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Original Article

Impact of Low Back Pain on Musculoskeletal Health in Prime Gravida Women With or Without Spinal Anesthesia

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ABSTRACT

Background: Postpartum musculoskeletal symptoms may affect maternal mobility, self-care, physical activity, and return to daily routine, particularly among primigravida women recovering after delivery. Spinal anesthesia is commonly used in obstetric practice, yet its association with postpartum musculoskeletal health remains clinically relevant and insufficiently defined. Objective: To determine the association between spinal anesthesia exposure and postpartum musculoskeletal health among primigravida women. Methods: A cross-sectional observational study was conducted among 266 primigravida women assessed eight weeks after delivery. Participants were divided equally into women who received spinal anesthesia before delivery (n = 133) and women who did not (n = 133). Data were collected using a structured form and the Musculoskeletal Health Questionnaire, assessing pain intensity, joint or muscle stiffness, walking interference, washing or dressing difficulty, physical activity limitation, disruption of daily routine, and overall musculoskeletal health score. Descriptive statistics and Pearson correlation analysis were performed using SPSS version 25. Results: Pain intensity was comparable between groups, with moderate-to-severe pain reported by 16.5% of women in the spinal anesthesia group and 15.0% in the non-spinal anesthesia group. However, severe functional interference was more frequent among women exposed to spinal anesthesia, particularly daily routine disruption (27.8% vs 12.8%), daytime pain or stiffness (24.1% vs 11.3%), and walking interference (24.1% vs 11.3%). Spinal anesthesia status showed a significant weak-to-modest negative correlation with Musculoskeletal Health Questionnaire score ($r = -0.231$, $p < 0.001$). Conclusion: Spinal anesthesia exposure was associated with poorer postpartum musculoskeletal health among primigravida women, mainly through greater stiffness and functional interference rather than pain intensity alone. These findings support routine postpartum musculoskeletal screening and early rehabilitative guidance. Keywords: Spinal anesthesia, primigravida, postpartum, musculoskeletal health, low back pain, stiffness, MSK-HQ.

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INTRODUCTION

Low back pain and other musculoskeletal symptoms are common health concerns during pregnancy and the postpartum period, with important consequences for maternal mobility, sleep quality, functional independence, and overall quality of life. Pregnancy-related biomechanical and physiological changes, including progressive weight gain, anterior displacement of the Centre of gravity, increased lumbar lordosis, ligamentous laxity, hormonal influences, and altered postural control, may increase mechanical loading on the lumbar spine and pelvic girdle. These changes can contribute to pain, stiffness, reduced walking tolerance, and difficulty performing daily activities. In pregnant and postpartum women, low back pain may therefore extend beyond localized discomfort and become part of a broader musculoskeletal health burden affecting physical activity, self-care, household tasks, and psychosocial well-being (1,2).

Musculoskeletal discomfort in pregnancy has been reported in diverse clinical settings, and its severity may vary according to trimester, parity, body mass index, occupational demands, posture, physical activity level, and previous history of pain. Several studies have shown that pregnancy-related low back

pain can interfere with daily functioning and may persist after delivery in a proportion of women. In addition to pregnancy-related factors, delivery-related exposures may also influence postpartum musculoskeletal recovery (3,4). Pain management during labor and delivery is therefore clinically relevant not only for immediate obstetric care but also for early maternal rehabilitation and functional recovery. Pharmacological and non-pharmacological strategies, including analgesics, physical therapy, posture correction, exercise, massage, yoga, and other supportive measures, have been recommended to reduce pain and improve maternal function when appropriately indicated (5).

Spinal anesthesia is widely used in obstetric practice, particularly for cesarean delivery and selected vaginal deliveries requiring regional anesthesia. It provides effective intraoperative and peripartum analgesia by blocking nociceptive transmission from the lower body through injection of local anesthetic into the subarachnoid space. Although spinal anesthesia is generally considered safe and effective when performed under appropriate clinical monitoring, it may be associated with adverse events such as hypotension, post-dural puncture headache, transient neurological symptoms, localized back discomfort, numbness, or weakness. In the postpartum period, distinguishing anesthesia-related musculoskeletal symptoms from pregnancy-related biomechanical pain, surgical recovery, and normal postpartum physical strain can be challenging, particularly when pain and functional limitations are assessed by self-report (6,7).

