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Original Article

Correlation Between Sacroiliitis and Piriformis, Quadratus Lumborum Muscle Tightness in Pregnant Women with Mechanical Low Back Pain

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ABSTRACT

Background: Pregnancy-related mechanical low back pain is a common musculoskeletal complaint influenced by hormonal, biomechanical, postural, and neuromuscular changes. Altered pelvic loading, ligamentous laxity, increased lumbar lordosis, and compensatory muscle activation may contribute to sacroiliac joint dysfunction and tightness of the piriformis and quadratus lumborum muscles. Objective: To determine the association between clinically suspected sacroiliac joint dysfunction and piriformis and quadratus lumborum muscle tightness among pregnant women with mechanical low back pain. Methods: A cross-sectional observational correlational study was conducted among 88 pregnant women in the second and third trimesters presenting with mechanical low back pain. Pain intensity was assessed using the Numeric Pain Rating Scale, pelvic girdle disability using the Pelvic Girdle Questionnaire, and low back disability using the Modified Oswestry Disability Index. Sacroiliac joint dysfunction was assessed using a five-test provocation cluster, piriformis tightness using the FAIR test, and quadratus lumborum tightness using palpation and lumbar lateral flexion assessment. Chi-square and Spearman's correlation tests were applied. Results: Mean age was 28.94 ± 4.11 years and mean gestational age was 26.64 ± 6.85 weeks. Sacroiliac joint provocation-test positivity was significantly associated with FAIR test status ($\chi^2 = 88.000$, $p < 0.001$), but not with quadratus lumborum tightness ($\chi^2 = 0.169$, $p = 0.681$). PGQ score showed a strong positive correlation with quadratus lumborum tightness ($r = 0.864$, $p < 0.001$), while NPRS was not significantly correlated with PGQ or MODI scores. Conclusion: Clinically suspected sacroiliac joint dysfunction was strongly associated with piriformis-related FAIR positivity, whereas quadratus lumborum tightness was more closely related to pelvic girdle disability. Comprehensive assessment of both joint-related and muscular contributors is recommended in pregnancy-related mechanical low back pain. Keywords: Mechanical low back pain, pregnancy-related low back pain, sacroiliac joint dysfunction, piriformis tightness, quadratus lumborum tightness, pelvic girdle pain, FAIR test.

INTRODUCTION

Mechanical low back pain during pregnancy is a clinically important musculoskeletal condition that affects maternal comfort, mobility, sleep quality, and participation in daily activities. Pregnancy-related lumbopelvic pain is frequently reported during the second and third trimesters, when progressive anatomical, hormonal, and biomechanical adaptations increase mechanical loading across the lumbar spine, pelvis, and sacroiliac joint complex. Prospective and pooled evidence indicates that pain around the lumbopelvic region is common during the perinatal period and that pregnancy-related lumbopelvic pain represents a substantial clinical burden across pregnant populations (1,2). Although many women experience transient symptoms, persistent mechanical low back pain may limit functional capacity, alter

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gait, reduce tolerance for routine activity, and contribute to disability during a period when postural and load-transfer demands are progressively increasing.

The pathophysiology of pregnancy-related mechanical low back pain is multifactorial. As pregnancy advances, enlargement of the uterus shifts the body's center of mass anteriorly, commonly increasing anterior pelvic tilt and lumbar lordosis. These postural adaptations modify load distribution through the lumbar spine, pelvis, and lower limbs. At the same time, pregnancy-related hormonal influences on connective tissue may reduce passive ligamentous restraint around the pelvis and sacroiliac joints, increasing dependence on active muscular stabilization. Biomechanical modeling of the lumbar spine–sacrum–pelvis system supports the clinical relevance of altered stress distribution around the sacroiliac joint when pelvic alignment and loading patterns are disturbed (3). In this context, mechanical low back pain should not be viewed as an isolated lumbar complaint but as a lumbopelvic condition influenced by joint mobility, muscular control, postural compensation, and load-transfer efficiency.

