ANNALS OF MEDICINE
2025, VOL. 57, NO. 1, 2476046
https://doi.org/10.1080/07853890.2025.2476046

REVIEW ARTICLE

OPEN ACCESS Check for updates

Educating women to prevent and treat low back and pelvic girdle pain during and after pregnancy: a systematized narrative review

Sabine Vesting[a,b], Annelie Gutke[b] and Liesbet de Baets[c,d]

[a]Närhälsan Gibraltar Rehabilitation, Gothenburg, Sweden; [b]Department of Health and Rehabilitation, Unit of Physiotherapy, Institute of Neuroscience and Physiology, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden; [c]Pain in Motion Research Group (PAIN), Department of Physiotherapy, Human Physiology and Anatomy, Faculty of Physical Education and Physiotherapy, Vrije Universiteit Brussel, Belgium; [d]Department of Rehabilitation Sciences, Faculty of Movement and Rehabilitation Sciences, Musculoskeletal Rehabilitation Research Group, KU Leuven, Belgium

ABSTRACT

Purpose: This review evaluated the effectiveness of patient education and information on low back pain (LBP) and pelvic girdle pain (PGP) in pregnant and postpartum women and evaluated their alignment with modern pain education principles rooted in the biopsychosocial model.

Method: A systematized narrative review was performed, including a systematic search of three databases and reference screening from relevant systematic reviews. The methodological quality of the included randomized controlled trials (RCT) was evaluated using the PEDro scale.

Results: Eighteen studies, including nine RCTs with PEDro scores ranging from to 2–8, indicated that patient education during pregnancy can help reduce pain and related disability. Most studies did not differentiate between LBP and PGP, which limits the specificity and targeted approach of educational interventions. Education alone is less effective without accompanying active treatment. Current programs primarily emphasize biomechanics, covering anatomy and physical changes, but often neglect lifestyle factors, such as stress and sleep.

Conclusion: Although patient education is important for managing pregnancy-related LBP and PGP, its effectiveness may be improved by tailoring programs to specific pain conditions and integrating a biopsychosocial perspective on pain.

IMPLICATIONS FOR REHABILITATION

- It is important to differentiate between lower back and pelvic girdle pain to specifically address patient education with respect to pain conditions.
- The incorporation of lifestyle factors such as stress and sleep could be an important part of patient education for both pregnant and postpartum women.
- Patient education should not stand alone, but should be combined with active treatment, such as exercise.
- Patient education may be more effective during or at the beginning of pregnancy.

ARTICLE HISTORY

Received 20 December 2024
Revised 19 February 2025
Accepted 22 February 2025

KEYWORDS

Pain education; lumbopelvic pain; advice; pregnancy-related pain; educational programs

Introduction

Pain in the lower back and pelvis is among the top 10 causes of disability over a lifetime [1]. It also imposes a high cost on society. Low back pain (LBP) is one of the leading contributors to disability worldwide, accounting for an estimated 83 million disability-adjusted life years (DALYs) in 2010 up from 58.2 million in 1990 [2]. The prevalence of chronic LBP is higher among women than men, which may partly be explained by pregnancy and childbirth being risk factors for its development [3]. This is especially true for women who experience pain during pregnancy, as severe pain during pregnancy is a risk factor for persistent pain later in life [4].

Regarding LBP and pelvic girdle pain (PGP) during pregnancy, three distinct pain conditions are identified: pregnancy-related LBP, PGP and lumbopelvic pain (LPP) [5]. LBP, without the presence of PGP, is not more prevalent in pregnant women than in a comparable non-pregnant population [5]. In contrast, PGP is a clearly pregnancy-related pain condition characterized by a low tolerance for prolonged standing and walking and a sensation of 'legs giving way' [6].

CONTACT Annelie Gutke annelie.gutke@neuro.gu.se Department of Health and Rehabilitation, Unit of Physiotherapy, Institute of Neuroscience and Physiology, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden

Supplemental data for this article can be accessed online at https://doi.org/10.1080/07853890.2025.2476046.

Approximately 50% of women experience PGP or LPP during pregnancy, and 25% continue to experience these conditions in the first year after childbirth [7].

