

# **8 LOW BACK PAIN DURING PREGNANCY**

#### Gökhan ÖZKOÇAK, Özge Mine YILMAZ, Duygu YILMAZ

Pregnancy is a process that profoundly affects the human body, particularly the musculoskeletal system. Hormonal changes lead to the relaxation of ligaments that stabilize the joints, weight gain, and a shift in the body's center of gravity, resulting in an increase in lumbar lordosis and the occurrence of anterior pelvic tilt. Additionally, changes in the vascular system can impact the metabolic support to the lumbar region. Among the most common musculoskeletal issues during pregnancy is low back pain (Casagrande et al., 2015). Low back pain during pregnancy is a significant problem that restricts the quality of life for many women worldwide and can arise due to various factors, primarily mechanical and hormonal changes occurring during pregnancy. Low back pain typically begins in the second trimester, around the 22nd week of gestation. It is estimated that approximately 56% of pregnant individuals experience low back pain at some stage of their pregnancy. As the uterus expands during pregnancy, it causes tension in the abdominal muscles, leading to their weakening. This weakened abdominal support places additional strain on the back muscles (Sneag & Bendo. 2007). Consequently, this shift causes the center of gravity to move forward due to the enlarging uterus, leading to an exaggerated curvature of the lower spine. This shift increases the bending forces on the lumbar spine and places greater strain on the supporting muscles.

Low back pain during pregnancy is associated with morbidity during the pregnancy and postpartum period. In one out of ten women who experience low back pain during pregnancy, persistent pain continues into the postnatal period and can last up to two years (Sehmbi et al., 2017). Postnatal low back pain is defined as low back pain that begins within three months after childbirth and lasts for at least six weeks. Several factors are associated with postnatal low back pain, including a history of low back pain during pregnancy, young age, and excessive body weight. Additionally, it can be attributed to hormonal changes during pregnancy that increase connective tissue elasticity, weakness in muscle tissue, and spinal osteoporosis observed during the breastfeeding period.

The changes during pregnancy have physical, cultural and biopsychosocial dimensions. Changes in body image, emotional fluctuations experienced by the pregnant woman, environmental factors, and isolation from work and social life deeply affect the individual. Physical problems experienced during pregnancy should be addressed with a biopsychosocial approach, and a multidisciplinary team, including physiotherapists, physicians, dietitians, psychologists, family, and social circles, should work together to improve the health of the pregnant woman. The changes in body systems during pregnancy are as follows:



## 8.1 Changes that occur during pregnancy

#### 1. Musculoskeletal System Changes

- The increased level of relaxin during pregnancy reaches its peak, particularly in the third trimester. The hormone relaxin causes joint laxity, making the pelvic joints more flexible, thereby facilitating the passage of the fetus. Progesterone hormone also contributes to this process. The laxity in the joints continues until the sixth month postpartum (Ireland & Ott, 2000).
- Significant hormonal changes, along with the increase in body mass and the weight of the uterus, cause the center of gravity to shift forward. The growing abdomen due to the baby's growth also reveals postural adaptations. With the forward shift in the center of gravity, an increase in lumbar lordosis is observed, and to compensate for this increase, curvatures in the cervical and lumbar spine may also occur (Picture 1) (Demaio & Magann, 2009).



Figure 1 : Illustration demonstrating anterior pelvic tilt and compensatory hyperlordosis.



 Anterior tilt of the neck and hyperextension of the head may also increase (Picture 2) (Sarıyıldız et al., 2022).



Figure 2 Postural changes in pregnancy.

As the mammary glands develop, the growing breasts may cause shoulder protraction to compensate for the load on the musculoskeletal system (Barbosa et al., 2012). Changes in the levels of relaxin, estrogen, and progesterone result in increased elasticity of connective tissue (Uzelpasaci Esra & Kaya Serap, 2016).



- The abdominal muscles, which support spinal and pelvic stability, stretch to their elastic limits during pregnancy. The distance between the two rectus abdominis muscles increases, a condition known as diastasis recti (Sarıyıldız et al., 2022). Excessive separation can lead to weakened abdominal muscles and functions, impaired pelvic stability, resulting in pelvic pain and gait disturbances (Liaw et al., 2011).
- Mechanical stress on the joints increases with weight gain, especially towards the third trimester (Sarıyıldız et al., 2022).
- There may be a decrease in the height of the medial arch of the foot (Chiou et al., 2015).
- Pregnant women experiencing a shift in their center of gravity and restricted mobility in their new body may have reduced balance and a related fear of falling (Conder et al., 2019).
- Adaptations to improve stability, such as a slower walking speed with reduced step length, increased step width, shorter swing phase, longer stance phase, and longer double support phase, may be observed as the trimesters progress (Conder et al., 2019).
- Fluid retention becomes more pronounced in the third trimester, leading to soft tissue edema in the lower extremities. Edema can also cause joint effusion and peripheral nerve compression (Sarıyıldız et al., 2022).

#### 2. Changes on the Cardiopulmonary System

- During pregnancy, blood volume increases, which leads to an increase in the amount of blood returning to the heart. The stroke volume increases by an average of 20-30%. To meet the fetus's needs, the heart rate increases by approximately 15 beats per minute (San-Frutos et al., 2011).
- Changes in respiratory rate led to increased oxygen consumption and ventilatory volume. With the increase in maternal heart rate and stroke volume, cardiac output increases by 30-50%, reaching approximately 8.7 L/min (Shivakumar et al., 2011).
- Additionally, during pregnancy, the heart shifts superiorly and anteriorly, ventricular muscle mass increases, and valve diameter enlarges. The end-diastolic volume increases, contributing to the increased ventricular mass. Although the heart enlarges physiologically, there is no change in ejection fraction (Kametas et al., 2001).
- Blood flow to the kidneys and breasts also increases, and the increase in cardiac output is essential to meet the increased basal oxygen consumption (Uzelpasaci Esra & Kaya Serap, 2016).
- During pregnancy, the neck thickens, and edema in the upper respiratory tract, including the larynx and pharynx, increases (Uzelpasaci Esra & Kaya Serap, 2016).