The sacroiliac joint is a central structure in lumbopelvic load transmission because it transfers forces between the trunk and lower extremities while contributing to pelvic ring stability. During pregnancy, increased ligamentous laxity, abdominal mass, altered gait, and postural compensation may increase shear and torsional forces across the sacroiliac joint. These changes may produce clinically suspected sacroiliac joint dysfunction, which can present as posterior pelvic pain, low back pain, buttock pain, or symptoms overlapping with lumbar and hip-related disorders. Because clinical symptoms of sacroiliac joint dysfunction may resemble other causes of pregnancy-related low back pain, standardized provocation testing is commonly used in physiotherapy settings to identify sacroiliac joint involvement. However, clinically positive sacroiliac joint provocation tests should be distinguished from inflammatory or imaging-confirmed sacroiliitis, as the latter requires a different diagnostic framework and may involve infectious, inflammatory, or structural pathology (4).

Muscular adaptations around the pelvis may further contribute to pregnancy-related mechanical low back pain. The piriformis muscle functions as an important hip rotator and pelvic stabilizer, and increased demand for dynamic stabilization may lead to overactivity, tightness, or symptom reproduction during provocative hip positioning. Piriformis tightness may contribute to buttock pain, altered hip mechanics, reduced mobility, and sciatica-like symptoms, particularly when pelvic mechanics are already compromised (5,6). Similarly, the quadratus lumborum contributes to lumbar lateral flexion, pelvic control, and frontal-plane stabilization of the lumbar spine. During pregnancy, increased lumbar lordosis and asymmetrical loading may elevate mechanical demand on the quadratus lumborum, potentially resulting in tightness, tenderness, restricted lateral flexion, and increased pelvic girdle-related disability (7).

Despite growing attention to pregnancy-related low back and pelvic girdle pain, limited clinical evidence has examined the relationship between sacroiliac joint provocation-test positivity and specific lumbopelvic muscle tightness in pregnant women with mechanical low back pain. Existing studies have often focused on prevalence, general pain severity, or therapeutic exercise, while fewer have evaluated how joint-related clinical findings coexist with piriformis and quadratus lumborum tightness in the same pregnant population (8). This knowledge gap is important for physiotherapy assessment because pregnancy-related mechanical low back pain may require integrated evaluation of both passive joint-related pain provocation and active muscular contributors to lumbopelvic control. Identifying whether sacroiliac joint dysfunction is associated with piriformis or quadratus lumborum tightness may help clinicians develop more targeted assessment and rehabilitation strategies for pregnant women with mechanical low back pain.

Therefore, this study aimed to determine the correlation between clinically suspected sacroiliac joint dysfunction, assessed through a cluster of sacroiliac joint provocation tests, and piriformis and quadratus lumborum muscle tightness among pregnant women with mechanical low back pain. The study also evaluated the relationship of pelvic girdle disability, low back disability, and pain intensity with the assessed clinical variables. It was hypothesized that sacroiliac joint provocation-test positivity would be associated with piriformis muscle tightness and quadratus lumborum tightness in pregnant women with mechanical low back pain.

MATERIALS AND METHODS

A cross-sectional observational correlational study was conducted to evaluate the relationship between clinically suspected sacroiliac joint dysfunction and piriformis and quadratus lumborum muscle tightness among pregnant women with mechanical low back pain. The study was carried out at the University of Lahore Teaching Hospital and PESSI Hospital, Multan Road, Lahore, over a six-month period following synopsis approval. The cross-sectional design was selected because the study objective was to assess clinical associations among sacroiliac joint provocation-test findings, muscle tightness, pain intensity, and disability at a single point during pregnancy, rather than to determine treatment effects or establish temporal causality.

A total of 88 pregnant women with mechanical low back pain were recruited using a non-probability convenience sampling technique. Eligible participants were pregnant women in the second or third trimester who presented with mechanical low back pain and were able to undergo clinical physiotherapy assessment. Participants were approached in the clinical setting, the purpose and procedures of the study were explained, and informed consent was obtained before data collection. Participation was voluntary, and confidentiality of all participant information was maintained throughout the study.

Data were collected using a structured proforma that included demographic, obstetric, pain-related, functional, and clinical assessment variables. Demographic and clinical information included age, trimester of pregnancy, occupation, body mass index category, gestational age, and duration of low back pain. Pain intensity was assessed using the Numeric Pain Rating Scale. Pelvic girdle-related functional limitation was evaluated using the Pelvic Girdle Questionnaire, while low back pain-related disability was assessed using the Modified Oswestry Disability Index. Lumbar lateral flexion was measured bilaterally as a clinical indicator of side-specific lumbar mobility, and the values were recorded in degrees.

