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Optimizing Pelvic Rocking with Gym Ball to Reduce Low Back Pain in Pregnancy

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ABSTRACT

Low Back Pain (LBP) is discomfort due to physiological changes during pregnancy that will have an impact on the quality of life of pregnant women, such as decreased physical mobility, reduced sleep quality, and increased psychological stress. The high prevalence of LBP in pregnancy ranges from 24% to 90%. Therefore, it is necessary to strive for pain management that is easy to do, has minimal side effects for pregnancy, and can be done independently by pregnant women, with minimal equipment and low costs. Using a gym ball in pelvic rocking exercises can stretch the pelvic muscles and increase levels of the beta-endorphin hormone, which can reduce pain. This study aims to analyze using a gym ball in pelvic rocking exercises to minimize the pain scale of low back pain in pregnancy. This research design is a quasi-experiment with a Pre-test, Post-test, and Nonequivalent Control Group Design. The sampling technique in this research was Purposive sampling, with 30 respondents divided into two groups. The instrument used was the Visual Analog Scale (VAS) to assess the level of the LBP pain scale. Data analysis used the t-test. The results of statistical tests show a p-value of 0.000 (p-value<0.05), so it can be concluded that using a gym ball in pelvic rocking exercises affects the LBP scale in pregnancy.

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INTRODUCTION

During pregnancy, a woman's body experiences several hormonal and biomechanical adjustments that cause discomfort (Berber & Satılmış, 2020). Anatomical and hormonal changes, increased body weight, and changes in the size and position of the uterus contribute to a shift in the center of gravity of a pregnant woman's body. This increases the load on the axial skeleton, such as the spine, which causes an increase in the lumbosacral angle, changes in the center of body weight, and compensatory changes in body posture because these biomechanical changes can trigger low back pain (LBP) (Bryndal et al., 2020; Casagrande et al., 2015). LBP is pain between the costal margin and the inferior gluteal fold and increases in intensity with advancing gestational age (Maternity & Ermasari, 2022; Sencan et al., 2018)

Low Back Pain is axial or parasagittal discomfort in the lower back or waist and above the sacrum. LBP is primarily musculoskeletal and caused by mechanical, circulatory, hormonal, and psychosocial factors (Carvalho et al., 2017). In the biomechanical process of pregnancy, the center of gravity moves forward due to an increase in the size of the uterus and breasts, which causes changes in body posture, such as plantar descent, knee hyperextension, and pelvic anteversion. These changes cause lumbar lordosis, which results in tension in the paraspinal muscles and compression of large blood vessels by the uterus, causing decreased blood flow to the spine, which can cause lower back pain, especially in the final trimester of pregnancy (Katonis et al., 2011).

Risk factors associated with low back pain during pregnancy include a history of low back pain during menstruation, having a history of low back pain, and age; it is known that the younger a woman is during pregnancy, the greater the possibility of experiencing LBP during pregnancy. Increased body weight is also identified as a risk factor because more significant weight gain during pregnancy can lead to sacroiliac joint instability and increased lumbar lordosis, which results in pain (Berber & Satılmış, 2020; dos Santos & Gallo, 2010; Katonis et al.,

2011). Several other factors influence LBP, such as Body Mass Index (BMI), ergonomic position, smoking, and exercise habits (Rahmawati, 2021).

The prevalence of LBP in pregnancy ranges from 24% to 90% but is most often estimated to be ≥50% (Aydın et al., 2015; Casagrande et al., 2015; Franke et al., 2014). The prevalence increases with the duration of pregnancy and reaches its highest point in the third trimester. Pain can continue during the first year postpartum. In fact, in 20% of women, pain continues until three years postpartum (Berber & Satılmış, 2020; Bryndal et al., 2020; Franke et al., 2014) Therefore, LBP in pregnancy that does not receive early treatment can have an impact on reducing the quality of life of pregnant women, such as limited physical mobility, increased psychological stress, sleep disorders, decreased capacity to work, disruption of social and sexual life, long-term back pain and increased pain during childbirth, this condition can increase health costs incurred during pregnancy. LBP is often considered a "normal" pregnancy discomfort, and some researchers suggest that it is caused by a lack of knowledge of health professionals, resulting in low recommendations for treating LBP (Bryndal et al., 2020; Davenport et al., 2019; Sousa et al., 2015).