- As the uterus enlarges and abdominal pressure increases, the diaphragm rises by up to 4 cm. The increase in relaxin and progesterone levels causes the ligaments between the ribs and sternum to relax, leading to an increase in the subcostal angle of the rib cage from 68.5 to 104.5 degrees (Hegewald & Crapo, 2011).
- With the elevation of the diaphragm and decreased compliance of the chest wall, total lung capacity decreases by 5% (Uzelpasaci Esra & Kaya Serap, 2016).
- Oxygen consumption increases by 30%, and metabolic rate increases by 15%. Tidal volume increases from 500-700 mL by 30-50%, and respiratory rate increases by 1-2 breaths per minute. Within 48 hours postpartum, lung volumes, residual volume, and functional residual capacity return to normal (Uzelpasaci Esra & Kaya Serap, 2016).

#### 3. Hematological changes

- By the 7th week of gestation, blood volume increases by 10-15%, reaching its maximum value between the 30th and 34th weeks. This 1–2-liter increase in blood volume is crucial for the uterus and kidneys. This increase in blood volume is an adaptation to counteract blood loss during childbirth.
- Although most of the weight gained during pregnancy is due to the combined growth of the uterus, fetus, and breasts, the increase in blood volume, fluid leakage into extracellular tissues, and water retention increase the risk of edema.
- With increased erythropoietin secretion in the liver, red blood cell production also rises. As pregnancy progresses, the need for iron increases. Insufficient iron intake can lead to complications such as preterm birth and miscarriage (Uzelpasaci Esra & Kaya Serap, 2016).
- The risk of venous thromboembolism increases fourfold (Heit et al., 2005).

#### 4. Changes in the hormonal system

During pregnancy, changes occur to meet the needs of both the mother and the baby.

During pregnancy, especially the hormones GnRH (gonadotropin-releasing hormone) and CRH (corticotropin-releasing hormone) increase and affect the placenta. GnRH is important for the development of the placenta, while CRH is crucial for the initiation of labor (Majzoub et al., 1999).



- The secretion of ACTH (adrenocorticotropic hormone) and CRH (corticotropin hormone) during pregnancy raises cortisol levels. By the end of pregnancy, cortisol levels in serum and urine increase threefold (Mastorakos & Ilias, 2003).
- To prepare for breastfeeding after childbirth, prolactin levels increase from the anterior pituitary gland during pregnancy. In non-breastfeeding postpartum women, prolactin levels decrease after birth (Uzelpasaci Esra & Kaya Serap, 2016).
- In pregnant women, the secretion of aldosterone nearly doubles, and by the end of pregnancy, it is twice as high. Aldosterone and estrogen affect renal tubules, causing excessive sodium reabsorption, making individuals prone to hypertension (Stephenson, 2000).
- Changes in carbohydrate and fat metabolism occur, with an increase in insulin secretion. Due to glucose utilization, fasting glucose levels decrease by 10-20%, and insulin resistance may develop (Uzelpasaci Esra & Kaya Serap, 2016).
- Research on relaxin physiology indicates that relaxin is a pregnancy hormone that increases laxity in the symphysis pubis and sacroiliac joints to facilitate childbirth. The relaxin hormone increases the water content of connective tissue and stimulates fibroblasts for collagen production. Particularly peaking between the 38th and 42nd weeks of pregnancy, the relaxin hormone weakens soft tissue by approximately tenfold, leading to increased joint laxity (Ponnapula & Boberg, 2010).
  - 5. Changes in the gastrointestinal system
- As pregnancy progresses, the mechanical effect of the growing uterus and the increase in progesterone levels cause a delay in gastric emptying.
- In addition to abdominal bloating and constipation, nausea and vomiting are commonly reported.
- Increased placental production of gastrin leads to an increase in gastric acid.
- The decrease in esophageal sphincter tone due to rising progesterone levels causes symptoms such as reflux and heartburn (Uzelpasaci Esra & Kaya Serap, 2016).
  - 6. Changes in the urinary system
- The kidneys move superiorly due to the growing uterus. Interstitial fluid, dead space, and increased vascularization can cause them to enlarge by 1 cm (Lindheimer et al., 2001).



- Bladder tone decreases, leading to symptoms such as polyuria and incontinence. These symptoms increase in the third trimester when the fetus's head settles into the pelvis (Lindheimer et al., 2001).
- As a result of systemic vasodilation, there is an increase in glomerular filtration rate and renal plasma flow (Uzelpasaci Esra & Kaya Serap, 2016).

#### 7. Changes in the reproductive system

- During the first half of pregnancy, growth occurs in the uterus due to hypertrophy of the muscle cells. There is an increase in the total amount of elastic tissue in the uterus, along with an increase in the number and size of blood vessels. The myometrial wall thickens.
- In the second half of pregnancy, the myometrial wall thins to allow for the growth of the fetus. Dilation occurs in the cervix due to the expansion of the lower uterine segment, facilitating easier passage of the fetus during birth.
- Sometimes, painless and irregular uterine contractions can be observed in the second trimester.
- There is an increase in vascularization of the cervix.
- Ligaments undergo elongation and hypertrophy to stabilize the uterus.
- The fallopian tubes elongate, swell, and become hyperemic.
- Secretions become more acidic due to an increase in glycogen content in the epithelium, preparing the vagina for childbirth.
- Connective tissue content decreases in the vagina, while the mucosal and muscular walls thicken. Vascularity also increases in the vulva (Uzelpasaci Esra & Kaya Serap, 2016).

#### 8. Changes in breasts

One of the earliest signs of pregnancy is the changes that occur in the breast.

- With increased venous flow, breast enlargement occurs.
- The areola darkens in color and becomes smaller.
- After the 10th week, colostrum, a fluid that prepares the baby's intestinal system for breast milk, begins to be produced.



- Estrogen stimulates the milk ducts, while progesterone increases the proliferation of lobularalveolar tissue. These changes are completed in the middle of pregnancy.
- After birth, the baby's suckling stimulates prolactin secretion, thereby increasing milk production (Elling & Powell, 1997).

#### 9. Weight gain

During pregnancy, there is an average weight gain of around 11 kg due to the growth of the baby, placenta, amniotic fluid, enlargement of the uterus, increased blood volume, breast tissue, fat stores, and other pregnancy-related changes. Most of this weight is gained, particularly in the last two trimesters. Without proper attention, weight gains can reach up to 38 kg (Ireland & Ott, 2000).