Clinically suspected sacroiliac joint dysfunction was assessed using a cluster of sacroiliac joint provocation tests, including FABER, Gaenslen's test, thigh thrust, compression, and distraction tests. Sacroiliac joint provocation-test positivity was operationally defined as the presence of at least three positive tests out of the five-test cluster. This definition was used to identify clinical sacroiliac joint involvement in the context of mechanical low back pain and was not intended to confirm inflammatory, infectious, or imaging-defined sacroiliitis. Piriformis muscle tightness was assessed using the Flexion-Adduction-Internal Rotation test, with a positive test recorded when the maneuver reproduced clinically relevant symptoms or indicated restriction consistent with piriformis involvement. Quadratus lumborum tightness was assessed clinically through palpation for tenderness and evaluation of lumbar lateral flexion restriction. All clinical findings were recorded immediately after assessment to minimize recall and transcription error.

The primary variables of interest were sacroiliac joint provocation-test status, piriformis muscle tightness, and quadratus lumborum tightness. Secondary variables included pain intensity, pelvic girdle disability, low back disability, and right and left lumbar lateral flexion range of motion. Sacroiliac joint provocation-test status, FAIR test status, and quadratus lumborum tightness were treated as categorical clinical variables, while pain intensity, disability scores, and lumbar lateral flexion measurements were treated according to their scale properties and distribution. The assessment framework was designed to reduce diagnostic ambiguity by distinguishing clinical sacroiliac joint dysfunction from confirmed inflammatory sacroiliitis.

To reduce measurement bias, data were collected through a structured assessment sequence using the same clinical proforma for all participants. The same predefined operational criteria were applied when recording sacroiliac joint provocation-test positivity, FAIR test findings, quadratus lumborum tightness, disability scores, and pain intensity. Potential confounding factors considered clinically relevant to pregnancy-related mechanical low back pain included gestational age, trimester, body mass index category, occupation, and duration of low back pain. These variables were recorded to describe the study population and support interpretation of the observed associations.

Data were analyzed using descriptive and inferential statistics. Continuous variables were summarized using mean and standard deviation when appropriate, while categorical variables were summarized using frequencies and percentages. Normality of continuous variables was assessed using Kolmogorov–Smirnov and Shapiro–Wilk tests. Because key continuous variables showed non-normal distribution, non-parametric correlation analysis was used where appropriate. Chi-square testing was used to examine associations between categorical clinical variables, including sacroiliac joint provocation-test positivity and piriformis or quadratus lumborum tightness. Spearman's rank correlation was used to assess relationships among ordinal or non-normally distributed variables, including associations between disability scores, pain intensity, and quadratus lumborum tightness. A p-value of less than 0.05 was considered statistically significant.

Ethical approval was obtained from the relevant institutional review committee before data collection. Written informed consent was obtained from all participants, and participant anonymity and confidentiality were preserved. Data were recorded on structured forms and reviewed for completeness before analysis to support data integrity and reproducibility. The study was conducted according to ethical principles for human participant research, and the data supporting the findings were maintained by the research team for verification and future academic use upon reasonable request.

RESULTS

A total of 88 pregnant women with mechanical low back pain were included in the final analysis. The mean age of participants was 28.94 ± 4.11 years, and the mean gestational age was 26.64 ± 6.85 weeks. Most participants were overweight, and the most frequently reported duration of low back pain was 9–12 weeks. Clinical outcomes included pain intensity, pelvic girdle-related disability, low back pain-related disability, lumbar lateral flexion, sacroiliac joint provocation-test status, FAIR test status, and quadratus lumborum tightness.

Table 1. Descriptive Statistics of Continuous Clinical Variables Among Pregnant Women With Mechanical Low Back Pain

Variable	N	Minimum	Maximum	Mean ± SD
NPRS	88	2	3	2.59 ± 0.49
PGQ score	88	20	58	38.43 ± 10.56
MODI score	88	1	3	2.32 ± 0.54
Right lateral flexion, degrees	88	17	29	23.08 ± 3.91
Left lateral flexion, degrees	88	21	30	25.59 ± 2.86

Abbreviations: NPRS, Numeric Pain Rating Scale; PGQ, Pelvic Girdle Questionnaire; MODI, Modified Oswestry Disability Index; SD, standard deviation.

