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Original Research

Diastasis Recti Abdominis Is Associated with Non-Specific Lower Back Pain in Postpartum Women

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ABSTRACT

Background: *During pregnancy and childbirth there is stretching of the linea alba which results in diastasis recti abdominis (DRA), a condition where the abdominal muscles separate. Postpartum women with DRA often experience non-specific low back pain. This study aims to examine the association between DRA severity and non-specific low back pain in postpartum women.*

Methods: *This study employed a quantitative approach with an analytical cross-sectional study research design. A total of 30 postpartum women at the were selected as samples using a purposive sampling technique. The degree of DRA was measured using a digital caliper, while non-specific low back pain was assessed using a visual analog scale (VAS). Data were analyzed using Pearson Correlation.*

Results: *A significant positive correlation was found between DRA severity and low back pain intensity (r = 0.519; p = 0.003), indicating that higher DRA severity is associated with greater pain intensity.*

Conclusion: *DRA severity is moderately associated with non-specific low back pain in postpartum women. These findings emphasize the importance of assessing abdominal muscle integrity in postpartum care.*

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INTRODUCTION

During pregnancy and childbirth, physiological changes occur in a woman's body, most notably due to the production of the hormone relaxin, which softens connective tissue and collagen, making the pubic symphysis more flexible and leading to stretching of the linea alba. The uterus enlarges to match the fetus's position and size as they grow, causing excessive pressure on the connective tissue in the middle of the abdomen (the linea alba). During the labor process, those who contribute to core stability, as the abdominal wall consists of several muscles that strengthen the core. The primary function of the abdominal muscles is to stabilize the trunk and help the lumbosacral and thoracolumbar regions. There is stretching of the ligaments, diaphragm, pelvis, and fascia, which causes the linea alba to stretch even more, resulting in DRA (Oliveira et al., 2025).

Diastasis recti abdominis (DRA) is a condition marked by the separation of the rectus abdominis muscles along the midline connective tissue of the abdomen, known as the linea alba. This condition is common in postpartum women. It is caused by the stretching and widening of the linea alba during pregnancy and childbirth. Several factors influence the development of DRA. These include body mass index (BMI), parity, gravida, age, and physical activity level.

The rectus abdominis and back muscles (erector spinae) are classified as global muscles that contribute to proximal stabilization. Both muscle groups contribute to overall stability and mobility by generating strength and movement (Lee, 2021). When the linea alba is widened, the rectus abdominis muscles become weaker, causing the erector spinae muscles to work harder as compensation. Reduced trunk stability affects posture and loading on the spinal muscles, resulting in lower back pain. The progression of DRA increasingly affects the function of global muscles and reduces the functionality of the abdominal wall, further worsening lower back pain (Saleem et al., 2021).

Based on the literature review, (Sokunbi et al., 2023) summarized 13 studies on the relationship between DRA and lower back pain and found a relationship in 5 of 13 (38.5%). Conversely, 8 out of 13 studies (61.5%) found no relationship. However, the results of the study have not been able to provide a definitive conclusion regarding the relationship between DRA and lower back pain because there are several weaknesses in the 13 studies, including the selection of samples with ages over 18 years without setting age limits and no control for risk factors, such as BMI, parity, gravida, physical activity, and type of delivery, thus affecting the results of the study. In a preliminary study conducted on 20 postpartum women aged 25-35 years, the 20 respondents complained of lower back pain that had been felt since giving birth (Sokunbi et al., 2023).

This study introduces a comprehensive analysis of the association between the degree of DRA and non-specific low back pain in postpartum women by simultaneously considering multiple influencing factors, including body mass index (BMI), parity, gravida, physical activity, and type of delivery. Previous studies have primarily examined DRA or low back pain separately or without integrating these maternal and lifestyle variables (Apsari et al., 2024; Bulguroglu et al., 2025; Robinault et al., 2023). Therefore, this study provides an integrated perspective that clarifies the multifactorial relationship between abdominal muscle separation and postpartum musculoskeletal dysfunction.