Management of low back pain during pregnancy has become a topic of increasing research interest in recent years. Management usually focuses on administering analgesic drugs, which have side effects on pregnancy. The literature shows that a physical activity program carried out 4 to 12 weeks during pregnancy significantly reduces low back pain and functional disability and the number of sick leave days (Barbier et al., 2023; Casagrande et al., 2015). Several studies report that non-pharmacological methods that can be used are acupuncture, acupressure, osteopathic manipulation, yoga, physical activity, massage, relaxation techniques, and exercise/special training during pregnancy, which has been proven to reduce pain compared to routine care during pregnancy (Bishop et al., 2016; Davenport et al., 2019; Diez-Buil et al., 2024; Sonmezer et al., 2021).

The International Society of Obstetrics and Gynecology recommends that pregnant women who do not have medical complications do moderate-intensity exercise for 30-45 minutes and stretching and muscle strengthening exercises twice a week while paying attention to contraindications(Barbier et al., 2023; Barker & Eickmeyer, 2020; Kinser et al., 2017; Kisner et al., 2017). Pelvic Rocking is an exercise that can be done during pregnancy (Elkheshen et al., 2016).

Pelvic rocking is a pelvic movement exercise to tighten the pelvic muscles; it can be done using a gym ball by shaking the pelvis from side to side, front and back, and rotating. This exercise can reduce muscle tension, affect flexibility, strength, and muscle control, and trigger the release of endorphins, which can reduce pain. The movement in pelvic rocking exercises creates a feeling of comfort and relaxation, strengthens the abdominal and waist muscles, reduces pressure on the blood vessels in the uterine area, and reduces pressure on the bladder (vesica urinaria). Pelvic rocking can maintain spinal posture in good condition, thereby reducing Low Back Pain (Elkheshen et al., 2016; Rohmah, 2022). Pelvic rocking exercises can be done independently easily and are self-management pain relievers that require minimal equipment at a low cost (Elkheshen et al., 2016; Lestari, 2020).

This research presents a novel approach that combines pelvic rocking movements and the use of a gym ball as an intervention for lower back pain during pregnancy. While pelvic rocking exercises have been studied in various contexts, the use of a gym ball, specifically in the context of pregnancy-related low back pain, is less explored.

The use of a gym ball in this research is a distinguishing factor, as it offers an unstable surface that enhances balance, stability, and muscle engagement during exercise. The gym ball's elastic properties help to support the body during the exercises, making them safer and more effective for pregnant women. Additionally, the gym ball's role in facilitating proper posture and spinal alignment during movement provides an additional benefit not commonly emphasized in previous studies.

Thus, this research contributes new insights into combining specific pelvic rocking movements with the gym ball, offering a practical and accessible non-pharmacological intervention for managing low back pain in pregnancy.

METHOD

This research uses a quasi-experimental approach with a pre-test and post-test nonquivalent control group design. The sampling technique uses purposive sampling. Samples in the control group received routine pregnancy care. Pregnant women in the intervention group were given pelvic rocking exercises using a gym ball, carried out in 8 sessions divided into 2 times per week for 4 weeks. The duration of the pelvic rocking exercise refers to the recommendations of

the American College of Obstetricians and Gynecologists regarding physical activity and exercise in pregnancy, for 30 minutes per session, including warming up and the main movement of pelvic rocking can be carried out by: 1) Sit on the gym ball with feet flat on the ground, ensuring the pelvis is higher or level with the knees. 2) Bouncing: Sit on the gym ball and make an up-and-down motion to adjust to the ball's balance. 3) Side to Side: Sit on the gym ball while moving the hips left and right. 4) Pelvic Tilt: Sit on the gym ball while moving the hips forward and backward 5) Pelvic Circle: Sit on the gym ball and perform circular hip movements to the right and left. 6) Cat and Cow: Kneel on the floor while hugging the gym ball. Align the knees and feet with the hips, and perform pelvic tilts by raising and lowering the hips, coordinating the breath with slow inhalation and exhalation.