The mean NPRS score was 2.59 ± 0.49, with recorded values ranging from 2 to 3. The mean PGQ score was 38.43 ± 10.56, indicating measurable pelvic girdle-related functional limitation within the sample. The mean MODI score was 2.32 ± 0.54. Mean right lateral flexion was 23.08 ± 3.91 degrees, while mean left lateral flexion was 25.59 ± 2.86 degrees, showing greater average lateral flexion on the left side than on the right side.

Reviewer-style note: The original dataset summary reported sacroiliac joint provocation-test status, FAIR test status, and quadratus lumborum tightness as coded means and standard deviations. Because these are categorical clinical variables, they should be reported as n (%) rather than mean ± SD. The raw positive and negative frequencies were not provided in the supplied manuscript; therefore, categorical frequency reporting and valid calculation of odds ratios or risk ratios could not be completed from the available aggregate data.

Table 2. Normality Assessment for PGQ Score and Lumbar Lateral Flexion

Variable	Kolmogorov–Smirnov Statistic	Kolmogorov–Smirnov df	Kolmogorov–Smirnov p-value	Shapiro–Wilk Statistic	Shapiro–Wilk df	Shapiro–Wilk p-value
PGQ score	0.178	88	<0.001	0.912	88	<0.001
Left lateral flexion	0.107	88	0.014	0.938	88	<0.001
Right lateral flexion	0.136	88	<0.001	0.922	88	<0.001

Abbreviation: PGQ, Pelvic Girdle Questionnaire.

Normality testing showed that PGQ score and bilateral lumbar lateral flexion measurements deviated from normal distribution. The PGQ score showed significant non-normality on both Kolmogorov–Smirnov and Shapiro–Wilk testing. Left lateral flexion and right lateral flexion also showed statistically significant departures from normality, supporting the use of non-parametric methods for correlation analyses involving these variables.

Table 3. Correlation Between Disability Scores and Pain Intensity

Variable Pair	N	Spearman's r	p-value
PGQ score and NPRS	88	0.017	0.876
MODI score and NPRS	88	-0.051	0.635

Abbreviations: PGQ, Pelvic Girdle Questionnaire; NPRS, Numeric Pain Rating Scale; MODI, Modified Oswestry Disability Index.

There was no meaningful correlation between pain intensity and pelvic girdle-related disability. The correlation between PGQ score and NPRS was close to zero. Similarly, the correlation between MODI score and NPRS was weakly negative, indicating that pain intensity was not statistically associated with either PGQ or MODI score in this sample.

Table 4. Correlation Between PGQ Score and Quadratus Lumborum Tightness

Variable Pair	N	Spearman's r	p-value
PGQ score and quadratus lumborum tightness	88	0.864	<0.001

Abbreviation: PGQ, Pelvic Girdle Questionnaire.

A strong positive correlation was observed between PGQ score and quadratus lumborum tightness. The correlation coefficient was 0.864, with $p < 0.001$, indicating that higher pelvic girdle disability scores were associated with greater quadratus lumborum tightness status in the analyzed sample. Because quadratus lumborum tightness was recorded as a categorical clinical variable, this result should be interpreted as an association between ranked PGQ values and coded tightness status rather than as a continuous dose–response relationship.

Table 5. Association of Sacroiliac Joint Provocation-Test Positivity With Piriformis and Quadratus Lumborum Muscle Tightness

Association Tested	N	χ^2	p-value
Sacroiliac joint provocation-test positivity and FAIR test status	88	88.000	<0.001
Sacroiliac joint provocation-test positivity and quadratus lumborum tightness	88	0.169	0.681

Abbreviations: FAIR, Flexion-Adduction-Internal Rotation; χ^2, chi-square statistic.

Sacroiliac joint provocation-test positivity showed a statistically significant association with FAIR test status. The reported chi-square statistic was 88.000 with $p < 0.001$, indicating complete or near-complete concordance between sacroiliac joint provocation-test positivity and FAIR test findings in the supplied aggregate results. In contrast, sacroiliac joint provocation-test positivity was not statistically associated with quadratus lumborum tightness, with $\chi^2 = 0.169$ and $p = 0.681$.