The relationship between spinal anesthesia and postpartum musculoskeletal health remains clinically important but insufficiently defined. Women with pre-existing low back pain or pregnancy-related musculoskeletal strain may experience altered pain perception after delivery, while women undergoing cesarean section may have additional postoperative limitations that affect walking, self-care, and routine household activities. Consequently, postpartum musculoskeletal symptoms may be influenced by a combination of pregnancy-related biomechanical stress, anesthesia exposure, delivery mode, postoperative recovery, and individual maternal characteristics. Previous evidence has explored pregnancy-related low back pain and anesthesia-associated back symptoms, but fewer studies have specifically examined musculoskeletal health as a multidimensional outcome using a standardized tool in primigravida women with and without spinal anesthesia (8).

A structured assessment of postpartum musculoskeletal health is needed because isolated pain intensity scores may not fully capture the functional impact of symptoms. The Musculoskeletal Health Questionnaire provides a broader evaluation of joint or muscle pain, stiffness, mobility, activity limitation, and interference with daily routine. This is particularly relevant among primigravida women, who are experiencing pregnancy, delivery, and early postpartum recovery for the first time and may have different functional adaptation patterns compared with multiparous women. Evaluating musculoskeletal health at approximately eight weeks after delivery may help identify persistent symptoms beyond the immediate postpartum phase and may inform counseling, rehabilitation planning, and preventive maternal care strategies (9).

Despite the widespread use of spinal anesthesia in obstetric care, there remains a knowledge gap regarding whether primigravida women who receive spinal anesthesia differ from those who do not in terms of postpartum musculoskeletal pain, stiffness, and functional limitation. Existing literature has reported pregnancy-related low back pain prevalence and potential contributors, but limited evidence directly compares postpartum musculoskeletal health outcomes between women exposed and unexposed to spinal anesthesia using a structured musculoskeletal outcome measure. Addressing this gap may help clarify whether women receiving spinal anesthesia represent a subgroup requiring closer postpartum assessment and targeted rehabilitation support (10).

Therefore, the present study was conducted among primigravida women eight weeks after delivery to evaluate the association between spinal anesthesia exposure and postpartum musculoskeletal health. Using a PICO framework, the population comprised primigravida postpartum women, the exposure was receipt of spinal anesthesia before delivery, the comparison group included women without spinal

anesthesia, and the outcomes were pain intensity, joint or muscle stiffness, walking ability, self-care, physical activity limitation, daily routine interference, and overall Musculoskeletal Health Questionnaire score. The objective of this study was to determine whether postpartum musculoskeletal health differs between primigravida women who received spinal anesthesia and those who did not.

MATERIALS AND METHODS

A cross-sectional observational study was conducted to evaluate the association between spinal anesthesia exposure and postpartum musculoskeletal health among primigravida women. The study was designed to compare musculoskeletal symptoms and functional limitations between women who received spinal anesthesia before delivery and those who did not, with assessment performed at eight weeks postpartum. This design was selected because the objective was to examine the relationship between anesthesia exposure and musculoskeletal health status at a defined postpartum time point rather than to establish temporal causality or intervention effectiveness.

The study population comprised postpartum primigravida women aged 18–35 years who had delivered a live infant and were assessed eight weeks after delivery. Participants were recruited using a convenience sampling technique from accessible postpartum women who met the eligibility criteria. Women were included if they were primigravida, within the specified age range, had normal body mass index, and were eight weeks post-delivery at the time of assessment. Women were excluded if they were currently pregnant, had known neurological disorders, had pre-existing spinal deformity before delivery, had systemic conditions likely to affect musculoskeletal function, or had a history of spinal anesthesia before the index pregnancy and delivery. Eligible participants were categorized into two comparison groups according to whether they had received spinal anesthesia before delivery: women exposed to spinal anesthesia and women not exposed to spinal anesthesia.