The gym ball used in this study is constructed from PVC (Polyvinyl Chloride), featuring anti-burst and anti-slip properties that enhance its elasticity and resistance to rupture. These features ensure the gymball can bear weight and maintain stability during use. The size of the gym ball is selected based on the respondent's height to optimize the effectiveness of the exercises, especially for balance and posture. 1) For individuals with a height of less than 150cm, a 55cm diameter gymball is used. 2) For individuals with a height between 150-160cm, a 65cm diameter gymball is used. 3) For individuals taller than 160cm, a 75cm diameter gymball is used.

A total of 30 pregnant women with complaints of LBP who were registered at the JnC Family Care Clinic in Metro City were included in the sample for this study. The inclusion criteria in this study were pregnant women with a gestational age of ≥ 22 weeks with LBP. Meanwhile, the exclusion criteria for this study are multiple pregnancies, a history of cardiovascular disease, medical complications (bleeding, preeclampsia, placental abruption, placenta previa), contraindications for physical exercise (for example, suffering from other severe musculoskeletal diseases, high-risk pregnancy, balance deficiency) and the patient had received LBP treatment.

The instrument used in this research was a questionnaire form to determine the sociodemographic characteristics of the sample and pregnancy information. Pain level measurement in this study used the Visual Analog Scale (VAS), which is reliable for assessing the severity of LBP (Shafshak & Elnemr, 2021). VAS is a 100mm horizontal or vertical line with 0mm indicating no pain and 100mm very painful. The scoring method on VAS is determined by measuring the distance (mm), and the patient is given a mark in the score range of 0-100. The interpretation of the score on the VAS is no pain (0-4mm), mild pain (5-44mm), moderate pain (45-74mm), and very painful (75-100mm). Pain measurements were carried out before and after the intervention. The pre-test was conducted before the first session of the intervention, while the post-test was carried out after four weeks or after the completion of eight intervention sessions. Assessing after 8 sessions allows for a more comprehensive understanding of the cumulative effects of pelvic rocking exercises using the gym ball, as the impact on low back pain may require time to manifest. By evaluating the end of the intervention, we ensure that the pain reduction observed is not just short-term relief but a more sustainable outcome that results from the full intervention protocol.

The ethical feasibility test was conducted at the Health Research Ethics Commission, Universitas Malahayati, and was declared ethically feasible with letter number 4546/EC/KEP-UNMAL/VII/2024.

The data analysis used in this research was carried out in 2 stages. Univariate analysis determined the average pain scale in the control and intervention groups. In contrast, bivariate analysis was used to determine the effect of using a gym ball in pelvic rocking exercises on the LBP pain scale. The statistical test used is the t-test (t-test).

RESULTS

Table 1 shows that most respondents were aged 20-35 in the intervention group (86.67%) and the control group (93.33%). The majority of respondents in this study had a Bachelor's degree in education level, 60% in the control group and 66.6% in the intervention group. Housewife is the job held by most respondents in this study, 66.67% in the control group and 46.67% in the intervention group. Regarding parity, the control group was dominated by primigravida pregnant women at 66.67%, while in the intervention group, most respondents were multigravida pregnant, 60%. Looking at exercise habits, most respondents in this study had the habit of exercising <30 minutes every 3-5 times/week, both in the control group at 60% and the intervention group at 66.67%. Risk factors for ergonomic positions when working: The majority of respondents in this study experienced Awkward Posture during work/activities, bending for long periods,

reaching, kneeling, squatting, or twisting any part of the body, both in the control group were 46.67 % and intervention group 60%.