Reviewer-style note: The 2×2 cell counts for sacroiliac joint provocation-test status versus FAIR test status and quadratus lumborum tightness were not provided. Therefore, odds ratios, risk ratios, exact confidence intervals, Fisher's exact test results, and cell-specific percentages could not be validly calculated. The perfect chi-square result for FAIR test status should be verified against the raw frequency table before final submission.

Overall, the results indicate that clinically suspected sacroiliac joint dysfunction, operationalized through sacroiliac joint provocation-test positivity, was strongly associated with FAIR test status but not with quadratus lumborum tightness. Quadratus lumborum tightness showed a strong positive correlation with pelvic girdle disability as measured by the PGQ. Pain intensity, however, was not meaningfully correlated with either pelvic girdle-related disability or low back pain-related disability in this sample. These findings support the interpretation that joint-related provocation findings and muscle tightness may contribute differently to pregnancy-related mechanical low back pain and pelvic functional limitation.

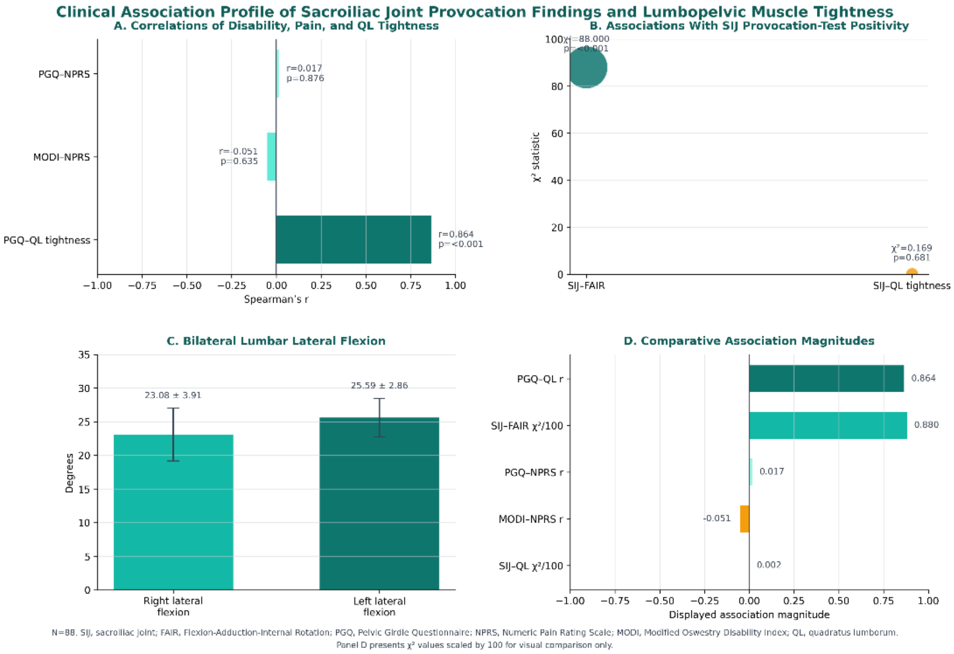

Figure 1 The panelled clinical association profile shows that pelvic girdle disability had a strong positive association with quadratus lumborum tightness (Spearman's $r = 0.864$, $p < 0.001$), whereas pain intensity showed negligible correlations with both PGQ score ($r = 0.017$, $p = 0.876$) and MODI score ($r = -0.051$, $p = 0.635$). Sacroiliac joint provocation-test positivity demonstrated a marked association with FAIR test status ($\chi^2 = 88.000$, $p < 0.001$), while its association with quadratus lumborum tightness was minimal and non-significant ($\chi^2 = 0.169$, $p = 0.681$). Bilateral lumbar lateral flexion showed lower mean mobility on the right side than the left side, with right lateral flexion measuring 23.08 ± 3.91 degrees and left lateral flexion measuring 25.59 ± 2.86 degrees. Collectively, the figure highlights a clinically distinct pattern in which sacroiliac joint provocation findings align most strongly with piriformis-related FAIR positivity, whereas quadratus lumborum tightness appears more closely linked with pelvic girdle disability than with sacroiliac joint provocation-test status.