Based on the results of the preliminary study and previous research, this study aims to examine the association between the degree of DRA and non-specific low back pain in postpartum women. By considering influencing factors such as body mass index (BMI), parity, gravida, physical activity, and type of delivery, this study is expected to provide a more comprehensive understanding of this association and contribute to more appropriate physiotherapy management in postpartum women. The findings of this study are expected to contribute to evidence-based physiotherapy practice by supporting early screening, risk identification, and the development of more targeted physiotherapy management strategies for postpartum women experiencing DRA-related low back pain.

MATERIALS AND METHOD

This study used a correlational design with an analytical cross-sectional approach to examine the association between the degree of DRA and non-specific low back pain at a single point in time. This design was chosen because it allows the researcher to identify relationships between variables without manipulating them. Data were collected simultaneously from postpartum mothers using standardised assessment tools to ensure

consistency in measurement. This approach also enabled the data collection process to be carried out efficiently within a relatively short timeframe, whilst providing an initial insight into the clinical relationships observed.

The study population consisted of postpartum women at Puskesmas Weekarou, West Sumba, Indonesia, and the research was conducted from January to March 2025. The sample in this study comprised 30 postpartum women who met the research criteria. The sample size was determined based on the minimum requirement for correlation analysis, which recommends at least 30 subjects to achieve sufficient statistical power.

A purposive sampling technique was used in this study. The sample in this study consisted of 30 postpartum women who met the research requirements. Inclusion criteria include a maximum of 6 months postpartum, having DRA, aged 20-35 years, parity 3 times, third-trimester gravida, normal Body Mass Index (BMI), vaginal delivery, light physical activity, and willingness to be a research sample by signing an informed consent form. Exclusion criteria include subjects who have or have experienced musculoskeletal system disorders (vertebral fractures or pelvic disorders), neurological disorders, Prolapsed Intervertebral Disk (PIVD) or stenosis, and those who are consuming analgesic or muscle relaxant drugs. In this study, the dependent variable is nonspecific lower back pain complaints, and the independent variable is the degree of diastasis recti abdominis (DRA).

The data collected included age, type of delivery, parity, gravida, BMI, physical activity level, non-specific low back pain, and the degree of DRA. In this study, the independent variable was the degree of DRA, while the dependent variable was non-specific low back pain. Physical activity was assessed using the International Physical Activity Questionnaire Short Form (IPAQ-SF), and non-specific low back pain was measured using the Visual Analog Scale (VAS), both widely used instruments with established validity and reliability. DRA was measured using a digital caliper at three standardized points: 4.5 cm above the umbilicus, at the umbilicus, and 4.5 cm below the umbilicus. All measurements were conducted following a standard operating procedure (SOP) to ensure consistency, and the instrument was calibrated prior to data collection. The measurements were performed by a trained physiotherapist to ensure the accuracy and reliability of the results.

The data processing stage was carried out using SPSS version 27. A normality test was conducted using the Shapiro–Wilk test, and the results showed that the data were normally distributed ($p > 0.05$). Therefore, Pearson correlation analysis was used to examine the relationship between the degree of DRA and non-specific low back pain. A significance level of 0.05 was applied to determine the statistical significance of the analysis results.

This study has received ethical approval from the Health Research Ethics Committee of Universitas Dhyana Pura, with ethical clearance No. 54/EA/KEP-UNDHIRA/2024 dated March 13, 2024. All participants provided informed consent prior to participation, and the study was conducted in accordance with ethical principles. The confidentiality of all participants' identities and personal data is safeguarded, and such data is used solely for research purposes.

RESULTS

The characteristics of the study participants are presented in Table 1. The variables described include age, gravida, parity, BMI, low back pain intensity measured using VAS, and the degree of DRA.