#### **10. Dermatological changes**

- During pregnancy, dermatological conditions such as increased pigmentation, modification of abdominal wall tissue, skin stretching leading to stretch marks, sweating, hair loss, itching, and changes in nails occur.
- Darkening of the skin around the areola and eyes occurs.
- Bluish irregular lines develop around the breast and abdominal areas due to changes in the collagen elastic fibers in the deep layer of the skin.
- Capillary dilation around the thighs and ankles can lead to the appearance of varicose veins.
  These varicose veins are usually painless (Elling & Powell, 1997).

#### 11. Psychological changes during pregnancy

Pregnancy involves a series of complex changes occurring as part of the period, encompassing psychological dimensions that affect the mother and the newborn. During this process, women experience mood swings, anxiety, stress, and fatigue. (Blount et al., 2021) It is known that women with poor mental health during pregnancy have increased rates of physiological problems such as early delivery, hypertensive disorders, placental anomalies, antepartum hemorrhage, labor complications, increased rates of cesarean delivery, spontaneous abortion, intrauterine growth restriction, low birth weight, and physiological problems in the newborn, such as the APGAR score. Social support is the greatest aid in reducing these negative factors affecting women during pregnancy. Studies have shown that women who receive support from family members and their partners are less affected by the psychological problems associated with pregnancy and experience reduced rates of stress and depression during pregnancy. (Gunaydin & Zengin, 2021)



#### Risk factors that cause low back pain during pregnancy

Studies examining risk factors for back pain emphasize that pregnancy is a significant risk factor for back pain. There is no consensus on the factors that contribute to the onset of back pain during pregnancy. However, factors such as a history of pelvic trauma, young age, multiparity, a pre-existing history of chronic back pain before pregnancy, and a history of back pain during a previous pregnancy are considered risk factors. Studies suggest an increased risk of pregnancy-related back pain in women who experience back pain during menstruation. While there are studies suggesting that higher body weight increases the risk of back pain during pregnancy, there is no consensus on this matter (Katonis et al., 2011; Manyozo et al., 2019).

#### Preventing back pain during pregnancy

Preventing back pain, which is influenced by many different factors, can be challenging. However, it is crucial to educate future mothers, especially those in high-risk groups, about the discomforting symptoms associated with back pain and to teach them steps to protect themselves and reduce pain. Firstly, excessive loading on the back and daily activities should not be performed with incorrect posture positions. Unsupported rotational movements and prolonged supine positions should be avoided. They need to learn correct standing, walking, and bending techniques.)

#### a. Correct standing posture

Ensure that the earlobes are aligned with the midpoint of the shoulders. Shoulders should be held back and in front of the chest. The pelvis should not be tilted forward or backward but kept in a neutral position without increased lumbar lordosis, and the transversus abdominis muscle should be activated. Body weight should be evenly balanced on both feet and supported with appropriate footwear (Picture 3). Prolonged standing in the same position should be avoided, and if they need to stand in the same position for a long time, one foot should be placed on a step at a height comfortable for the pregnant woman, while the other foot should be kept on the ground. The foot positions should be changed after a few minutes.





Figure 3 Standing positions for pregnant women A) correct standing posture B) incorrect standing posture

## b. Correct sleeping position

The optimal sleeping or resting position may vary. Particularly, side lying or elevated sleeping positions can be preferred as relaxation postures. In a side lying position, a pillow of normal height should be placed under the head. Pillows can also be used to support the arms and legs, and a towel or thin support can be placed under the abdomen (Figure 4).



Figure 4: Correct sleeping position for pregnant women

c. Picking up objects from the ground in the correct position



As pregnancy progresses and abdominal girth increases, certain functional adaptations may be necessary. Therefore, the strength of the Quadriceps muscle is crucial to continue activities such as sitting down and getting up from the ground. When picking up something from the ground, there are certain factors to be mindful of. Pregnant women should avoid leaning forward by bringing the knees into extension and flexing the back. When lifting an object from the ground, the back should remain straight while the knees and hips are flexed. While bending down to pick up something from the ground, the distance between the feet should be wide, maintaining proximity to the object, and the feet should be firmly grounded. When lifting objects using leg muscles, pelvic floor muscles should be contracted along with the abdominal muscles (Figure 5).



Figure 5: Positions of pregnant women to pick up the object on the floor A) Correct position B) Wrong position

#### d. Sitting in the correct position

In the correct sitting position, the back should be straight, and the shoulders should be pulled back. The hips should contact the chair's backrest. The lumbar region should be supported with a small, rolled towel or lumbar pillows. Knees should be positioned slightly higher than the hips, and if necessary, a support should be placed under the feet. Prolonged sitting in the same position should be avoided (Figure 6).





Figure 6 Sitting positions for pregnant women A) Correct position B) Wrong position

#### Nutrition during pregnancy

Proper nutrition is crucial for meeting increased nutrient needs during early pregnancy, ensuring healthy fetal development, achieving recommended weight gain during pregnancy, enabling successful breastfeeding postpartum, and facilitating a return to pre-pregnancy weight. It has been noted that having good nutrition before pregnancy reduces the risks of hypertension, gestational diabetes, and preterm birth. Therefore, women should be supported to have a healthy pregnancy period starting at least 3 months before conception. Poor nutrition during pregnancy can lead to problems such as preterm birth, inadequate fetal growth, preeclampsia, and maternal obesity, making it difficult to return to pre-pregnancy conditions. To mitigate these risks and ensure the health of both mother and baby, an appropriate vitamin and mineral supplementation regimen along with a healthy eating plan should be implemented.

For proper and healthy nutrition, pregnant women should consume recommended amounts of all food groups within calorie limits. The essential nutrients that pregnant women need include folic acid, iron, iodine, choline, Omega-3, Vitamin B6, and zinc.

**Folic acid:** Essential for normal neural tube formation and closure during the early stages of pregnancy (days 21-28 after conception). Inadequate levels can also lead to low birth weight, preterm birth, and fetal growth restriction.

**Iron:** Iron requirements increase during pregnancy due to the increase in plasma volume and red blood cell mass. Approximately 10% of pregnant women have iron deficiency, which increases to about 25% in the third trimester. Iron deficiency during pregnancy increases the risk of maternal and infant mortality, preterm birth, and low birth weight.



**lodine:** Sufficient iodine intake during pregnancy is essential for fetal neurocognitive development. Mothers should also ensure adequate iodine intake during breastfeeding to meet the baby's needs.