DISCUSSION

The present study evaluated the relationship between clinically suspected sacroiliac joint dysfunction, piriformis muscle tightness, quadratus lumborum tightness, pain intensity, and disability among pregnant women with mechanical low back pain. The main finding was a statistically significant association between sacroiliac joint provocation-test positivity and FAIR test status, indicating that pregnant women with clinical evidence of sacroiliac joint involvement were more likely to demonstrate piriformis-related provocation findings. In contrast, sacroiliac joint provocation-test positivity was not significantly associated with quadratus lumborum tightness. However, quadratus lumborum tightness showed a strong positive correlation with pelvic girdle disability as measured by the PGQ, suggesting that quadratus lumborum involvement may be more closely related to functional pelvic limitation than to sacroiliac joint provocation-test status alone. Pain intensity showed negligible correlations with both PGQ and MODI scores, indicating that pain severity and disability did not increase proportionally in this sample.

These findings are biologically plausible within the known neuromechanical adaptations of pregnancy. Recent prospective evidence suggests that pregnancy-related hormonal changes, altered postural control, and increasing mechanical load across the lumbopelvic region may contribute to pain and disability as pregnancy progresses. Daneau et al. reported that pregnancy-related hormonal and neuromechanical adaptations are associated with changing clinical pain status during pregnancy, supporting the view that lumbopelvic pain is influenced by both mechanical and physiological factors (9). Similarly, Yoseph et al. emphasized that pregnancy-related spinal biomechanics involve progressive changes in load distribution, lumbar curvature, pelvic position, and soft-tissue demand, all of which may increase stress across the sacroiliac joint and surrounding stabilizing muscles (10). In the current study, the strong association between sacroiliac joint provocation-test positivity and FAIR test status may reflect this integrated joint-muscle response, where altered pelvic stability increases compensatory demand on the piriformis muscle.

The clinical interpretation of sacroiliac joint findings requires caution. The present study used a cluster of sacroiliac joint provocation tests to identify clinically suspected sacroiliac joint dysfunction, not imaging-confirmed or inflammatory sacroiliitis. This distinction is important because pregnancy-related posterior pelvic pain, mechanical sacroiliac joint dysfunction, inflammatory sacroiliitis, osteitis condensans ilii, and radicular or hip-related disorders may present with overlapping clinical symptoms. Monteiro et al. highlighted the diagnostic complexity of postpartum infectious sacroiliitis, while Banjade et al. described osteitis condensans ilii as a condition that may mimic sacroiliitis and remain underrecognized in clinical practice (11,12). Therefore, the findings of the present study should be interpreted as evidence of association between clinical sacroiliac joint provocation-test positivity and muscle-related findings, rather than as confirmation of inflammatory sacroiliitis.

The observed association between sacroiliac joint provocation-test positivity and FAIR test status differs from some prevalence-based reports in general pregnant populations. Rathod et al. reported a relatively low prevalence of piriformis tightness among women in the third trimester and suggested that pregnancy-related soft-tissue changes may influence muscle extensibility (13). The difference between that finding and the present study may be explained by differences in sample selection. The present study included pregnant women with mechanical low back pain, rather than an unselected pregnant population. It is therefore possible that piriformis involvement is not highly prevalent in all pregnancies but becomes more clinically relevant among women with concomitant lumbopelvic pain and sacroiliac joint provocation-test positivity.

The absence of a significant association between sacroiliac joint provocation-test positivity and quadratus lumborum tightness suggests that quadratus lumborum dysfunction may not be directly linked to sacroiliac joint provocation findings in the same way as piriformis-related FAIR positivity. However, the strong positive correlation between PGQ score and quadratus lumborum tightness indicates that quadratus lumborum involvement may still be clinically important in pregnancy-related pelvic girdle disability. The quadratus lumborum contributes to lumbar lateral flexion, frontal-plane trunk control, and pelvic stabilization. Increased lumbar lordosis, altered pelvic alignment, asymmetrical weight distribution, and compensatory trunk strategies during pregnancy may increase quadratus lumborum demand, leading to tightness and functional limitation even when sacroiliac joint provocation tests are not strongly associated with quadratus lumborum findings.