A total sample size of 266 participants was calculated using the WHO sample size calculator and was allocated equally into two groups, with 133 women in the spinal anesthesia group and 133 women in the non-spinal anesthesia group (4). The sample size was considered adequate for comparing postpartum musculoskeletal health patterns between the two exposure groups and for assessing the correlation between spinal anesthesia status and Musculoskeletal Health Questionnaire score. Participants were approached after eligibility screening, informed about the study purpose and procedures, and enrolled after obtaining voluntary informed consent. Participation was kept voluntary, and participants were informed of their right to withdraw from the study at any stage without penalty.

Data were collected using a structured data collection form and the Musculoskeletal Health Questionnaire. The structured form recorded demographic and obstetric information, including age, primigravida status, delivery-related characteristics, and spinal anesthesia exposure. The Musculoskeletal Health Questionnaire was used to assess postpartum musculoskeletal health, including pain intensity, joint or muscle pain and stiffness during the day and night, interference with walking, difficulty with washing or dressing, limitation in desired physical activities such as walking or jogging, and disruption of work or daily household routine during the preceding two weeks (11). Pain intensity was recorded using categorical severity levels ranging from no pain to severe pain, while functional and symptom-related items were recorded using ordered response categories from “not at all” to “very severe.” A lower Musculoskeletal Health Questionnaire score was interpreted as poorer musculoskeletal health.

The primary exposure variable was spinal anesthesia status before delivery, categorized as “yes” or “no.” The primary outcome variable was postpartum musculoskeletal health as measured by the Musculoskeletal Health Questionnaire score. Secondary outcome variables included pain intensity category, night-time joint or muscle pain and stiffness, daytime joint or muscle pain and stiffness, walking interference, difficulty with washing or dressing, limitation in physical activity, and disruption of daily routine. Delivery type was recorded as an obstetric characteristic because it may influence

postpartum pain, mobility, and functional recovery. Age was recorded as a demographic variable. Functional impairment was operationally defined as any reported interference with walking, self-care, physical activity, work, or daily routine due to joint or muscle symptoms during the preceding two weeks.

Data collection was performed through direct administration of the questionnaire and review of relevant clinical information regarding delivery and anesthesia exposure. Responses were checked for completeness before entry into the dataset. Data were coded numerically, entered into SPSS version 25, and reviewed for entry errors before analysis. Categorical variables were summarized using frequencies and percentages, while continuous or score-based variables were summarized using appropriate measures of central tendency and dispersion, including mean, median, mode, and standard deviation where applicable. The distribution of responses across spinal anesthesia groups was presented using tables and figures.

Statistical analysis was performed to compare musculoskeletal health indicators between women who received spinal anesthesia and those who did not. Frequencies and percentages were calculated for categorical symptom-severity responses. The association between spinal anesthesia status and Musculoskeletal Health Questionnaire score was assessed using Pearson correlation analysis. Statistical significance was evaluated using a two-tailed test, with $p < 0.05$ considered statistically significant. The strength and direction of association were interpreted using the correlation coefficient. Data were analyzed in SPSS version 25. Missing or incomplete responses were checked during data cleaning, and only complete valid responses were included in the final analysis.

Potential sources of bias were addressed through predefined inclusion and exclusion criteria, standardized questionnaire-based assessment, equal group allocation, and uniform timing of outcome assessment at eight weeks postpartum. Restricting the study to primigravida women reduced parity-related variation in musculoskeletal adaptation and postpartum recovery. Limiting the age range and including women with normal body mass index helped reduce demographic and anthropometric variability. However, delivery mode, postpartum activity level, baseline musculoskeletal symptoms, and obstetric recovery factors were treated as clinically relevant variables because they could influence postpartum musculoskeletal outcomes.

Ethical principles were followed throughout the study. Participants were informed about the purpose of the study, voluntary participation, confidentiality of responses, and the right to withdraw at any time. No identifying information was disclosed in the analysis or reporting of results. The study involved questionnaire-based assessment and clinical information review only, with no intervention or procedure imposed on participants. Data were handled confidentially, stored securely, and used only for research purposes. Research integrity was maintained by applying uniform eligibility criteria, using the same data collection tool across participants, coding responses consistently, and performing statistical analysis on the finalized dataset.