Table. 1 Respondents' characteristics

Respondent characteristics	Group			
	Control		Intervention	
	n	%	n	%
Age (years)				
<20	1	6.67	2	13.33
20-35	14	93.33	13	86.67
Total	15	100	15	100
Level of education				
Senior High School	4	26.67	4	26.67
Bachelor degree	9	60	10	66.67
Master degree	2	13.33	1	6.67
Total	15	100	15	100
Employment				
Housewife	10	66.67	7	46.67
Teacher	3	20	4	26.67
Wiraswasta	2	13.33	4	26.67
Total	15	100	15	100
Parity				
Primigravida	10	66.67	6	40
Multigravida	5	33.33	9	60
Total	15	100	15	100
Physical exercise				
Not doing sports	2	13.33	2	13.33
<30 minutes every 3-5 times/week	9	60	10	66.67
30 minutes every 3-5 times/week	4	26.67	3	20
Total	15	100	15	100
Ergonomic position when working				
Awkward posture	7	46.67	9	60
Statis	3	20	2	13.33
Repetition	4	26.67	3	20
Excessive use of energy	1	6.67	1	6.67
Total	15	100	15	100

Table 2. Average pain scale before and after in the control group

Pain Scale	N	Mean	SD	Min	Max
Pre-test	15	60.20	6.5	48	71
Post-test		53.47	4.5	46	61

Based on Table 2, the average pain scale in pregnant women with LBP in the Control Group during the pre-test data collection was 60.20, with a standard deviation value of 6.5, a minimum value of 48, and a maximum value of 71. Meanwhile, the average pain scale in pregnant women with LBP during the post-test data collection was 53.47, with a standard deviation value of 4.5, a minimum value of 46, and a maximum value of 61.

Table 3. Average pain scale before and after pelvic rocking exercise using a gym ball in the intervention group

Pain Scale	N	Mean	SD	Min	Max
Pre-test	15	59.20	11.03	37	72
Post-test		20.07	5.14	12	34

Based on Table 3, it is known that the average pain scale in pregnant women with LBP before being given pelvic rocking exercise intervention using a gym ball was 59.20, with a standard deviation value of 11.03, a minimum value of 37, and a maximum value of 72. Meanwhile, the average pain scale in Pregnant women with LBP after being given pelvic rocking exercise intervention using a gym ball was 20.07 with a standard deviation value of 5.14, a minimum value of 12, and a maximum value of 34.

Table 4. Effect of using gym balls in pelvic rocking exercises on pain scale in pregnancy

Group	Pain Scale	N	Mean	Beda Mean	SD	*p-Value*
Control	Pre-test	15	60.20	6.73	6.11	0.000
	Post-test		53.47			
Intervensi	Pre-test	15	59.20	39.13	11.78	
	Post-test		20.07			

Table 4 shows that the average difference in the LBP pain scale in the control group is 6.73, with a standard deviation of 6.11. Meanwhile, the average difference in the pain scale in the intervention group was 39.13, with a standard deviation of 11.78. Statistical test results, p-value show a value of 0.000 (p-value<α=0.05), which means there is an influence of using a gym ball in pelvic rocking exercises on the Low Back Pain (LBP) pain scale in pregnancy.

DISCUSSION

Comparison of pain scale in intervention and control group

The average pain scale of the control group in the pre-test and post-test assessments decreased but remained in the same range, with moderate pain. This research is in line with studies conducted by Saptyani et al. (2020), which stated that there was a decrease in the pain scale in the

control group. This research is also in line with studies conducted by Ifalahma et al. (2024) regarding remodeling pregnancy exercises with pelvic rocking exercises as management of back pain in pregnant women, which states that respondents in the control group had a decrease in the pain scale but were still in the same category both in pre-test and post-test data collection.

Pregnancy has a significant physiological effect on a pregnant woman's body, impacting the musculoskeletal system. Hormonal changes accompanied by an increase in body mass cause a shift in the center of gravity, which will increase the dynamic load on the axial skeleton, which will trigger Low Back Pain in pregnancy. An enlarged and stretched uterus will put additional pressure on the lumbar muscles, causing a loss of tone and strength of the abdominal muscles. In addition, the pelvis will rotate sagittally towards the sacrum bone, the fulcrum. As a result, hyperlordosis will occur, and the pregnant woman's center of gravity shifts towards the front, which creates additional flexion in the spine and increases the load on the spinal muscles. Shifting the center of gravity anteriorly also causes a more significant load on the sacroiliac ligament. As pregnancy progresses and the size of the uterus increases, the sacroiliac ligaments become lax and allow increased anterior rotation of the pelvis and exacerbate hyperlordosis of the spine, which places more significant pressure on the pelvis and lower back (Casagrande et al., 2015).