The weak and statistically non-significant correlations between NPRS and both PGQ and MODI scores are clinically notable. These findings suggest that pain intensity alone may not adequately represent the functional burden of pregnancy-related mechanical low back pain. A woman may report relatively mild pain intensity while still experiencing clinically relevant limitation in movement, posture, walking tolerance, or pelvic girdle function. This finding supports the use of multidimensional assessment tools in pregnant women with low back pain, including pain scales, disability questionnaires, muscle tightness assessment, joint provocation testing, and functional movement measures. It also highlights the need for clinicians to avoid relying exclusively on pain intensity when planning physiotherapy assessment or rehabilitation.

The findings are consistent with broader literature identifying sacroiliac joint dysfunction as a relevant contributor to low back and pelvic girdle pain. Fiani et al. described sacroiliac joint and pelvic dysfunction as important contributors to postpartum and pregnancy-related lumbopelvic symptoms, particularly when pelvic stability and load transfer are affected (14). Dydyk et al. also emphasized that sacroiliac joint injury and dysfunction can contribute substantially to low back pain, although diagnosis may be challenging because symptoms overlap with lumbar spine and hip disorders (15). The present study adds to this evidence by examining the coexistence of sacroiliac joint provocation-test positivity with piriformis and quadratus lumborum tightness in pregnant women with mechanical low back pain.

From a clinical perspective, the findings support a comprehensive physiotherapy assessment approach. Pregnant women with mechanical low back pain should not be assessed only for lumbar pain intensity; instead, evaluation should include sacroiliac joint provocation tests, piriformis-related testing, quadratus lumborum tightness assessment, lumbar lateral flexion, and functional disability measures. The strong association between sacroiliac joint provocation-test positivity and FAIR test status suggests that piriformis assessment may be particularly relevant when sacroiliac joint involvement is suspected. Meanwhile, the strong relationship between PGQ score and quadratus lumborum tightness suggests that quadratus lumborum assessment may help explain pelvic girdle-related disability even when pain intensity is low or only mildly elevated.

This study has several limitations. Its cross-sectional design prevents causal inference and does not determine whether sacroiliac joint dysfunction preceded muscle tightness or whether muscle tightness contributed to sacroiliac joint symptoms. The use of non-probability convenience sampling may limit generalizability beyond the included clinical population. Sacroiliac joint involvement was assessed using clinical provocation tests rather than imaging or inflammatory markers; therefore, the term sacroiliitis should be interpreted cautiously and preferably replaced by clinically suspected sacroiliac joint dysfunction or sacroiliac joint provocation-test positivity. The study also relied on clinical assessment of muscle tightness, and inter-rater reliability was not reported. Potential confounders such as parity, prior low back pain, activity level, occupational load, body mass index, trimester, gestational age, and psychosocial factors were not adjusted in multivariable analysis. In addition, the narrow reported range of NPRS and MODI values suggests that these variables may have been coded or categorized, which should be clarified in future reporting.

Future research should use prospective cohort designs to examine temporal relationships between pregnancy progression, sacroiliac joint dysfunction, piriformis tightness, quadratus lumborum tightness, pain intensity, and disability. Studies with larger samples, standardized examiner training, inter-rater reliability testing, imaging confirmation where clinically indicated, and adjusted regression models would strengthen causal interpretation and clinical applicability. Reporting exact 2×2 frequency tables, effect sizes, confidence intervals, and adjusted estimates would also improve statistical transparency. Interventional studies are needed to determine whether targeted rehabilitation addressing sacroiliac joint stability, piriformis flexibility, quadratus lumborum mobility, and pelvic girdle function can reduce disability and improve maternal quality of life during pregnancy.

CONCLUSION

Clinically suspected sacroiliac joint dysfunction, assessed through sacroiliac joint provocation-test positivity, was significantly associated with FAIR test status among pregnant women with mechanical low back pain, indicating a close clinical relationship between sacroiliac joint provocation findings and piriformis-related involvement. Quadratus lumborum tightness was not significantly associated with sacroiliac joint provocation-test positivity, but it showed a strong positive correlation with pelvic girdle disability, suggesting that quadratus lumborum tightness may contribute more directly to functional limitation than to sacroiliac joint provocation findings. Pain intensity was not meaningfully correlated with pelvic girdle or low back disability, emphasizing the need for multidimensional assessment beyond pain severity alone. These findings support comprehensive physiotherapy evaluation of both joint-related and muscular contributors in pregnancy-related mechanical low back pain, while future longitudinal and adjusted studies are needed to confirm temporal relationships and guide targeted rehabilitation.

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