RESULTS

A total of 266 primigravida postpartum women were included in the analysis, with equal allocation into the spinal anesthesia group (n = 133) and non-spinal anesthesia group (n = 133). Age distribution was comparable between groups, with no statistically significant difference across age categories ($\chi^2 = 0.116$, $p = 0.990$). The largest age category in both groups was 28–30 years, representing 38.3% of women in the spinal anesthesia group and 39.1% in the non-spinal anesthesia group. Delivery type differed markedly between groups ($\chi^2 = 140.797$, $p < 0.001$). Cesarean delivery was reported in 92 women, all within the spinal anesthesia group, representing 69.2% of that group and 34.6% of the total sample.

Pain intensity was similar between groups ($\chi^2 = 0.143$, $p = 0.986$). No pain was reported by 101 women (75.9%) in the spinal anesthesia group and 103 women (77.4%) in the non-spinal anesthesia group. Moderate-to-severe pain was observed in 22 women (16.5%) in the spinal anesthesia group compared

with 20 women (15.0%) in the non-spinal anesthesia group. The odds of moderate-to-severe pain were not meaningfully different between groups (OR = 1.12, 95% CI: 0.58–2.17, p = 0.867).

Table 1. Baseline Age Distribution and Delivery Characteristics by Spinal Anesthesia Status

Variable	Spinal Anesthesia Yes n (%)	Spinal Anesthesia No n (%)	Total n (%)	Test Statistic	p-value
Age group, years				$\chi^2 = 0.116$	0.990
20–23	15 (11.3)	15 (11.3)	30 (11.3)		
24–26	45 (33.8)	46 (34.6)	91 (34.2)		
28–30	51 (38.3)	52 (39.1)	103 (38.7)		
32–33	22 (16.5)	20 (15.0)	42 (15.8)		
Delivery type				$\chi^2 = 140.797$	<0.001
Normal without spinal anesthesia	30 (22.6)	102 (76.7)	132 (49.6)		
Cesarean	92 (69.2)	0 (0.0)	92 (34.6)		
Normal with spinal anesthesia	11 (8.3)	31 (23.3)	42 (15.8)		

Table 2. Pain Intensity by Spinal Anesthesia Status

Pain Intensity	Spinal Anesthesia Yes n (%)	Spinal Anesthesia No n (%)	Total n (%)	χ^2 p-value	OR (95% CI)
0, No pain	101 (75.9)	103 (77.4)	204 (76.7)	0.986	Reference
1–3, Mild pain	10 (7.5)	10 (7.5)	20 (7.5)		—
4–6, Moderate pain	16 (12.0)	15 (11.3)	31 (11.7)		—
7–10, Severe pain	6 (4.5)	5 (3.8)	11 (4.1)		—
Moderate-to-severe pain combined	22 (16.5)	20 (15.0)	42 (15.8)	—	1.12 (0.58–2.17), p = 0.867

Joint or muscle pain and stiffness during the night showed a higher proportion of severe symptoms in the spinal anesthesia group, although the full ordinal distribution was not statistically significant (χ^2 = 4.675, p = 0.322). Fairly severe or very severe night symptoms were reported by 32 women (24.1%) in the spinal anesthesia group compared with 19 women (14.3%) in the non-spinal anesthesia group. Daytime joint or muscle pain and stiffness showed a stronger group difference, with fairly severe or very severe symptoms in 32 women (24.1%) in the spinal anesthesia group and 15 women (11.3%) in the non-spinal anesthesia group. The full ordinal comparison approached statistical significance (χ^2 = 7.878, p = 0.096), while the combined severe-category comparison showed significantly higher odds in the spinal anesthesia group (OR = 2.49, 95% CI: 1.28–4.86, p = 0.010).

