

Review Article

Efficacy of Core Strengthening Exercise Programs for Alleviating Postpartum Low Back Pain and Physical Function in Women with Caesarean Section-A Narrative Review

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A B S T R A C T

Background: A common postpartum concern for women after caesarean sections is pain and dysfunction of muscles of the lower back and abdomen, it is a serious global health issue that impacts many women. The aim of this study is to investigate the effectiveness of core strengthening exercise Programs on postpartum low back pain and physical dysfunction in women who have had caesarean sections.

Methods: This study design is a narrative review by computerized electronic search using databases such as PubMed, PEDro, Scopus, EMBASE, and the Google Scholar with keywords including postpartum low back pain, core strengthening programs, caesarean section, physiotherapy and exercise intervention. The inclusion criteria specified randomized controlled trials published in English from 2013 till 2024. The primary focus was postpartum low back pain, and core strengthening exercise programs were identified as a treatment option. The initial database search yielded 125 studies, of which 55 were considered to potentially meet the criteria. Ultimately, 10 journal articles were included in this study.

Results: Evaluation of these article indicated that core strengthening exercise programs had a positive impact on postpartum low back pain and physical function in women after a caesarean section. The review found that programs lasting at least eight weeks, consisting of three

sessions per week, could provide the most substantial benefits for core strengthening.

Conclusions: The findings of this narrative review showed that postpartum low back pain can be effectively relieved and physical function can be improved in women with core strengthening exercise regimens following a caesarean section.

Keywords: Postpartum Low Back Pain, Core Strengthening Programs, Caesarean Section, Physiotherapy Exercise, and Therapeutic Intervention

Introduction

Low back pain is a prevalent concern among women recovering from a Caesarean section ⁽¹⁾. The postpartum period starts immediately after the baby is born and typically continues for 6 to 8 weeks, ending when the mother's body has mostly returned to its pre-pregnancy condition ⁽²⁾. Postpartum back pain often results from weakened abdominal muscles and impacts the physical, psychosocial, and economic well-being of postpartum mothers. It can lead to sleep disturbances, stress, and anxiety. The prevalence of low back pain among postpartum mother's ranges from 21% to 82% in the first year after childbirth ⁽³⁾. Persistent low back pain affects 8% to 20% of women for 2 to 3 years postpartum. Postpartum back pain is reported to affect up to 54% of women within three months after childbirth ⁽⁴⁾. Persistent low back pain (LBP) often develops into chronic pain, with 28% of women experiencing unresolved acute postpartum pain. The substantial economic burden and diminished quality of life associated with chronic LBP underscore the critical need for effective early intervention strategies. Women who had caesarean sections reported a higher occurrence of low back pain (LBP) compared to those who underwent vaginal deliveries ⁽⁵⁾. Factors contributing to low back pain during the postpartum period include weakened abdominal, back and pelvic floor muscles, hormonal changes that loosen ligaments, poor posture, altered spinal curvature, the increased physical load of caring for the baby, and strain from breastfeeding or lifting ^(6,7,8). Additional contributors include ligament laxity, weight gain, and altered spinal curvature lordosis. Epidural anaesthesia and obesity can also lead to lumbar dysfunction post-delivery ⁽⁹⁾. Diastasis recti abdominis can occur after a caesarean section. This condition involves the separation of the abdominal muscles along the midline, which can lead to weakened core strength, reduced stability, and potential back pain ⁽¹⁰⁾. Pain localized in low back, worsened with prolonged sitting and lifting. Functional measures indicated slight lumbar range of motion decrease. Manual muscle testing revealed weakness in gluteus medius and lower abdominals ⁽¹¹⁾. Activating the core muscles aids in stabilizing

hypermobile joints, which in turn decreases mechanical stress on the spine ⁽¹²⁾. Core stabilization exercises have been associated with notable reductions in intensity of pain and improvements in functional ability, indicating that a well-structured program can offer lasting relief ⁽¹³⁾. Core stability exercises help reduce pain by enhancing spinal stability, improving muscle coordination, boosting blood circulation, reducing muscle spasms, correcting posture, and supporting long-term pain relief ⁽¹⁴⁾. These benefits make them effective for managing low back pain. The purpose of this study is to explore the effects of core strengthening programs in relieving postpartum low back pain and physical function.