Factors associated with LBP in pregnancy include gestational age, weight gain during pregnancy, body posture, anxiety, smoking habits, level of physical activity, parity, and history of LBP in previous pregnancies (Berber & Satılmış, 2020). According to a study conducted by Kovacs et al. (2012), Other factors related to LBP in pregnancy are education, age, number of hours worked, Body Mass Index (BMI), exercise habits, and ergonomic position when working or doing activities.

Respondents in this study had a gestational age of ≥22 weeks, and most were multigravida. According to Ifalahma et al. (2024), back pain/LBP will increase with increasing gestational age, especially in the third trimester, because it is caused by the increasing burden on the mother by the growing fetus; besides that, high parity also increases the risk of LBP. Based on the characteristics of the respondents in this study, they were in the age range of 20-35 years, according to a study conducted by Rahmawati (2021). Regarding the risk factors for LBP, it is stated that as age increases, degeneration will occur in the form of tissue damage, tissue replacement, and fluid reduction. This causes the stability of the bones and muscles to decrease, and the elasticity of the bones decreases, which triggers the symptoms of LBP.

The average pre-test pain scale in the intervention and control groups was in the moderate pain range, possibly related to the respondent's exercise habits. Most respondents exercised <30 minutes every 3-5 times/week. Research conducted by Megasari (2015) revealed that back pain was experienced by 61.5% of pregnant women who did not exercise during pregnancy. According to Tsakiridis et al. (2020), Implementing a healthy lifestyle, including physical activity, is reported to be beneficial in pregnancy because it can prevent musculoskeletal pain, prevent excessive weight gain, and have a positive influence on the psychological health of pregnant women in dealing with the physical changes that occur during pregnancy. ACOG recommends 150 minutes per week of exercise during pregnancy or 20–30 minutes daily.

Recommendation non-pharmacological treatments to reduce LBP in pregnancy are prenatal yoga and exercise. Exercise in pregnancy can reduce various disorders that generally occur during pregnancy, such as dilation of blood vessels, back pain, and muscle and joint pain. Exercise during pregnancy can relieve complaints of back pain because it can strengthen and maintain the elasticity of the abdominal wall muscles, ligaments, pelvic floor muscles, buttocks, back, and shoulders, and it can also improve body posture in anticipation of a shift in gravity towards the anterior (Coulombe et al., 2017; Ifalahma et al., 2024). Pelvic rocking is an exercise that can be done during pregnancy. Using a gym ball for exercise effectively reduces low back pain by improving posture, flexibility, and core strength. The movements involved in pelvic rocking exercises include 1) Bouncing, 2) Side to Side, 3) Pelvic Tilt, 4) Pelvic Circle, and 5) Cat and Cow. According to the recommendations of the American College of Obstetricians and Gynecologists, physical activity and exercise can be performed for 30 minutes per session, conducted in 8 sessions over 4 weeks, with 2 sessions per week. It aims to maintain pelvic muscle tone and relieve back pain.

The results of this study show that the average pre-test and post-test pain scale in pregnant women with LBP in the intervention group who were given pelvic rocking exercises using a gym ball decreased from 59.20 to 20.07. In line with studies conducted by Gustiani et al. (2023) regarding the Effect of Pelvic Rocking Exercise on lower back pain in third-trimester pregnant women,

it was stated that there was a decrease in the intensity of back pain in the intervention group given pelvic rocking by 4.75. The data in the results of this study show that pelvic rocking can reduce the pain scale in LBP in the intervention group. Research data shows that the intervention group's pain scale decreased from moderate to mild pain. Pelvic rocking movements strengthen the muscles in the pelvis, waist, and back, releasing tension in the lower back and reducing LBP.