Table 3. Joint or Muscle Pain and Stiffness During Night and Day by Spinal Anesthesia Status

Symptom Domain	Severity Category	Spinal Anesthesia Yes n (%)	Spinal Anesthesia No n (%)	Ordinal χ^2 p-value	Fairly Severe/Very Severe OR (95% CI), p-value
Night pain/stiffness	Not at all	31 (23.3)	40 (30.1)	0.322	
	Slightly	44 (33.1)	47 (35.3)		
	Moderately	26 (19.5)	27 (20.3)		
	Fairly severe	17 (12.8)	11 (8.3)		
	Very severe	15 (11.3)	8 (6.0)		
	Fairly severe/very severe combined	32 (24.1)	19 (14.3)	—	1.90 (1.01–3.56), p = 0.061
Day pain/stiffness	Not at all	31 (23.3)	41 (30.8)	0.096	
	Slightly	45 (33.8)	50 (37.6)		
	Moderately	25 (18.8)	27 (20.3)		
	Fairly severe	17 (12.8)	8 (6.0)		
	Very severe	15 (11.3)	7 (5.3)		
	Fairly severe/very severe combined	32 (24.1)	15 (11.3)	—	2.49 (1.28–4.86), p = 0.010

Functional limitation was more frequent in the spinal anesthesia group across walking, washing or dressing, physical activity, and daily routine domains. Walking interference showed fairly severe or very severe limitation in 32 women (24.1%) in the spinal anesthesia group compared with 15 women (11.3%) in the non-spinal anesthesia group, corresponding to significantly higher odds of severe walking interference (OR = 2.49, 95% CI: 1.28–4.86, p = 0.010). Washing or dressing difficulty was also greater in the spinal anesthesia group, with severe difficulty in 31 women (23.3%) compared with 16 women (12.0%) in the non-spinal anesthesia group (OR = 2.22, 95% CI: 1.15–4.30, p = 0.024). Physical activity limitation showed a smaller difference, with severe limitation in 24 women (18.0%) versus 16 women (12.0%), and this comparison was not statistically significant (OR = 1.61, 95% CI: 0.81–3.19, p = 0.230). Disruption of work or daily routine showed the clearest functional difference: fairly severe or very severe disruption was reported by 37 women (27.8%) in the spinal anesthesia group compared with 17 women (12.8%) in the non-spinal anesthesia group (OR = 2.63, 95% CI: 1.39–4.96, p = 0.004).

Table 4. Functional Interference Domains by Spinal Anesthesia Status

Functional Domain	Severity Category	Spinal Anesthesia Yes n (%)	Spinal Anesthesia No n (%)	Ordinal χ^2 p-value	Fairly Severe/Very Severe OR (95% CI), p-value
Walking interference	Not at all	33 (24.8)	39 (29.3)	0.113	
	Slightly	43 (32.3)	50 (37.6)		
	Moderately	25 (18.8)	29 (21.8)		
	Fairly severe	17 (12.8)	8 (6.0)		
	Very severe	15 (11.3)	7 (5.3)		
	Fairly severe/very severe combined	32 (24.1)	15 (11.3)	—	2.49 (1.28–4.86), p = 0.010
Washing/dressing interference	Not at all	30 (22.6)	43 (32.3)	0.125	
	Slightly	45 (33.8)	46 (34.6)		
	Moderately	27 (20.3)	28 (21.1)		
	Fairly severe	16 (12.0)	9 (6.8)		
	Very severe	15 (11.3)	7 (5.3)		
	Fairly severe/very severe combined	31 (23.3)	16 (12.0)	—	2.22 (1.15–4.30), p = 0.024
Physical activity limitation	Not at all	32 (24.1)	38 (28.6)	0.676	
	Slightly	49 (36.8)	49 (36.8)		
	Moderately	28 (21.1)	30 (22.6)		
	Fairly severe	12 (9.0)	9 (6.8)		
	Very severe	12 (9.0)	7 (5.3)		
	Fairly severe/very severe combined	24 (18.0)	16 (12.0)	—	1.61 (0.81–3.19), p = 0.230
Daily routine disruption	Not at all	30 (22.6)	41 (30.8)	0.045	
	Slightly	41 (30.8)	45 (33.8)		
	Moderately	25 (18.8)	30 (22.6)		
	Fairly severe	20 (15.0)	9 (6.8)		
	Very severe	17 (12.8)	8 (6.0)		
	Fairly severe/very severe combined	37 (27.8)	17 (12.8)	—	2.63 (1.39–4.96), p = 0.004

The correlation analysis demonstrated a statistically significant negative association between spinal anesthesia status and Musculoskeletal Health Questionnaire score. The Pearson correlation coefficient was $r = -0.231$, with $p < 0.001$ and $n = 266$, indicating a weak-to-modest inverse association.