Methodology

Study Design

This study was conducted as a narrative review using a structured literature search based on PRISMA principles to identify and synthesize evidence on the effectiveness of core strengthening exercise programs for postpartum low back pain following caesarean section.

Source of article review

A computerized search was conducted using databases like PEDro, PubMed, and EMBASE, a computerized search was performed using medical subject headings (MeSH) and keywords such as "antenatal back pain," "postpartum low back pain," "core strengthening programs," "caesarean section," "physiotherapy exercise," and "therapeutic intervention." With "core strengthening programs" listed as one of the intervention choices, the main focus was on "postpartum low back pain."

Inclusion and Eligibility criteria

Reviewing abstracts and titles was the initial step in the analysis in order to find pertinent studies. After that, appropriate articles were chosen, and their complete contents were thoroughly evaluated in accordance with the established inclusion and exclusion criteria.

A PEDro scale score of 6 or above, research published between 2013 to 2024, randomized controlled trials involving postpartum women who had had caesarean sections, and English-language publications were the inclusion criteria for the review. Articles in languages other than English, editorials and opinions, conference papers, qualitative and observational studies, and systematic reviews were among the exclusion criteria.

Quality Appraisal

The methodological quality of the included studies was assessed using the PEDro scale because it is a validated and widely accepted tool for evaluating the quality of physiotherapy and exercise-based intervention trials.

Results

Ten randomized controlled trials are included in this review to conclude the effectiveness of core strengthening exercises as a rehabilitation method for postpartum low back pain and physical function in women who have had caesarean sections. There were 398 individuals in all, with 30 to 40 people per study participating in the trials. The quality of these trials was generally assessed as moderate. Pedro score analysis offers a thorough examination of the quality assessment as mentioned in Table 1.

According to this study, postpartum low back pain can be effectively treated with core strengthening activities that increase muscular strength and improve physical function. We examined the results of multiple randomized controlled trials to determine whether core strengthening exercises are beneficial in alleviating pain and enhancing physical function in postpartum women after undergoing a caesarean section.

Abbreviations: ODI- Oswestry Disability Index; NPRS- Numeric Pain Rating Scale; PFM-Pelvic Floor Muscles; VAS- Visual Analog Scale.

Table 1. Quality Assessment Through Pedro Score

Study / Publication Year	1	2	3	4	5	6	7	8	9	10	11	Total Score
Chaudry, Sana et al (2013) ⁽¹⁵⁾	+	+	-	+	-	-	-	+	-	+	+	6
Khorasani, Fahime et al (2020) ⁽¹⁶⁾	+	+	+	+	-	-	-	-	+	+	+	6
Eid Deeb, Abeer M et al (2019) ⁽¹⁷⁾	-	+	+	+	-	-	+	+	-	+	+	7
Saleh, Marwa Shafiek Mustafa et al (2019) ⁽¹⁸⁾	-	+	+	+	-	-	-	+	-	+	+	6
Adnan, Hadiqa et al (2021) ⁽¹⁹⁾	+	+	+	+	+	-	-	+	+	+	+	8
Nayyab, Iqra et al (2021) ⁽²⁰⁾	+	+	+	+	+	-	-	+	-	+	+	7
Saleem, Zuleka et al (2021) ⁽²¹⁾	+	+	-	+	-	-	-	+	-	+	+	6
Teymuri, Zahra et al (2018) ⁽²²⁾	+	+	+	+	-	-	+	+	-	+	+	7
Chaudhry, Rabia Yousaf et al (2024) ⁽²³⁾	+	+	-	+	-	-	-	+	-	+	+	6