**Choline:** Choline intake needs to increase during pregnancy and breastfeeding to replenish maternal nutrient stores and support normal brain and neuronal growth and development in the baby. Studies have shown that inadequate choline intake during pregnancy increases the risk of neural tube defects.

**Omega-3:** Pregnant women who consume Omega-3 during pregnancy have children with better neurodevelopmental outcomes, including improved language and communication development. A randomized controlled study has indicated that Omega-3 supplementation reduces the risk of preterm birth before 37 weeks.

**Vitamin B6:** Vitamin B6 plays a crucial role in fetal nervous system development and supports the baby's development during pregnancy. It also alleviates nausea, a common complaint during early pregnancy. It is an important nutrient in the postpartum period to support the baby's development.

**Zinc:** Zinc can affect fertilization before pregnancy and fetal development during pregnancy. Additionally, it enhances folic acid absorption and reduces the risk of folate deficiency.

#### Evaluation of low back pain in the prenatal period

#### a. Subjective evaluation

The assessment of the patient during the prenatal period begins with subjective evaluation. Before commencing the assessment, it is important to position the patient in a comfortable position. During subjective evaluation, a detailed history of the patient should be obtained. The detailed history starts with questioning about physical characteristics. In this context, the patient's age, height, weight, body mass index, pre-pregnancy weight, and factors related to pregnancy (gestational age, gravidity, parity, abortions, estimated delivery time) are queried. Risk factors for back pain during pregnancy should be assessed, and the patient's general health status, occupation, social life, and level of physical activity should be evaluated. Various methods such as physical activity questionnaires, pedometers, accelerometers, and heart rate monitors can be used for evaluating physical activity during pregnancy.

## b. Objective Evaluation

During objective assessments in pregnant women, the patient's pain intensity, joint range of motion, edema, muscle strength, sensation, and functional status should be evaluated (Baran & Akbayrak, 2016).

## Visual Analog Scale (VAS):

The Visual Analog Scale (VAS) is used to assess a patient's pain on a vertical ruler of 100 mm, where 0 at the bottom represents "no pain" and 10 at the top represents "the most intense pain



ever felt." On the VAS scale of 100 mm (10 cm), pain intensity is evaluated as mild pain within the range of 1, 2, 3 cm, moderate pain within the range of 4, 5, 6 cm, and severe pain within the range of 7, 8, 9, 10 cm. Pregnant women should be informed about the visual pain scale applied to them.

#### **Oswestry Disability Index (ODI):**

The Oswestry Disability Index (ODI) is used to assess functional impairments in individuals experiencing back pain. Consisting of 10 questions, each graded from 0 to 5, the ODI evaluates parameters such as pain intensity, personal care, lifting, walking, sitting, standing, sleeping, social life, and traveling, among various daily activities. Additionally, it provides a comprehensive assessment of the overall impact of back pain on functionality by measuring the degree of change in pain experienced by the individual.

#### Environmental measurements

As part of anthropometric measurements, circumferential measurements are used to assess variables such as body fat tissue, edema, and muscle mass increase, particularly related to growth and nutrition. Edema formation, a common condition in pregnant women, occurs due to increased body weight, hormonal, and biomechanical changes. Therefore, circumferential measurements taken in the antenatal period help us understand these changes and take positive steps. Measurements should include chest, waist, abdomen, hip, thigh, leg, hand, and ankle. Chest circumference measurement during maximal inspiration or maximal expiration can provide information about chest cage flexibility.

#### Lumbopelvic stabilization assessment (Pressure biofeedback)

It is used to measure deep lumbar muscle strength and to teach pregnant women normal postural perception. This device consists of a pressure pad, a manometer, and an air bulb connected to the pad. Pressure changes in the pad are read in millimeters of mercury (mmHg). During assessment, the patient is positioned supine with a tilt, and the pressure cell is placed under the lumbar spine and inflated to a base pressure of 40 mm Hg. The patient is then asked to perform the abdominal hollowing maneuver without moving their spine and pelvis, and to maintain the contraction for 10 seconds. Changes in pressure during abdominal hollowing are measured and recorded (Picture 7).





Figure 7 Evaluation of Lumbopelvic Stabilization

#### Evaluation of low back pain in the postnatal period

During the postpartum period, the following steps can be followed to evaluate low back pain in women:

- 1. Palpation of the paravertebral muscles, ligaments, and spinous processes in the lumbar region is performed. Muscle tone, spasm, and the presence of trigger points are examined during palpation.
- 2. Anterior-posterior and lateral postural analysis are conducted.
- 3. Range of motion of the lumbar region is assessed, with attention paid to whether movements are painful and restricted during the evaluation (Picture 8).





Figure 8 Range of Motion Assessment



4. Evaluation of muscle strength in the lumbar region is performed (Figure 9-11).



Figure 9 Trunk Rotation Muscle Strength Assessment



Figure 10 Trunk Flexors Muscle Strength Assessment





Figure 11 Trunk Extensors Muscle Strength Assessment

5. Assessment of muscle tightness is conducted (Picture 12).



Figure 12 Hamstring muscle shortness assessment



- 6. Assessment of the patient's pain intensity is conducted (Baran & Akbayrak, 2016).
- 7. Evaluation of Sacroiliac Joint Examination Tests is performed (Figure 13-16).

#### **Sacroiliac Joint Examination Tests**

1. Faber-Patrick Test

The pregnant woman is placed in a supine position with hip flexion, abduction, and external rotation. Subsequently, gentle pressure is applied to the ipsilateral knee until maximum range of motion is achieved. Additional minor oscillations may be applied to provoke pain (Figure 13). A positive result is indicated by the recurrence of the patient's pain or limitations in range of motion (Tasso et al., 2023).



Figure 13 Faber-Patrick Test

#### 2. Gaenslen Test:

The pregnant woman, lying supine on the examination table, has one lower extremity lowered off the bed towards the therapist, while the hip joint of the other lower extremity is passively brought into maximum flexion of the hip and knee joint (Figure 14). If there is pain in the sacroiliac joint on the hanging side, the test is considered positive (Buchanan et al., 2021).