Table 5. Correlation Between Spinal Anesthesia Status and Musculoskeletal Health Questionnaire Score

Variables	Pearson Correlation r	r^2	p-value	N
Spinal anesthesia status and MSK-HQ score	−0.231	0.053	<0.001	266

This means that spinal anesthesia exposure was associated with lower Musculoskeletal Health Questionnaire scores, reflecting poorer musculoskeletal health. The coefficient of determination was approximately $r^2 = 0.053$, indicating that spinal anesthesia status accounted for about 5.3% of the variability in Musculoskeletal Health Questionnaire scores.

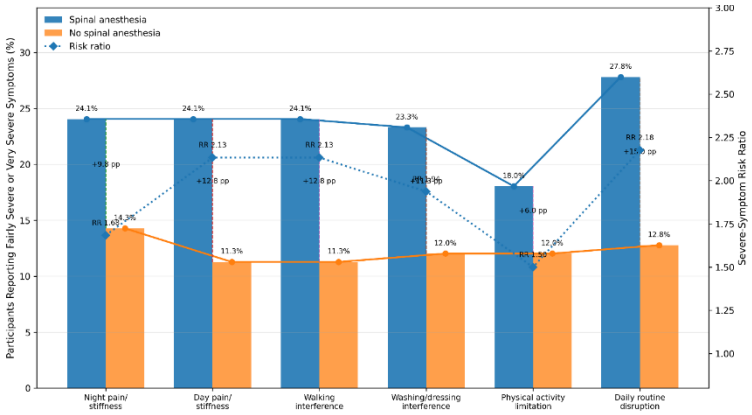

Figure 1. Severe Postpartum Musculoskeletal Symptom Burden by Spinal Anesthesia Status

The figure 1 demonstrates a consistently higher severe-symptom burden among women who received spinal anesthesia across all six musculoskeletal domains. Fairly severe or very severe symptoms were most frequent for daily routine disruption, affecting 27.8% of women in the spinal anesthesia group compared with 12.8% in the non-spinal anesthesia group, corresponding to an absolute difference of 15.0 percentage points and a risk ratio of 2.18. Severe daytime pain or stiffness and severe walking interference each affected 24.1% of women exposed to spinal anesthesia versus 11.3% of unexposed women, yielding absolute differences of 12.8 percentage points and risk ratios of 2.13 for both domains.

Night pain or stiffness was also higher in the spinal anesthesia group (24.1% vs 14.3%; RR 1.68), while washing or dressing interference showed a clinically relevant excess burden (23.3% vs 12.0%; RR 1.94). Physical activity limitation showed the smallest gradient, affecting 18.0% of exposed women and 12.0% of unexposed women (RR 1.50). Overall, the pattern suggests that spinal anesthesia status was associated more strongly with functional restriction and stiffness-related burden than with isolated pain intensity.

Overall, the results show that pain intensity alone was nearly identical between groups, but several functional and stiffness-related domains showed a higher burden of severe symptoms among women who received spinal anesthesia. The strongest differences were observed for daily routine disruption, daytime pain or stiffness, walking interference, and washing or dressing interference. Severe daily routine disruption was 15.0 percentage points higher in the spinal anesthesia group than in the non-spinal anesthesia group, while severe daytime pain or stiffness and severe walking interference were each 12.8 percentage points higher. These findings indicate that the main group differences were more apparent in functional impairment and stiffness-related domains than in the basic pain intensity category.