Effect of pelvic rocking exercise with gym ball on low back pain

This research shows an influence of using a gym ball in pelvic rocking exercises on the Low Back Pain cale in pregnancy. In line with the studies conducted by Ifalahma et al. (2024) regarding remodeling pregnancy exercises with pelvic rocking exercises as management of back pain in pregnant women and research conducted by Rohmawati et al. (2023) regarding the effect of pelvic rocking on back pain intensity in third-trimester pregnant women which states that pelvic rocking is effective in reducing back pain in pregnancy.

Pelvic rocking is an effective way to relax the lower body, especially the pelvic area. Pelvic rocking exercise is recommended during pregnancy, especially in the third trimester until delivery, to increase relaxation and help the fetus descend into the birth canal. Lestari (2020) states that regular pelvic rocking exercises during pregnancy can trigger the release of endorphin hormones, causing feelings of comfort. Additionally, pelvic rocking can help reduce muscle tension, improve body posture, and increase blood circulation, thereby reducing pain during pregnancy (Ifalahma et al., 2024; Yanti & Sukmaningtyas, 2020).

In this study, pelvic rocking was carried out by rotating the pelvis from right to left, front and back. This movement is very effective in reducing the intensity of back pain in pregnancy according to a study conducted by Yanti & Sukmaningtyas (2020) states that the pelvic rocking exercise mechanism by rotating the hips and waist will reduce pressure on the waist so that the back muscles stretch and relax. Pelvic rocking can be done standing, lying, sitting, or half-squatting. Pregnant women can use a gym ball to make pelvic rocking exercises easier during pregnancy. Pelvic rocking can be done at the same time as pregnancy exercises because it is related to stretching and strengthening the back muscles, which can reduce the intensity of back pain felt by pregnant women. Pregnancy exercise movements are accompanied by relaxation techniques that can release endorphin hormones that can cause comfort. Apart from being used to relieve back pain, pelvic rocking can also help lower the baby's head into the pelvic cavity so that it can facilitate the birth process. Pelvic rocking is not only used to maintain pelvic elasticity but also to maintain abdominal muscles and is effective in relieving back pain in pregnancy (Megasari, 2015; Tsakiridis et al., 2020; Yanti & Sukmaningtyas, 2020).

As a result of the research, supported by previous studies and existing theories, the author assumes that low back pain, or LBP, is a discomfort often experienced by pregnant women, especially in the last trimester of pregnancy. This discomfort is caused by physiological changes that occur during pregnancy. However, if it is not treated, it can have an impact on reducing the quality of life of pregnant women. So, it is necessary to strive for pain management that is easy to do, has minimal side effects for pregnancy, and can be done independently by pregnant women, with minimal equipment and low costs. Pelvic rocking exercises can treat LBP in pregnancy by reducing muscle tension, improving body posture, and increasing blood circulation. Apart from that, pregnant women can do pelvic rocking independently with minimal equipment and low cost.

CONCLUSION

Pelvic rocking exercises using a gym ball are effective in reducing the pain intensity associated with low back pain during pregnancy. Therefore, Pelvic rocking exercises using a gym ball, incorporating movements such as bouncing, side-to-side, pelvic tilt, pelvic circle, and cat and cow, may be an effective non-pharmacological intervention for alleviating low back pain during pregnancy.

CREDIT AUTHOR STATEMENT

AE: 1) Conducting field studies, pre-surveys, and literature review 2) Designing the research concept 3) Preparing the tools, materials, and research instruments 4) Administering the pelvic rocking intervention and observing the pain scale in LBP (low back pain) 5) Coordinating the implementation of the study (data collection, data analysis, and data interpretation). 6) Taking responsibility for preparing the research report and research outputs 7) Preparing and conducting monitoring and evaluation. **RW**: 1) Preparing and

submitting research permission documents 2) Assisting in preparing the tools, materials, and research instruments 3) Administering the pelvic rocking intervention and observing the pain scale in LBP 4) Assisting with the implementation of the research 5) Producing the research outputs 6) Documenting the research activities.

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