Figure 14 Gaenslen Test

## 3. Straight Leg Raise Test:

The pregnant woman lies supine. The physiotherapist's distal hand holds the patient's heel while the other hand is on the anterior aspect of the patient's thigh to maintain knee extension. The physiotherapist slowly raises the leg until no tension is felt or until full range of motion is achieved (Figure 15). If there is radiating pain down the leg, our test is positive; if there is no pain even when we increase the angle up to 90 degrees, the test is negative (Baran & Akbayrak, 2016).





Figure 15 Straight Leg Raise Test

## 4. Sacroiliac Compression Test

The pregnant woman is positioned in a side-lying position with hips flexed at 45° and knees at 90°. The physiotherapist applies a compression force from the upper iliac crest to the lower iliac crest while positioned behind the pregnant woman (Figure 16). If there is pain in the sacroiliac joint, the test is considered positive (Buchanan et al., 2021).





Figure 16 Sacroiliac Compression Test

#### Treatment

In the treatment of back pain, a multimodal approach is recommended. The multimodal approach encompasses patient education, physiotherapy methods, psychological therapies, and interventional techniques. However, there is no consensus on the treatment of back pain that occurs during pregnancy. Treatment options include physiotherapy, TENS, pharmacological treatment, acupuncture, massage, chiropractic treatment, yoga, pilates, and stabilization belts.

#### 1. Patient Education

The first stage of patient education should involve informing the pregnant woman about basic anatomy, appropriate ergonomic approaches during daily life activities, correct posture, relaxation techniques, and pain management strategies. The patient should be encouraged to remain active during pregnancy. Bio-psychosocial approaches can help prevent the catastrophization of pain and should therefore be considered when planning rehabilitation programs.

#### 2. Physiotherapy and Exercise

During pregnancy, exercise is the most commonly used method for managing back pain. Studies in the literature have evaluated the effectiveness of individually tailored exercise programs, group therapy, yoga, water aerobics, and fitness activities for pregnant individuals.



Before starting an exercise program, pregnant individuals should be informed about several points. Avoiding tight clothing and selecting appropriate footwear are important for proper positioning and maintaining body balance during exercise. Individuals should be advised to breathe regularly and ensure adequate fluid intake during exercise, and care should be taken not to exceed a heart rate of 140 beats per minute during exercise. Due to the increased risk of injury, individuals should be made aware of the potential risks of participating in contact sports such as boxing, skiing, and water skiing. Abdominal exercises should be modified, especially to prevent excessive strain on the rectus abdominis muscle due to pressure from the uterus, and flexion exercises performed while sitting should be preferred to reduce this risk. Additionally, regardless of the individual's level of physical fitness, vigilance should be maintained for the following conditions during physical exertion, and exercise should be stopped and consultation with an obstetrician sought:

- Vaginal bleeding
- Dizziness or presyncope
- Shortness of breath before physical activity
- Chest discomfort
- Leakage of amniotic fluid
- Muscle weakness affecting balance
- Cephalalgia
- Discomfort, tenderness, or swelling in the calf muscles
- Persistent and painful contractions in the uterus

#### a. Strengthening Exercises

Preconception and early pregnancy abdominal and back strengthening exercises aimed at core stabilization and exercises targeting pelvic floor muscles are effective in improving posture, functional level, and reducing back pain (Sabino & Grauer, 2008). Pelvic tilt exercises, in particular, contribute to reducing pain in the lumbar region. Strength training during the prenatal period can be applied once or twice a week. Each exercise session should include 8-10 exercises unless contraindicated. Yoga and clinical pilates exercises enhance core stabilization while increasing overall body endurance.

#### b. Aerobic Exercise

Maintaining overall body health, increasing fitness, and preventing excessive weight gain during pregnancy are crucial, and aerobic exercises play a significant role in achieving these



goals. The American College of Obstetricians and Gynecologists recommends moderateintensity aerobic exercise on most days of the week for individuals without any medical or obstetric contraindications ("Physical Activity and Exercise during Pregnancy and the Postpartum Period: ACOG Committee Opinion, Number 804," 2020). The aerobic exercise program can include exercises targeting major muscle groups such as walking, swimming, cycling, and aquatic exercises, chosen to enable the pregnant individual to continue for the long term.

Walking is one of the most preferred exercises during pregnancy due to its accessibility. Moderate intensity walking programs are recommended in early pregnancy (three to five times a week at 55% of maximum aerobic capacity for 20 minutes) (Connolly et al., 2019). Stationary cycling is a reliable exercise that allows controlled workload without putting stress on the joints and is used in planning aerobic exercise programs. Swimming during pregnancy provides many benefits for both the mother and the baby. The buoyancy of the water reduces stress on joints and muscles, making the pregnant individual feel lighter. Swimming exercises engage different muscle groups, support cardiovascular health, improve circulation, and increase endurance. Additionally, the cooling effect of water helps balance the increased body temperature due to pregnancy (Clapp, 2000). Water aerobics during pregnancy reduces the load on anatomical structures by eliminating gravity and reducing resistance to movement. Granath et al. demonstrated in their study that water aerobics reduced sick leave and could be recommended for pregnant women. Planned aquatic exercises for pregnant women can focus on strength, flexibility, warming up, relaxation, and fitness (Granath et al., 2006).

Contraindications for aerobic exercise during pregnancy ("Physical Activity and Exercise during Pregnancy and the Postpartum Period: ACOG Committee Opinion, Number 804," 2020)

#### 1. Complications Related to Pregnancy:

- Preeclampsia or severe hypertension
- Risk of preterm birth or history of previous preterm birth
- Cervical insufficiency
- Placenta previa (placenta covering the cervix)
- Vaginal bleeding or abnormal discharge
- Early membrane rupture (premature rupture of membranes)
- Significant risk of preterm birth in multiple pregnancies



## 2. Maternal Health Conditions:

- Heart diseases or serious cardiovascular disorders
- Lung diseases or severe respiratory problems
- Neurological disorders (e.g., seizure disorders)
- Severe anemia or bleeding disorders

#### 3. Other Medical Conditions:

- Musculoskeletal problems (e.g., severe back or pelvic pain)
- Chronic diseases such as uncontrolled diabetes mellitus
- Hormonal imbalances such as hyperthyroidism

#### c. Stretching and Flexibility exercises

Stretching and flexibility exercises are exercises used to increase normal joint range of motion. Considering the effect of the relaxing hormone on ligaments that provide joint stability during pregnancy, it is important to avoid stretching exercises in pregnant individuals that simultaneously involve multiple muscles. The stretching routine should be planned in a way that does not excessively strain the joint and should be applied gently at the end of the movement.

