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Effect of Structured Exercise Program on Lumbar Lordosis, Lumbar Range of Motion, And Pregnancy-Related Anxiety in Pregnant Women

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ABSTRACT

Background: During Pregnancy, women undergo many physiological and biomechanical changes, which include increased body weight, altered posture, and the influence of hormonal changes like the release of relaxin hormone that affect musculoskeletal stability. The forward shift of the centre of gravity contributes to an increase in lumbar lordosis, which often results in low back pain. Along with these physical problems, anxiety and depressive symptoms are also common during pregnancy.
Aim: To study the effect of a structured exercise program on lumbar lordosis, lumbar range of motion (ROM), and pregnancy-related anxiety in pregnant women.
Methodology: An experimental study was conducted on 72 pregnant women recruited at the end of the third month of pregnancy, as per the inclusion and exclusion criteria. Participants were allocated into two groups: Group A (experimental) received a structured exercise program, while Group B (control) was advised to continue routine activities. Baseline parameters like lumbar lordosis, lumbar ROM, and pregnancy-related anxiety were recorded. Assessments were repeated at the end of the 5th month, 7th month, and one month post-delivery. Data were analysed using SPSS software. Repeated Measures ANOVA and unpaired t-tests were applied.
Results: A significant improvement was observed in lumbar lordosis and pregnancy-related anxiety in the experimental group compared to the control group. No significant difference was found in lumbar ROM.
Conclusion: A structured exercise program positively influences lumbar lordosis and pregnancy-related anxiety in pregnant women.

KEYWORDS: structured Exercise Program, Pregnancy, Pregnancy-related Anxiety, Lumbar Lordosis

INTRODUCTION:

Pregnancy encompasses a range of coordinated physiological, hormonal, and biomechanical adaptations that profoundly affect the musculoskeletal system and mental well-being. Enhanced lumbar lordosis, a wider step width, and altered trunk mechanics are instances of compensatory posture and gait changes brought on by the increase in maternal body mass and the forward and downward shift of the center of mass.[1,2,3,4] Elevated levels of hormones like relaxin and progesterone, which increase ligamentous laxity and decrease pelvic and spinal stability, further complicate these biomechanical adaptations and contribute to low back pain and lumbopelvic discomfort during pregnancy .[1]

Individual compensatory strategies can vary, in spite of research demonstrating that spinal angles and gait velocity are consistently affected during pregnancy. This highlights the complex interaction between lifestyle, hormonal, and mechanical factors.[1,5,6] Many women experience symptoms like low back pain, which can have a major negative influence on quality of life.[1,7]

Additionally, due to hormonal changes and psychosocial factors, pregnant women are more likely to experience anxiety and depressive symptoms. Prenatal mental health issues are highly prevalent, according to research, which emphasizes the value of regular psychosocial screening and integrated care approaches. This study aims to study the effect of a structured exercise program on lumbar lordosis, lumbar range of motion (ROM), and pregnancy-related anxiety in pregnant women.

MATERIALS AND METHODS:

72 pregnant females in their 3rd month of pregnancy, with no history of low back pain, and primigravida were included in the study. Females with any back condition, inflammation, or infection were excluded from the study. The procedure was explained to the participants, and informed written consent was obtained in the language they understood. Participants who were willing to do exercises throughout the pregnancy period and ready for follow-up were then assigned to Group A (experimental group), and those who were not willing to do exercises throughout the pregnancy but were ready for assessment were assigned to Group B (control group).

Both groups were assessed for lumbar lordosis using Flexiruler, lumbar ROM by using the modified Schober test, and Anxiety by using the pregnancy-related Anxiety questionnaire at baseline, i.e., at the end of the 3rd month. Then, Participants in Group A were instructed and supervised by the investigator in performing a structured exercise program specifically designed to enhance the stability of the lumbopelvic-hip complex. They were advised to perform the prescribed exercises daily and to maintain a diary to record adherence. The exercise program followed a clearly defined prescription outlining sets, repetitions, hold time, and frequency.

- **Supervised Exercise Program was** conducted **three times a month**.
- **Home Exercise Program:** Participants were instructed to perform exercises at home.
- **Frequency and Duration: Initially,** 3 repetitions with a 5-second hold, and progression is by increasing to 10 repetitions with a 10-second hold. Twice a day

The participants of group B who were not willing to do exercise were not given any exercises. Parameters lumbar lordosis, lumbar ROM, and Anxiety were checked at baseline (the end of the 3rd month), and follow-ups occurred at the end of the 5th month, the end of the 7th month, and one month post-delivery for both groups.