DISCUSSION

The present study evaluated postpartum musculoskeletal health among primigravida women with and without spinal anesthesia and found that spinal anesthesia status was associated with poorer musculoskeletal health indicators across several symptom and functional domains. Although basic pain intensity was nearly comparable between groups, women who received spinal anesthesia reported a greater burden of joint or muscle stiffness, walking interference, difficulty with washing or dressing, and disruption of work or daily routine. The overall correlation between spinal anesthesia status and Musculoskeletal Health Questionnaire score was statistically significant but weak to modest in magnitude, indicating that spinal anesthesia exposure was associated with lower musculoskeletal health scores, while also suggesting that additional maternal, obstetric, biomechanical, and recovery-related factors likely contributed to postpartum symptoms (12,13).

The findings suggest that postpartum musculoskeletal burden should not be interpreted solely through pain intensity, because the most clinically meaningful differences appeared in stiffness and functional interference rather than in the simple pain category. Moderate-to-severe pain intensity was reported by 16.5% of women in the spinal anesthesia group and 15.0% in the non-spinal anesthesia group, showing minimal difference between groups. In contrast, fairly severe or very severe daytime pain or stiffness was reported by 24.1% of women in the spinal anesthesia group compared with 11.3% in the non-spinal anesthesia group, while severe walking interference showed the same pattern of 24.1% versus 11.3%. This indicates that postpartum musculoskeletal impairment may be better reflected by multidimensional functional measures than by pain intensity alone. The Musculoskeletal Health Questionnaire therefore provided a broader clinical picture by capturing stiffness, mobility, self-care, physical activity, and routine activity disruption.

The observed pattern is biologically and clinically plausible because postpartum musculoskeletal recovery is influenced by several overlapping mechanisms. Pregnancy-related biomechanical changes, including increased lumbar loading, altered posture, ligamentous laxity, abdominal wall stretching, and pelvic girdle stress, may persist into the postpartum period and contribute to pain, stiffness, and reduced functional tolerance (14). Spinal anesthesia may add procedure-related local tissue irritation, transient neurological symptoms, postural guarding, or perceived back discomfort in some women, although the magnitude and duration of such effects can vary (15). However, these mechanisms cannot be separated from delivery-related recovery factors in the present design. In particular, cesarean delivery was concentrated in the spinal anesthesia group, and postoperative pain, abdominal incision discomfort, reduced early ambulation, fear of movement, and delayed return to routine activity may all contribute to poorer functional outcomes after delivery. Therefore, the association observed in this study should be

interpreted as an exposure-group difference rather than definitive evidence that spinal anesthesia independently causes postpartum musculoskeletal impairment.

The results are consistent with prior literature showing that low back pain and musculoskeletal symptoms are common during pregnancy and may interfere with daily functioning. Previous studies have reported that pregnancy-related low back pain can affect mobility, household activities, sleep, and quality of life, with symptoms often influenced by trimester, posture, physical demands, body mass index, and maternal activity level (16,17). The present findings extend this clinical concern into the postpartum period by showing that symptom burden may persist or become functionally relevant at eight weeks after delivery. Unlike studies focused only on the prevalence of low back pain, this study assessed broader musculoskeletal health domains, allowing detection of impairments in walking, dressing, physical activity, and daily routine.

Comparison with previous studies on pregnancy-related low back pain shows both agreement and contrast. Some earlier research has suggested that pregnancy itself may not always be independently associated with long-term low back pain severity or disability when compared with women who have never been pregnant (18). In contrast, other studies have reported a substantial prevalence of low back pain among pregnant women and emphasized the need for routine prenatal assessment and targeted management (19). The present findings do not directly resolve this difference because the study population was limited to primigravida postpartum women rather than comparing pregnant and never-pregnant women. However, the findings support the broader view that musculoskeletal symptoms in the pregnancy-to-postpartum continuum are clinically relevant when assessed through functional outcomes rather than alone pain.