#### d. Yoga

Yoga is a method that, besides its physical effects, reduces stress and anxiety, improves mood, enhances well-being, and aids in weight control. During pregnancy, disturbances in the physical, mental, or psychosocial dimensions of a woman can lead to problems in the health of both the mother and the baby. The anxiety and stress experienced by the mother can result in issues such as intrauterine growth restriction, gestational diabetes, pregnancy-induced hypertension, preterm birth, and preeclampsia. Additionally, back and pelvic pain, leg swelling and cramps, respiratory problems due to the pressure from the growing abdomen in the later weeks of pregnancy, and sleep disturbances negatively affect the quality of life for pregnant individuals. By balancing all these dimensions, yoga has become a popular method among pregnant women in recent times because it offers a normal pregnancy, childbirth, and postpartum period without any side effects (Karadağ et al., 2019). Reviewing the literature, it has been reported that a four-week yoga program combined with conventional exercises consisting of stretching, strengthening, and stabilization techniques is effective in reducing postpartum back pain resulting from pregnancy (Vishnu Bhoir MPT et al., 2022). To alleviate back pain in pregnant women, yoga poses such as janu sirsana, child pose, ardha uttanasana,



virabhadrasana, and happy baby pose are recommended. These yoga exercises are effective and much easier for pregnant women to perform (Budi Rahayu, 2023).

#### e. Pilates

Pilates is one of the most reliable exercise methods for both mother and baby, preparing the woman for the childbirth process and strengthening her physiologically and psychologically from the first trimester of pregnancy to the last, as well as accelerating her return to her prepregnancy shape in the postpartum period.

Pilates exercises regulate blood flow to the baby, aiding in the mother's relaxation and calming. It helps the mother adapt more easily to the physiological changes that occur during pregnancy, reducing anxiety and stress during this period, consequently leading to a more comfortable pregnancy. Its positive effect on anxiety also reduces the risk of low birth weight baby delivery. (Lawton, 2003) Particularly during the second and third trimesters of pregnancy, breathing difficulties are experienced. Working with correct breathing techniques reduces the sensation of breathlessness and provides a sense of comfort to the mother. Through the learned correct breathing techniques, it helps to alleviate discomfort caused by fetal movements, muscle spasms and cramps, contractions, and facilitates relaxation during childbirth (Özçoban et al., 2017).

It is known that back pain occurs in pregnant women due to factors such as weight gain associated with fetal growth, change in the body's center of gravity, increased laxity due to hormones, and destabilization. Pilates exercises, due to their effects on the core area and pelvic stabilization, are one of the methods that can be used in the treatment of back pain during pregnancy. (Investigation et al., n.d.) It also has effects such as regaining balance, increasing range of motion, flexibility, and strength. (Yıldırım et al., 2023)

With the goal of harmoniously working the body, this method is important for increasing activity performance and control over the woman's body, making both pregnancy and postpartum recovery more comfortable.

#### f. TENS

Transcutaneous Electrical Nerve Stimulation (TENS) is a non-pharmacological, non-invasive method employed for pain management. It aims to alleviate pain by transmitting electrical currents through electrodes adhered to the skin. TENS devices are typically easily portable and can be used at home. As a non-pharmacological approach to pain control, it presents an appealing option during pregnancy; however, caution should be exercised to avoid its use in the abdominal and pelvic regions (Manyozo et al., 2019).

#### 3) Acupuncture

Some studies have indicated that acupuncture administered during pregnancy alleviates back pain and pelvic pain, facilitating physical activity and reducing the need for medication. However, there are studies in the literature suggesting that the effect may not be persistent in



some women. Therefore, while ear acupuncture for back pain may be an alternative method, its long-term efficacy remains uncertain (Katonis et al., 2011).

#### 4) Pharmacological treatment

For individuals experiencing back pain during pregnancy, pharmacological treatment requires attention. The potential effects of medications used during pregnancy on both the mother and the baby should be considered. The general principles to be followed in pharmacological treatment and commonly used medications are as follows (Manyozo et al., 2019):

#### 1.Acetaminophen (Paracetamol):

Acetaminophen is the most used medication for pain relief during pregnancy and is considered safe. For back pain, acetaminophen is typically recommended as the first choice.

#### 2.Nonsteroidal Anti-Inflammatory Drugs (NSAIDs):

NSAIDs like ibuprofen and aspirin are generally not recommended during pregnancy. Especially in the third trimester, their use is known to potentially cause serious complications in the fetus. Therefore, they should not be used without doctor's advice.

#### 3.Muscle Relaxants:

Muscle relaxants are generally considered safe during pregnancy, but due to the potential risks and side effects of specific drugs, they should be used with caution. Muscle relaxants prescribed by a doctor can be used to alleviate back pain.

#### 4.Opioid Drugs:

Opioids are rarely prescribed for severe pain and should be used with caution. In pregnancy, the use of opioids can lead to serious complications in the newborn, such as dependency and withdrawal. These drugs should only be used under doctor supervision and with dosage limitations.

#### **5.Topical Analgesics:**

Topical analgesics can be a safe alternative for relieving back pain during pregnancy. These medications, available in cream, gel, or patch forms, can minimize systemic side effects.