STATISTICAL ANALYSIS:

Statistical analysis is performed using SPSS 20.0 software. Demographic data is presented in the form of frequency and percentage. Repeated Measures ANOVA (RMANOVA) was used to test the change across different time points in Group A and Group B. An unpaired t-test for between-group comparison for quantitative data P-value less than 0.05 is considered significant

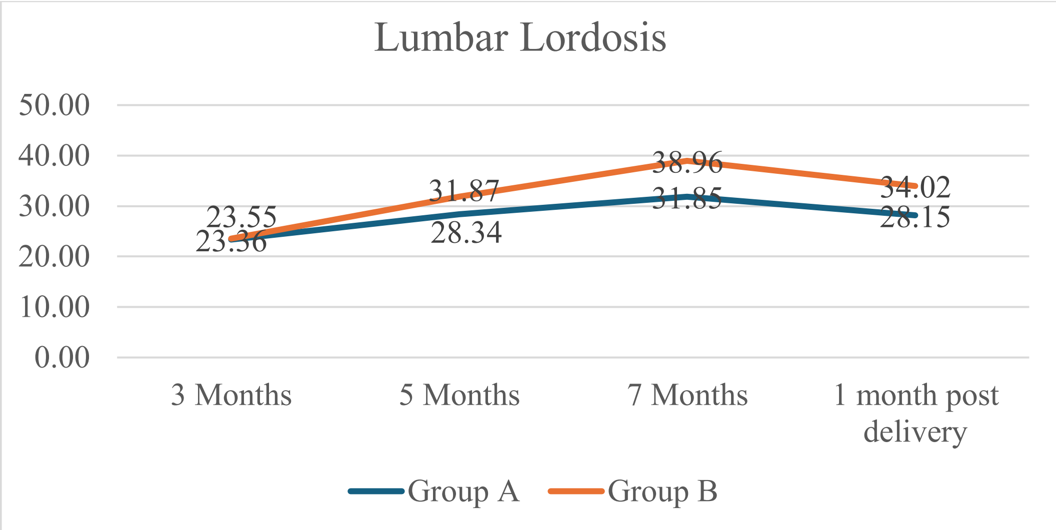
RESULT

Table 1.

	Group A	Group B
Age	25±3.5	25±3.2
Weight	54.2± 10.2	52.1±8.2
Height	158.5±6.1	159±4.6

Interpretation: Shows the mean Age, Weight, and Height of women in both groups

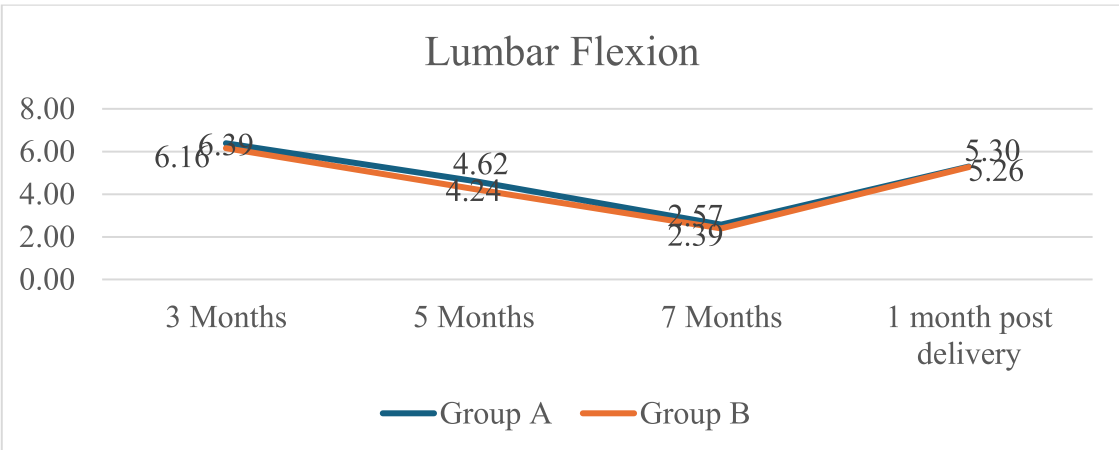
Figure 1:



Interpretation: There are changes in the lumbar lordosis across different time points in Group A and Group B. The p-value is less than 0.05 for both groups.