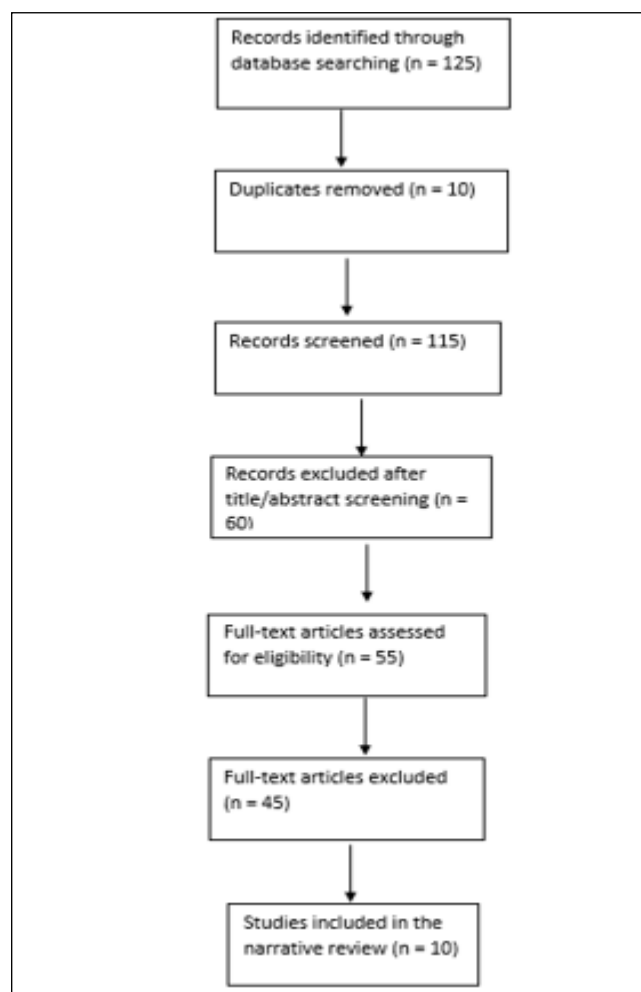


Figure 1.PRISMA 2020 flow diagram of study selection

Table 2.Summary Of Findings

Author/ Publication Year	Study Design	Subjects	Intervention		Duration and Frequency	Outcome Measure	Results
			Experimental Intervention	Control Intervention			
Chaudry, Sana et al (2013) ⁽¹⁵⁾	RCT	Total 40 Subjects EG-20 CG-20	Core stabilization exercises along with postural correction	Back strengthening exercises	8 weeks, three times a week	Visual analogue scale, Functional independent measure scale.	Experimental group saw 60% reduction in VAS pain alleviation, as well as increased lower limb strength and general functionality.
Khorasani, Fahime et al (2020) ⁽¹⁶⁾	RCT	Total 80 Subjects IG-40 CG-40	Home-based exercises focusing on pelvic floor muscles	No treatment	3 days a week for 12 weeks	ICIQ-UI-SF, Oswestry Disability Index (ODI), Visual analogue scale (VAS)	In postpartum women, home-based stabilization exercises successfully decreased LBP and increased pelvic floor strength.

Eid Deeb, Abeer M et al (2019) ⁽¹⁷⁾	RCT	Total 40 Subjects Group A -20 Group B-20	Stabilizing exercises	Stabilizing exercises and PFM training	3 Sessions / Week for 12 Weeks	Visual analogue scale Oswestry Disability Index	PFM strength, trunk range of motion, and pain and disability ($p = 0.001$) were improved for both groups. PFM strength increases and pain reduction were higher in Group B.
Saleh, Marwa Shafiek Mustafa et al (2019) ⁽¹⁸⁾	RCT	Total 34 Subjects Group A -17 Control Group B-17 Control	Core stability exercises and infrared radiation and ultrasound	Received Infrared radiation and ultrasound	Three times a week for 6 weeks	Pain Pressure Threshold scale Visual Analogue Oswestry Disability Index	Participants who performed core stability exercises showed significant improvements in their PPT and VAS.
Adnan, Hadiqa et al (2021) ⁽¹⁹⁾	RCT	Total 30 Subjects Group A -15 Group B-15	Static core exercises	Swiss ball training	3 days per week for 2 months	NPRS scale Oswestry disability index,	The two methods shown equivalent efficacy in treating postpartum low back pain.
Nayyab, Iqra et al (2021) ⁽²⁰⁾	RCT	Total 30 Subjects Group I -15 Group II -15	Supervised core stability exercise program	Unsupervised, home-based core stability exercise	3 sessions per week for 6 weeks	Numeric Pain Rating Scale (NPRS), Oswestry Disability Index (ODI),	Compared to at-home exercises, supervised core exercises promote muscle activation and lessen discomfort and impairment.
Saleem, Zuleka et al (2021) ⁽²¹⁾	RCT	Total 40 Subjects Group A -20 Group B-20	Abdominal Crunch, Static Glutei, Kegel Exercise, Isometric Back Strengthening Exercise	Double Straight Leg Raise, Static Glutei, Kegel Exercise, Isometric Back Strengthening Exercise	3 alternate days for 6 weeks. Three sets of 10 repetitions of each exercise	Inter-recti distance (IRD), Oswestry disability index (ODI)	Group A exercise produced promising results in reducing IRD and associated LBP.
Teymuri, Zahra et al (2018) ⁽²²⁾	RCT	Total 36 Subjects Training Group -18 Control Group - 20	Electrotherapy modalities and specific stabilizing exercises	Only electrotherapy modalities	6 weeks, 3 times per week	VAS scale ODI questionnaire	Discomfort, impairment, and pelvic floor muscle function can all be improved with stabilizing exercises for postpartum lumbopelvic discomfort.
Chaudhry, Rabia Yousaf et al (2024) ⁽²³⁾	RCT	Total 28 Subjects Group A -14 Group B-14	Trunk stabilization exercises	Core activation exercises	3 times a week for 8 weeks	NPRS scale ODI questionnaire	Stabilization activities are better at lowering pain and disability.