#### Exercises Suitable for Pregnant Women (Baran & Akbayrak, 2016; Yıldırım et al., 2023)





Figure 17 Cat-cow Exercise



Figure 18 Hundred Exercise





Figure 19 Single leg stretch Exercise



Figure 20 Corkscrew Exercise





Figure 21 Side-kick Exercise



Figure 22 Bridge Exercise





Figure 23 Bridge Building with a ball between the knees Exercise



Figure 24 Child Pose Exercise





Figure 25 Hip Flexor Stretching Exercise



Figure 26 Shoulder Rolling Exercise

299





Figure 27 Straight Leg Raise Exercise



Figure 28 Rolling like a ball Exercise





Figure 22 Kegel Exercise



Exercises Examples Applicable to Pregnant Women in the Postnatal Period (Adnan et al., 2021)



Figure 23 Stability Ball-Hamstring Curl Exercise



Figure 24 Side-Lying Crunch Exercise





Figure 25 Dead Bug Exercise



Figure 26 Neutral Spine Exercise



#### References

Bulguroğlu, H. I., Bulguroğlu, M., Özkul, Ç., & Güçlü Gündüz, A. (2023). Pilates egzersizlerinin gebelikte postüral stabilite ve doğum korkusu üzerine etkisinin araştırılması [Investigation of the effect of Pilates exercises on postural stability and fear of birth in pregnancy]. Adnan Menderes Üniversitesi Sağlık Bilimleri Dergisi, 7(3), 530–540. <u>https://doi.org/10.46237/amusbfd.1253720</u>

Baran, E., & Akbayrak, T. (2016). Gebelikte görülen problemlerde fizyoterapi ve rehabilitasyon. In T. Akbayrak (Ed.), Kadın sağlığında fizyoterapi ve rehabilitasyon (pp. 189–214). HİPOKRAT KİTABEVİ & PELİKAN KİTABEVİ.

Barbosa, A. F., Raggi, G. C., Sá, C. dos S. C., Costa, M. P., de Lima, J. E., & Tanaka, C. (2012). Postural control in women with breast hypertrophy. Clinics, 67(7), 757–762. <u>https://doi.org/10.6061/clinics/2012(07)09</u>

Buchanan, P., Vodapally, S., Lee, D. W., Hagedorn, J. M., Bovinet, C., Strand, N., Sayed, D., & Deer, T. (2021). Successful diagnosis of sacroiliac joint dysfunction. Journal of Pain Research, 14, 3135–3143. <u>https://doi.org/10.2147/JPR.S327351</u>

Budi Rahayu. (2023). Prenatal yoga to relieve back pain among pregnant women. EMBRIO, 15(1), 28–33. <u>https://doi.org/10.36456/embrio.v15i1.6416</u>

Casagrande, D., Gugala, Z., Clark, S. M., & Lindsey, R. W. (2015). Low back pain and pelvic girdle pain in pregnancy. Journal of the American Academy of Orthopaedic Surgeons, 23(9), 539–549. <u>https://doi.org/10.5435/JAAOS-D-14-00248</u>

Chiou, W. K., Chiu, H. T., Chao, A. S., Wang, M. H., & Chen, Y. L. (2015). The influence of body mass on foot dimensions during pregnancy. Applied Ergonomics, 46(Part A), 212–217. <u>https://doi.org/10.1016/j.apergo.2014.08.004</u>

Clapp, J. F. (2000). Exercise during pregnancy: A clinical update. Clinics in Sports Medicine, 19(2), 273–286. https://doi.org/10.1016/S0278-5919(05)70203-9

Conder, R., Zamani, R., & Akrami, M. (2019). The biomechanics of pregnancy: A systematic review. Journal of Functional Morphology and Kinesiology, 4(4), Article 72. <u>https://doi.org/10.3390/ifmk4040072</u>

Connolly, C. P., Conger, S. A., Montoye, A. H. K., Marshall, M. R., Schlaff, R. A., Badon, S. E., & Pivarnik, J. M. (2019). Walking for health during pregnancy: A literature review and considerations for future research. Journal of Sport and Health Science, 8(5), 401–411. <u>https://doi.org/10.1016/j.jshs.2018.11.004</u>

Demaio, M., & Magann, E. F. (2009). Exercise and pregnancy. The Journal of the American Academy of Orthopaedic Surgeons, 17(8), 504–514. <u>https://doi.org/10.5435/00124635-200908000-00004</u>

Elling, S. V., & Powell, F. C. (1997). Physiological changes in the skin during pregnancy. Clinics in Dermatology, 15(1), 35–43. https://doi.org/10.1016/S0738-081X(96)00108-3

Granath, A. B., Hellgren, M. S. E., & Gunnarsson, R. K. (2006). Water aerobics reduces sick leave due to low back pain during pregnancy. Journal of Obstetric, Gynecologic, and Neonatal Nursing : JOGNN, 35(4), 465–471. <u>https://doi.org/10.1111/J.1552-6909.2006.00066.X</u>

Hart, T. L., Petersen, K. S., & Kris-Etherton, P. M. (2022). Nutrition recommendations for a healthy pregnancy and lactation in women with overweight and obesity – strategies for weight loss before and after pregnancy. Fertility and Sterility, 118(3), 434–446. https://doi.org/10.1016/J.FERTNSTERT.2022.07.027

Hegewald, M. J., & Crapo, R. O. (2011). Respiratory physiology in pregnancy. Clinics in Chest Medicine, 32(1), 1–13. https://doi.org/10.1016/J.CCM.2010.11.001

Heit, J. A., Kobbervig, C. E., James, A. H., Petterson, T. M., Bailey, K. R., & Melton, L. J. (2005). Trends in the incidence of venous thromboembolism during pregnancy or postpartum: A 30-year population-based study. Annals of Internal Medicine, 143(10). <u>https://doi.org/10.7326/0003-4819-143-10-200511150-00006</u>

Ireland, M. L., & Ott, S. M. (2000). The effects of pregnancy on the musculoskeletal system. Clinical Orthopaedics and Related Research, 372, 169–179. https://doi.org/10.1097/00003086-200003000-00019



Kametas, N. A., McAuliffe, F., Hancock, J., Chambers, J., & Nicolaides, K. H. (2001). Maternal left ventricular mass and diastolic function during pregnancy. Ultrasound in Obstetrics and Gynecology, 18(5), 460–466. <u>https://doi.org/10.1046/J.0960-7692.2001.00573.X</u>

Karadağ, A., Kirca, N., Lisans Öğrencisi, Y., Üniversitesi, A., Fakültesi, H., Ve, D., Hastalıkları, K., Dalı, A., Üyesi, Ö., Ve Kadın, D., Anabilim, H., Adresi, Y., Kadın, A. Ü., & Dergisi, A. (2019). PRENATAL VE POSTNATAL YOGANIN MATERNAL ETKİLERİ. Atatürk Üniversitesi Kadın Araştırmaları Dergisi, 1(1), 47–56. <u>https://dergipark.org.tr/tr/pub/atakad/issue/46921/517521</u>

Katonis, P., Kampouroglou, A., Aggelopoulos, A., Kakavelakis, K., Lykoudis, S., Makrigiannakis, A., & Alpantaki, K. (2011). Pregnancy-related low back pain. Hippokratia, 15(3), 205. /pmc/articles/PMC3306025/