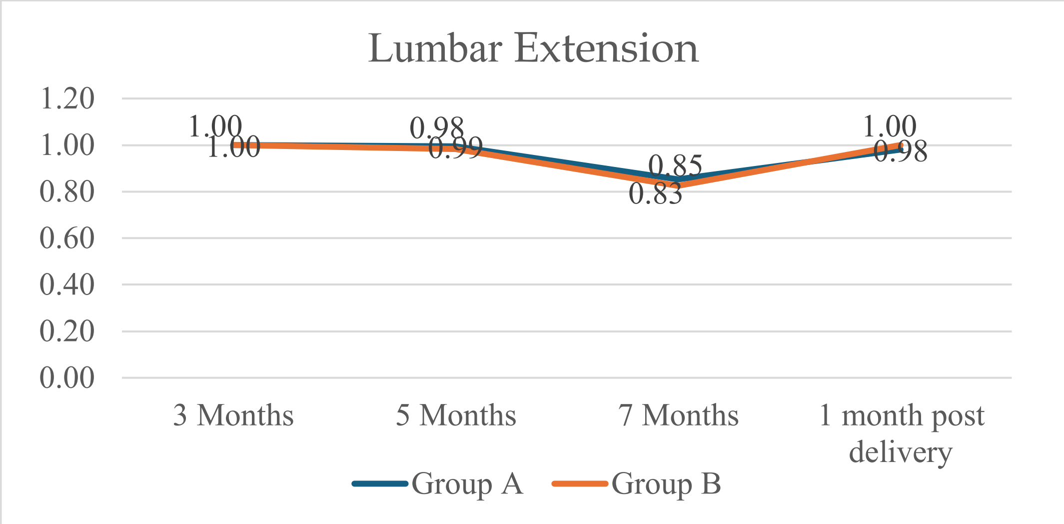
An unpaired t-test was performed to compare Group A and Group B. The above graph shows that the P-value at the 3rd month is greater than 0.05, the P-value at the 5th month is less than 0.05, the P-value at the 7th month is also less than 0.05, and the P-value at 1 month post-delivery is less than 0.05. explaining the positive effect of exercises on Lumbar lordosis.

Figure 2:



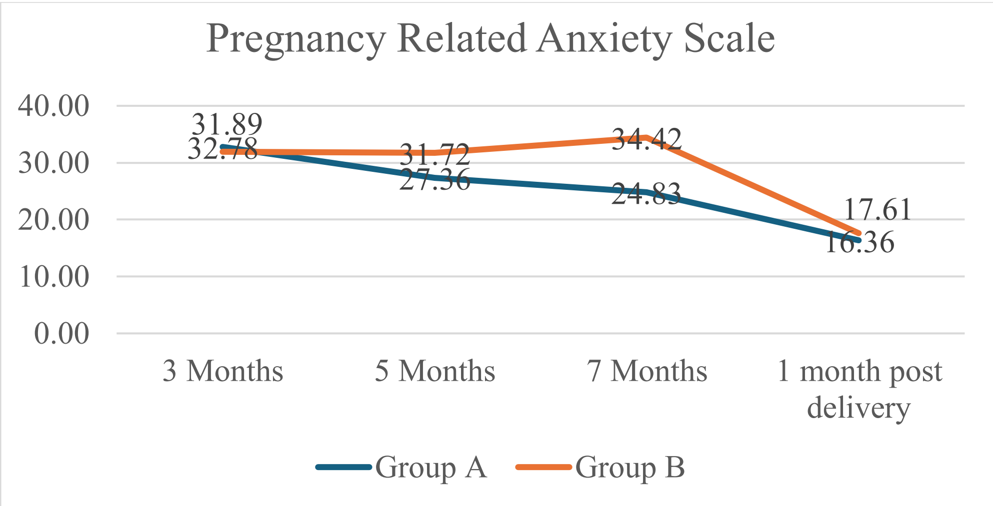
Interpretation: Repeated Measures ANOVA (RMANOVA) to test the change across different time points in Group A and Group B. The above graph shows, change in lumbar Flexion Range across different time points in Group A and Group B. The P-value is less than 0.05 for both groups.
An unpaired t-test was conducted to compare Group A and Group B. The P-value was greater than 0.05 for the 3rd month, 7th month, and 1 month post-delivery, indicating no significant differences between the groups during these times. However, the P-value was less than 0.05 for the 5th month.