Table 1. Sample Charactheristic (n = 30 Postpartum Women)

Characteristic	Min	Max	Mean	SD
Age (years)	20	35	29.50	5.02
Gravida	1	24	14.57	7.02
Parity	1	3	2.13	0.86
Body Mass Index/BMI	20.5	24.7	22.28	1.22
Low Back Pain (VAS)	3.4	5.8	4.56	0.68
Degree of DRA (Digital Caliper)	2.8	4.8	3.59	0.41

Note: SD = Standard Deviation

Table 1 presents the characteristics of the study participants. The data indicate that the majority of postpartum women experienced moderate levels of DRA and moderate non-specific low back pain. These findings highlight that both DRA and low back pain are prevalent in the study population, supporting the importance of examining the association between the degree of DRA and non-specific low back pain in postpartum women.

Table 2. Correlation Test with Pearson Correlation (n =30)

Variable	Pearson Correlation (r)	p-value*
Low Back Pain (VAS) Degree of DRA (Digital Caliper)	0.519	0.003

Note: * The results showed a significant correlation at the 0.01 level ($p < 0.01$)

Table 2 presents the results of the Pearson correlation test, which tests the hypothesis of this research. the significance value is 0.003 ($p<0.05$) and the Pearson Correlation value is p=0.519 or it can be said to be strong with a significance level of 0.01 (1%) so that based on the results of the correlation test it can be concluded that there is a moderate relationship and form of relationship to positive and significant direction between the degree of DRA between non-specific low back pain in postpartum women. This can be interpreted as the greater the degree of DRA, the higher the value of lower back pain.

DISCUSSION

Of the thirty samples, the average DRA degree was 3.5 cm. If categorized, this from thirty samples, the average DRA degree was 3.5 cm. If categorized, this result shows a score within the moderate range. This average value is influenced by several factors, including the number of births (parity), macrosomia, and untreated muscle weakness. These factors affect the function of the abdominal muscles as stabilizers, which is associated with the onset of lower back pain (Petronilla et al., 2023).

The lower back pain measurement (VAS) results averaged 4.56. If categorized, this measurement result is included in the moderate pain intensity category. The intensity of non-specific lower back pain is exacerbated by a series of daily physical activities, improper body positions (such as sitting, standing, and lifting), and work activities, as well as caring for children (bathing, carrying, breastfeeding) (Halimah & Fariz, 2021).

Non-specific lower back pain is usually characterized by pain lasting more than 1 day and is often due to a definite cause, which can be acute or chronic, and can limit or change daily routines (Robinault et al., 2023).

Based on the correlation data test results between the degree of DRA and non-specific lower back pain in Table 5.8, a correlation value was obtained, indicating a strong positive correlation with a significance value. The results of this analysis are positive, indicating that the relationship between the two variables is positive: namely, the greater the degree of DRA, the greater the increase in back pain. These findings suggest that abdominal muscle separation may contribute to decreased trunk stability, which can exacerbate lower back pain in postpartum women.

This study is consistent with several previous studies conducted on adult postnatal mothers with a history of both normal and caesarean deliveries. Assessments were carried out using a lower back pain measurement instrument and an examination for DRA via palpation. The results of the study showed that the majority of respondents experienced moderate DRA with moderate levels of lower back pain, and a significant positive correlation was found between DRA and lower back pain. However, previous studies still have limitations as they have not controlled for several factors that could potentially influence the results, such as BMI, type of delivery, and the age range of the study sample (Robinault et al., 2023).

During pregnancy, anatomical and physiological changes occur alongside the development of the fetus as a form of body adaptation. Changes in the musculoskeletal system occur, such as abdominal stretching due to the increasing volume of the uterus during pregnancy. This change is influenced by the endocrine system, which produces hormones that help the body adapt to physiological changes in the mother and fetus. One hormone that plays a role in the adaptation process during pregnancy is relaxin (Bulguroglu et al., 2025).

The relaxin hormone is produced by the corpus luteum, which plays a role in the locomotor system such as cartilage, ligaments, connective tissue, joints, tendons, and muscles, which causes remodelling, collagenase activation, increased laxity, reduced stiffness, and joint stretching, especially in the pelvic area and symphysis pubis during the pregnancy phase (Bulguroglu et al., 2025). Uterine enlargement causes tension in the abdominal muscles, stretching the abdominal wall and the linea alba. The abdominal wall will distend during pregnancy, making the abdominal muscles soft and loose after delivery, leading to separation or DRA (Apsari et al., 2024).