Thabet, Ali A. (2019) (24)	RCT	Total 40 subjects Group A -20 Group B-20	Deep core stability- strengthening and abdominal exercises	abdominal exercises program	3X a week for 8 weeks	Physical Functioning Scale (PF10)	The deep core strength workout regimen are better in addressing diastasis recti and enhancing the quality of life for women after childbirth.
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Discussion

We examined the effects of Core Strengthening exercise programme on postpartum women through this narrative review. Ten of 125 articles met the inclusion criteria and all of

these studies examined the effectiveness of core strengthening exercises for postpartum low back pain in women as included in table 2. The overall results showed that core stabilizing exercises intervention compared with the control group significantly improved pain intensity and disability. These exercises focus on strengthening the core muscles, which are crucial for stability and support during the postpartum recovery phase. The findings of this study emphasize the efficacy of stabilizing exercises in reducing pain intensity among postpartum women. The results align with the systematic review by Moheboleslam et al. (2022), which demonstrated a significant reduction in pain levels, with a standard mean difference of -0.76⁽²⁵⁾. This study aligns with the findings of Chaudhry et al. (2023), demonstrating that core stabilization exercises are superior to activation exercises in alleviating lumbo-pelvic pain⁽²⁶⁾. By targeting deep stabilizing muscles such as the transversus abdominis and multifidus, these exercises address the underlying biomechanical dysfunctions that contribute to pain more effectively than superficial muscle activation. Stabilization exercises play a crucial role in enhancing the activity of abdominal and pelvic floor muscles, as highlighted by Ehsani et al. (2020). These muscles are essential for maintaining lumbo-pelvic stability, providing the foundation for proper spinal and pelvic support. Increased activation of these muscle groups not only alleviates existing pain but also reduces the risk of future pain episodes by addressing the underlying biomechanical weaknesses⁽²⁷⁾. Core stabilizing exercises have shown a marked reduction in pain and disability, evidenced by improved Oswestry Disability Index scores (Chaudhry et al., 2023; Moheboleslam et al., 2022). Strengthening deep stabilizing muscles enhances lumbo-pelvic support, offering effective relief and improved function. These findings highlight their importance in rehabilitation programs for lumbo-pelvic pain management. The core is a fundamental anatomical structure essential for force transfer and stabilization throughout the body. It consists of various muscles, including the rectus abdominis, obliques, erector spinae, and others, working in harmony

to optimize physical performance and minimize the risk of injury⁽²⁸⁾. The abdominal muscles are essential for stabilizing the lumbar spine, primarily by increasing intra-abdominal pressure, as highlighted by Murai and Nakamura (2013)⁽²⁹⁾. There are several interconnected factors that contribute to low back pain (LBP) in women who have had a Caesarean section. These include pelvic floor dysfunction, which increases strain on the lower back, scar tissue and adhesions which limit mobility and change biomechanics and weakening of the abdominal muscles brought on by surgical incision which decreases spinal stability⁽³⁰⁾. In addition to postural abnormalities and compensatory motions that further strain the lumbar spine, hormonal changes particularly higher relaxin levels can result in joint instability. LBP is also influenced by mental stress, diminished physical activity, and muscle imbalances in order to effectively manage these issues core strengthening exercises, posture correction and rehabilitation are required. Core exercises have been shown to alleviate lower back pain, a common issue faced by new mothers, thereby enhancing daily functioning. Strengthening the core muscles helps support the lumbar spine, reduces pain, and improves overall mobility, which is essential for new mothers as they navigate the physical demands of caring for their newborns⁽³¹⁾. According to Leopold et al. (2021), core strengthening exercises have been shown to effectively reduce the inter-rectus distance, a significant indicator of diastasis recti, which is prevalent among postpartum women⁽³²⁾. Lalitha et al. (2021) found that core stabilization exercises were more effective than general low back exercises in alleviating chronic low back pain. These benefits were attributed to the core exercises capacity to improve spinal stability and alignment^(33,34). Early and progressive exercises post-surgery can lead to quicker recovery times, reducing the need for analgesics and promoting independence in daily activities⁽³⁵⁾. According to Tomar and Vyas (2024), participation in structured core strengthening programs has been associated with improved body image and reduced anxiety, offering significant benefits to mental health. A study by Nayyab et al. (2021) found that a supervised core stability exercise program significantly reduced pain and disability in post-C-section women, compared to an unsupervised program. According to Saleh et al. (2019), participants in core exercise programs typically experience a significant reduction in pain within six weeks. Extended programs, lasting up