Figure 3



Interpretation: The above graph shows, change in lumbar Extension Range across different time points in Group A and Group B. The P-value is less than 0.05 for both groups. There is no significant difference between Group A and Group B at 1 month, 3 months, 5 months, and 7 months post-delivery, as the P-value is greater than 0.05

Figure 4:



Interpretation: The observed P-value is less than 0.05 for both groups, suggesting that there are significant changes in pregnancy-related Anxiety the change across different time points of Pregnancy in Group A and Group B. When Group A is compared with Group B. group A shows a significant decline in Anxiety, as the P-value is Less than 0.05.

DISCUSSION:

This study was conducted to investigate the effects of interventions focusing on core activation, maintaining muscle balance, and posture correction on Lumbar lordosis, Lumbar Range of motion, and pregnancy-related anxiety during pregnancy. Seventy-two pregnant women in the 20 -35 age group were recruited. Who were healthy primigravida.

Pregnancy induces several biomechanical and physiological changes that impact lumbar lordosis, lumbar range of motion (ROM), the balance of muscles in the lumbopelvic-hip complex, and posture. Graph 1 shows that the lumbar lordosis has significant changes across the different time points in both groups. In the same graph, we can see that the changes are less in Group A, which is a trial group, when compared to Group B, which is a control group. This can be because Group A has been given the structured exercise program, which focuses on the muscles that provide stability to the spine.

Pregnancy-related changes that are shifts of COG anteriorly, which often lead to muscle imbalances: abdominal muscles (especially transverse abdominis) weaken while lumbar extensors may become overactive, affecting pelvic alignment and lumbar lordosis. The exercise program is focused on the Lumbopelvic Musculature. The Transvers abdominis (TrA) muscle contracts the Diaphragm, and the pelvic floor muscle contracts in synchrony with the TrA muscle. This mechanism has a significant effect that improves spinal stability and maintains the length-tension relationship of these muscles.

Gojko Skundric, Veljko Vukicevic, in their systematic review, say that improving the stability of the core and pelvic muscles, through regular exercise, can improve and eliminate pain in the lower back. Further, they mention that Core stability has a very positive effect on the prevention of an increase in lumbar lordosis.[8] Maryam Kashaniana, Zahra Akbari T concluded in their study that the lordosis angle had increased after 2 months in both groups(experimental and Control), indicating a physiologic process during pregnancy, but the increase was greater in the control group.[9]

The study found that there is a reduction in the Lumbar range of Motion during the different time points of the pregnancy, but there is no significant difference found between the experimental and control groups. As the anterior load of the trunk increases as the pregnancy progresses and women feel discomfort during the pending activities, along with this increase in lumbar lordosis, there is an increase in anterior pelvic tilt, leading to relative hip flexion. According to Luca Vismara, Francesco Menegoni, the reduced ROM of the spine is due to reduced mobility at both pelvic and thoracic levels; a static postural adaptation with an increased anterior pelvic tilt and increased lumbar lordosis.[10]

The study shows the changes in pregnancy-related anxiety at different time points in both groups. There is a significant increase, but when we compare group A and Group B, Group A shows a lower Anxiety score. Exercises are known to increase the feeling of well-being. Relaxation and spinal stability exercises during pregnancy have been studied for their impact on pregnancy-related anxiety, showing promising benefits for reducing distress and improving psychological well-being in pregnant women. V. Salmon et al concluded pelvic floor muscle exercises, a form of targeted spinal stability training during pregnancy, are effective for urinary incontinence prevention and may indirectly improve well-being by enhancing confidence and physical function during pregnancy, which could relate to anxiety reduction.[11] The system review done by K. Curtis, A. Weinrib, and J. Katz found that the exercises and relaxation have a positive effect on Anxiety in Pregnant women [12]

CONCLUSION:

Structured lumbopelvic hip complex stability exercises reduce Lumbar lordosis progression and pregnancy- related anxiety during pregnancy. But it has a limited impact on lumbar ROM.

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