Stretching of the linea alba occurs in the third trimester of pregnancy and continues to increase until delivery. The prevalence of DRA ranges from 32-95% at the end of pregnancy and 30-68% in the postpartum period. DRA will return in the first 8 weeks after delivery, but if there is no intervention, it will continue to increase throughout life (Weingerl et al., 2022). Stretching the abdominal wall and the linea alba can affect the function of the abdominal muscles. The abdominal muscles are a fascia to support the vertebrae (Turan & Özyemişçi-taşkıran, 2022).

Specifically, the ability of the abdominal wall and linea alba to provide force along the body's midline is closely related to maintaining posture, controlling trunk and pelvic movements, regulating intra-abdominal pressure, and supporting the abdominal viscera. The presence of DRA will affect the function of the abdominal wall, leading to decreased mechanical control and reduced functional strength, thereby worsening posture (Saleem et al., 2021). The changes that occur increase pressure on the spine, further burdening it.

This additional spine compensation is associated with lower back pain complaints (Safaee & Barati, 2022).

In the spine, the multifidus and erector spinae muscles are directly connected to the trunk and function to stabilize and control movement of the lumbar vertebrae, aiming to protect the spinal structure from pressure (Vlažná et al., 2021). Decreased trunk posture control affects the shift in the center of body movement or center of gravity (COG), where the center of gravity is forward, so that compensation in the lumbar extensor muscles increases, which results in decreased muscle strength and endurance and excessive fatigue in the lumbar extensor muscles, resulting in lower back pain (Alshehri et al., 2024).

One factor that worsens lower back pain is excessive muscle work (overwork). Excessive muscle work triggers muscle tension. Continuous contractions reduce the oxygen supply to the muscles. When oxygen availability decreases, muscles use glucose produced by anaerobic glycolysis, which produces lactic acid. Lactic acid is a byproduct of anaerobic mechanisms. The accumulation of lactic acid in the tissue can cause muscle fatigue, leading to lower back pain (Pratiwi et al., 2022).

The pain felt is mediated by nociceptors, peripheral sensory neurons that play a unique role in responding to stimuli that can damage the skin and internal organs. Factors and intensity influence nociceptor sensitivity. Pain receptors (nociceptors) specifically respond to stimuli that cause pain. This stimulus is then converted into an electrical signal (nerve impulse) sent to the brain, pain receptors, and transduction. Damage to peripheral tissue results in the release of substances (histamine, prostaglandins, serotonin) that stimulate nociceptors, causing increased transduction and conduction of nociceptive impulses to the central nervous system (CNS). When transduction occurs, the spinal cord horn transmits impulses through the A-delta and C fibers. The spinothalamic tract carries signals from the spinal cord to the brainstem and thalamus. Then, it involves the transmission of signals from the thalamus to the lower back, so that the pain sensation in the lower back is perceived (Karcz et al., 2024).

DRA is not a permanent condition; therefore, exercise interventions can be used to strengthen abdominal muscles, improve core stability, reduce the risk of mechanical injury, and decrease lower back pain in postpartum women. These findings highlight the importance of early identification and structured rehabilitation programs in postpartum care to optimize functional recovery and quality of life. Although this study provides clinically relevant evidence of the association between DRA and lower back pain, limitations such as study design, sample size, and the absence of long-term follow-up should be considered. Future research is recommended to involve larger samples, standardized exercise protocols, and longer follow-up periods to further confirm the effectiveness of exercise-based interventions in postpartum rehabilitation.

CONCLUSION

It can be concluded that there is a significant association of DRA and non-specific lower back pain in postpartum women, with a positive correlation indicating a unidirectional relationship; this means that as the degree of DRA increases, the intensity of lower back pain also increases. The implication of this research is that early screening and appropriate management of DRA in postpartum women are important to prevent worsening lower back pain and to support the implementation of targeted rehabilitation programs focusing on core muscle strengthening and functional recovery.

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