The findings also align partly with studies evaluating anesthesia-related postpartum back pain and delivery outcomes. Previous evidence has described postoperative or postpartum back pain after regional anesthesia, but the association remains difficult to interpret because patients receiving spinal anesthesia often differ clinically from those who do not, especially regarding delivery mode and obstetric indications (20). In the present study, the spinal anesthesia group included a high proportion of cesarean deliveries, which may have amplified functional limitation. This is particularly important because postpartum recovery after cesarean section involves both musculoskeletal adaptation and surgical healing. As a result, the poorer Musculoskeletal Health Questionnaire scores observed among women who received spinal anesthesia may reflect the combined effects of anesthesia exposure, cesarean delivery, postoperative immobility, and recovery-related behavioral changes rather than spinal anesthesia alone.

A key clinical implication of the findings is that postpartum assessment should include functional domains, not only pain intensity. Women may report little or no pain on a simple pain scale while still experiencing stiffness, difficulty walking, reduced activity tolerance, or disruption of daily routines. In this study, the largest severe-symptom difference was observed for daily routine disruption, affecting 27.8% of women in the spinal anesthesia group compared with 12.8% in the non-spinal anesthesia group. This suggests that functional recovery and return to household or work-related tasks may be especially sensitive indicators of postpartum musculoskeletal burden. Routine screening at postpartum follow-up could help identify women who may benefit from education, posture guidance, graded activity, physical therapy referral, or targeted strengthening and mobility exercises.

Studying has several strengths. It focused specifically on primigravida women, reducing variation related to previous pregnancies and repeated postpartum musculoskeletal adaptation. The equal group size improved comparability for descriptive analysis, and assessment at eight weeks postpartum allowed evaluation beyond the immediate delivery period. The use of the Musculoskeletal Health Questionnaire strengthened outcome assessment by capturing multidimensional musculoskeletal health rather than relying only on low back pain intensity. The study also included several clinically meaningful domains,

including night symptoms, daytime stiffness, walking ability, self-care, physical activity, and daily routine disruption.

Studying also has important limitations. The cross-sectional design limits causal interpretation because exposure and outcome were assessed at a defined postpartum point without baseline pre-delivery musculoskeletal scores. Self-reported symptom measures may introduce recall bias or response bias, particularly when participants associate postpartum discomfort with anesthesia or delivery experience. Convenience sampling may limit generalizability to broader postpartum populations. Important confounders such as delivery mode, pre-pregnancy musculoskeletal symptoms, physical activity level, occupational demands, postpartum complications, breastfeeding posture, analgesic use, and psychosocial factors were not fully controlled in the main analysis. The imbalance in cesarean delivery between groups is particularly important and may explain part of the observed association. The correlation coefficient was statistically significant but weak to modest, indicating that spinal anesthesia status explained only a small proportion of variation in musculoskeletal health scores.

Overall, the findings indicate that primigravida women who received spinal anesthesia experienced a higher burden of postpartum stiffness and functional interference than women who did not receive spinal anesthesia, while pain intensity alone showed little difference. The association was statistically significant but modest, and its interpretation must account for the likely contribution of delivery mode and postpartum recovery factors. These findings support the value of multidimensional musculoskeletal screening in postpartum care and highlight the need for analytically controlled studies that distinguish the independent effects of anesthesia exposure, cesarean delivery, and pregnancy-related biomechanical changes on maternal musculoskeletal recovery.

CONCLUSION

The study concluded that primigravida women who received spinal anesthesia before delivery had poorer postpartum musculoskeletal health than those who did not receive spinal anesthesia, particularly in domains related to joint or muscle stiffness, walking interference, washing or dressing difficulty, physical activity limitation, and disruption of work or daily routine. Although overall pain intensity was similar between groups, severe functional interference was consistently higher among women exposed to spinal anesthesia, with the greatest difference observed in daily routine disruption. The significant negative correlation between spinal anesthesia status and Musculoskeletal Health Questionnaire score indicated a weak-to-modest association, suggesting that spinal anesthesia exposure was related to lower musculoskeletal health scores at eight weeks postpartum. However, because postpartum musculoskeletal recovery may also be influenced by delivery mode, surgical recovery, pregnancy-related biomechanical changes, and individual maternal factors, the findings should be interpreted as an association rather than definitive evidence of causation. These results support the importance of routine postpartum musculoskeletal screening and early rehabilitative guidance for women at risk of persistent pain, stiffness, or functional limitation after delivery.

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