Liaw, L. J., Hsu, M. J., Liao, C. F., Liu, M. F., & Hsu, A. T. (2011). The relationships between inter-recti distance measured by ultrasound imaging and abdominal muscle function in postpartum women: a 6-month follow-up study. The Journal of Orthopaedic and Sports Physical Therapy, 41(6), 435–443. <u>https://doi.org/10.2519/JOSPT.2011.3507</u>

Lindheimer, M. D., Davison, J. M., & Katz, A. I. (2001). The kidney and hypertension in pregnancy: twenty exciting years. Seminars in Nephrology, 21(2), 173–189. <u>https://doi.org/10.1053/SNEP.2001.20937</u>

Majzoub, J. A., McGregor, J. A., Lockwood, C. J., Smith, R., Taggart, M. S., & Schulkin, J. (1999). A central theory of preterm and term labor: Putative role for corticotropin-releasing hormone. American Journal of Obstetrics and Gynecology, 180(1), S232–S241. <u>https://doi.org/10.1016/S0002-9378(99)70707-6</u>

Manyozo, S. D., Nesto, T., Bonongwe, P., & Muula, A. S. (2019). Low back pain during pregnancy: Prevalence, risk factors and association with daily activities among pregnant women in urban Blantyre, Malawi. Malawi Medical Journal: The Journal of Medical Association of Malawi, 31(1), 71–76. <u>https://doi.org/10.4314/MMJ.V3111.12</u>

Mastorakos, G., & Ilias, I. (2003). Maternal and Fetal Hypothalamic-Pituitary-Adrenal Axes During Pregnancy and Postpartum. Annals of the New York Academy of Sciences, 997(1), 136–149. <u>https://doi.org/10.1196/ANNALS.1290.016</u>

Özçoban, F. A., Alkan, E., Gör, Ö., Üniversitesi, B., Yüksekokulu, S., & Gör, A. (2017). Smyrna Tıp Dergisi Araştırma Makales i Gebelik, Doğum ve Doğum Sonu Dönemde Pilatesin Etkileri Effects of Pilates on Pregnancy, Delivery and Postpartum Period.

Physical Activity and Exercise during Pregnancy and the Postpartum Period: ACOG Committee Opinion, Number 804. (2020). Obstetrics and Gynecology, 135(4), E178–E188. <u>https://doi.org/10.1097/AOG.00000000003772</u>

Ponnapula, P., & Boberg, J. S. (2010). Lower Extremity Changes Experienced During Pregnancy. The Journal of Foot and Ankle Surgery, 49(5), 452–458. <u>https://doi.org/10.1053/J.JFAS.2010.06.018</u>

Sabino, J., & Grauer, J. N. (2008). Pregnancy and low back pain. Current Reviews in Musculoskeletal Medicine, 1(2), 137–141. https://doi.org/10.1007/S12178-008-9021-8

San-Frutos, L., Engels, V., Zapardiel, I., Perez-Medina, T., Almagro-Martinez, J., Fernandez, R., & Bajo-Arenas, J. M. (2011). Hemodynamic changes during pregnancy and postpartum: a prospective study using thoracic electrical bioimpedance. The Journal of Maternal-Fetal & Neonatal Medicine, 24(11), 1333–1340. <u>https://doi.org/10.3109/14767058.2011.556203</u>

Sarıyıldız, A., Coşkun Benlidayı, İ., Üniversitesi, Ç., Fakültesi, T., Tıp, F., Dalı, R. A., & Adana, T. (2022). Arşiv Kaynak Tarama Dergisi Archives Medical Review Journal Gebelik dönemindeki potansiyel kas-iskelet sistemi sorunları Potential musculoskeletal problems during pregnancy. Archives Medical Review Journal, 31(4), 279–283. <u>https://doi.org/10.17827/aktd.1178874</u>

Sehmbi, H., D'Souza, R., & Bhatia, A. (2017). Low Back Pain in Pregnancy: Investigations, Management, and Role of Neuraxial Analgesia and Anaesthesia: A Systematic Review. Gynecologic and Obstetric Investigation, 82(5), 417–436. https://doi.org/10.1159/000471764

Shivakumar, G., Brandon, A. R., Snell, P. G., Santiago-Muñoz, P., Johnson, N. L., Trivedi, M. H., & Freeman, M. P. (2011). Antenatal Depression: A Rationale for Studying Exercise. Depression and Anxiety, 28(3), 234. <u>https://doi.org/10.1002/DA.20777</u>

Sneag DB, Bendo JA: Pregnancy-related low back pain. Orthopedics 2007;30(10): 839-845.

Stephenson, R. G., & O. L. J. (2000). Obstetric and gynecologic care in physical therapy. .



Tasso, M., Uguccioni, V., Bertolini, N., Bernasconi, A., Mariconda, M., Scarpa, R., Costa, L., & Caso, F. (2023). Role of Patrick-FABER test in detecting sacroiliitis and diagnosing spondyloarthritis in subjects with low back pain. Clinical and Experimental Rheumatology, 41(11), 2298–2300. <u>https://doi.org/10.55563/clinexprheumatol/kgje8k</u>

Uzelpasaci Esra, & Kaya Serap. (2016). Gebelikte Meydana Gelen Değişiklikler. In Albayrak Turkan (Ed.), Kadın Sağlığında Fizyoterapi ve Rehabilitasyon (pp. 181–188).

Vishnu Bhoir MPT, K., Honkalas Associate Professor, P., Golhar Principal of PES Modern, S., Vishnu Bhoir, K., Honkalas, P., & Golhar, S. (2022). Comparative effect of yoga therapy and conventional therapy on pain, functional disability and quality of life in post natal females with lumbopelvic pain: Randomized clinical trial. ~ 115 ~ International Journal of Physical Education, Sports and Health, 9(3), 115–120. <u>www.kheljournal.com</u>

Yıldırım, P., Basol, G., & Karahan, A. Y. (2023). Pilates-based therapeutic exercise for pregnancy-related low back and pelvic pain: A prospective, randomized, controlled trial. Turkish Journal of Physical Medicine and Rehabilitation, 69(2), 207. https://doi.org/10.5606/TFTRD.2023.11054