to twelve weeks have shown even more pronounced benefits, including improved physical and mental well-being (Tomar & Vyas, 2024). Programs focusing on deep core stability have demonstrated effectiveness in closing diastasis recti, a common condition post-C-section, leading to enhanced quality of life (Thabet & Alshehri, 2019) ⁽³⁶⁾. These exercises performed three times a week, resulted in significant reductions in inter-recti separation indicating improved core strength and stability (Thabet & Alshehri, 2019). These exercises improve lumbar stability, which is crucial for postpartum women experiencing chronic low back pain (Chaloner et al., 2015) ⁽³⁷⁾. Numerous studies have highlighted the benefits of exercise programs in significantly reducing pain levels and disability associated with pain in the back and pelvis during the postpartum period (Dunn et al., 2019; Kinser et al., 2017) ⁽³⁸⁾. For instance, research by Li et al. (2013) demonstrated that sit-up exercises are effective in lowering the prevalence of non-specific low back pain in postpartum women at both 3 and 12 months post-delivery ⁽³⁹⁾. Their findings revealed a notable reduction in low back pain prevalence in the exercise group underscoring the efficacy of this core strengthening approach. An analysis suggests that a core strengthening exercise program lasting at least 8 weeks, with three 30-minute sessions per week, may provide more significant benefits for postpartum low back pain relief and improved physical function in women who have undergone caesarean sections ⁽⁴⁰⁾. The timing and progression of core strengthening exercises for postpartum women should be customized to accommodate individual recovery rates and any complications arising from Caesarean delivery (Saptyani et al., 2020) ⁽⁴¹⁾. Research strongly supports incorporating core strengthening exercises along with flexibility training as an effective approach to alleviate low back pain in postpartum women following a Caesarean section. These interventions have been shown to enhance spinal stability, increase muscle strength and endurance, and improve overall physical function (Saptyani et al., 2020; Hong & Lee, 2020;) ⁽⁴²⁾. This narrative review emphasizes Core Strengthening Exercise Programs, including Kegels, pelvic tilts, abdominal bracing, bridges, cat-cow stretches, bird dog, and modified planks for postpartum rehabilitation in women recovering from Caesarean sections ^(43,44,45). All reviewed studies reported favourable outcomes in reducing low back pain, improving core strength, restoring pelvic stability, and enhancing function mobility and quality of life. These findings highlight the effectiveness of targeted core exercises in promoting recovery and functional well-being in postpartum women. Future studies should include larger randomized controlled trials with standardized exercise protocols and long-term follow-up to establish the effectiveness of core strengthening exercises for postpartum low back pain following caesarean section.

Limitations

Despite promising findings, several limitations exist. Many studies had small sample sizes, limiting generalizability. The absence of standardized rehabilitation protocols also hinders the identification of optimal practices. Additionally, while short-term improvements were noted, the long-term sustainability of these benefits remains unclear and requires further investigation.

Conclusion

This narrative review emphasizes the significant benefits of core strengthening exercise programs in managing postpartum low back pain and enhancing physical function in women post-caesarean section. Evidence from various randomized controlled trials confirms the effectiveness of these programs in reducing pain, increasing muscle strength, and supporting physical recovery during the postpartum period. Finally, it can be recommended that core strengthening exercise programs are effective in alleviating postpartum low back pain, improving functional mobility, and enhancing the quality of life in women who have undergone Caesarean-section.

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