus even if the strength is maintained there will be prevention of low back pain.

Clinical Importance

Prevention is better than cure. These exercises given in antenatal period will prevent low back pain in pregnancy and after delivery. The exercises are safe and easy to understand. Exercises can be practiced as group therapy or can be given as home exercise program.

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Conflict of Interest: Nil
Source of Support: None

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How to Cite this Article:

Mhalagi P, Rairikar S, Shimpi A. Effectiveness Of Core Muscle Strengthening on Prevention of Low Back Pain in 2nd Trimester Primigravid Females. *Journal Medical Thesis* 2015 Jan-Apr ; 3(1):19-22