Pain-guided exercise programmes are guideline-based treatments for pregnancy-related and postpartum LBP, PGP and LPP [8–11]. Unfortunately, many pregnant women with LBP, PGP or LPP are hesitant to engage in physical activity due to fear of pain flares from exercise and concerns about harming their unborn child [12–14]. In contrast, most exercise programmes are safe for the foetus and significantly reduce pregnancy-related and postpartum PGP and LPP, with moderate to high effect sizes [8,15] Therefore, providing pain education to women with pregnancy-related LBP, PGP or LPP, helping them understand their symptoms, could be a key aspect of treatment. Modern pain neuroscience is an integrative approach that addresses both the biomedical and psychosocial components of pain. By explaining pain and reducing its perceived threat, this approach aims to change pain beliefs and alleviate fears, particularly regarding specific movements or movement patterns, while also decreasing perceived stress related to pain. In turn, this helps individuals relearn normal movement patterns and increase physical activity and exercise, which may have been feared or avoided due to pain. This approach has been shown to be effective in populations beyond pregnancy, such as individuals with general low back pain [16,17]. During and after pregnancy, a woman's body undergoes tremendous changes that may feel unfamiliar and scary, potentially increasing pain. Educating women on the normalcy of these changes could help reduce perceived threats, decrease pain, enhance exercise self-efficacy, and enable them to stay physically active [17–19]. Specific advice on posture and ergonomics, as well as the temporary use of a pelvic belt and crutches, can be discussed to help manage or control LBP, PGP or LPP, allowing women to remain physically active and engage in exercise [20].

However, the effectiveness of patient education for women with pregnancy-related or postpartum LBP, PGP or LPP in terms of reducing pain intensity and related disabilities is currently unknown. Additionally, it is unclear whether current patient education aligns with the contemporary biopsychosocial understanding of pain. This review aimed to evaluate the effectiveness of existing patient education for LBP and PGP in pregnant and postpartum women. Additionally, it seeks to critically assess whether these programs involve contemporary pain education concepts and the biopsychosocial pain model.

Methods

This systematized narrative review was designed according to the Scale for the Assessment of Narrative Review Articles (SANRA) [21]. The following electronic databases were searched for relevant articles: Medline/PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and Scopus (last search on the 11th of June 2024). The search terms were chosen based on knowledge and previous publications confirmed in a meeting with a professional librarian at the University of Gothenburg (see Supplement 1). The search results were exported to Endnote X7 (Clarivate), and duplicates were identified using the program and removed. The first author (SV) screened all titles and abstracts according to eligibility criteria. The full texts of the remaining articles were independently screened by two researchers (SV and LDB). The researchers contacted the corresponding authors when the full text was not available or when clarification was required. The inclusion criteria for this review were as follows.

Population (P): Studies included adult pregnant or postpartum participants (up to one year after delivery) with or without LBP, PGP, or LPP. Pain conditions related to the pelvis but of another origin were excluded (e.g. osteitis pubis, sciatica, pelvic floor pain, and non-pregnancy-related coccydynia and symphysis pubis dysfunction).

Interventions (I): Studies that included written or oral patient education, information, and/or advice as active or control treatments. Patient education, information, and/or advice could include recommendations for exercise, but only if exercise was part of the advice and not the main active treatment. In the following text, the term 'patient education' will encompass both *patient information and advice*, which tend to be more one-sided (i.e. with the therapist active and the patient passive), as well as *interactive patient education* that fosters engagement between both parties. However, owing to the difficulty in clearly distinguishing between these terms in the studies, the broader term 'patient education' will be used. Table 1 provides a detailed overview of the eligibility criteria for the educational interventions.

Comparison (C): Studies that included other treatments, such as exercise, yoga interventions, pelvic compression, or meditation, as either active or control.

Outcome (O): Studies that measured pain or pain-related disability as an outcome using self-report instruments such as pain rating scales (Visual Analog Scale or Numeric rating scale) or patient-reported outcome measures (PROMs).

Table 1. Description of the inclusion and exclusion criteria for the "patient education" intervention.

Inclusion criteria:	Exclusion criteria:
Patient education, information and/or advice were defined as any information about pregnancy-related pain in the low back or pelvis (e.g. diagnosis, prognosis, self-management or other treatment advice) provided to the participants by talking to the patient, pamphlets, booklets, links to online resources, audio files, or videos by health care providers. Education materials could be provided in person, *via* telephone, mail, or other digital solutions.	Studies that solely provided advice about exercising, where the primary research question focused on the effects of exercise, were excluded. Since patient information is often one component in a multimodal approach, we excluded studies where we determined that the information, education, or advice was not among the primary components of the intervention. Additionally, studies involving passive treatments, such as manual therapy, as part of a multimodal approach were excluded as their influence on pain could not be determined

Study design (S): Randomized controlled trials (RCTs), quasi-RCTs, controlled trials, pilot studies, and case series/studies were included.

The reference lists of related reviews in the field [9,22–24] and the selected articles were also screened by two researchers for eligible papers (SV and LDB). Data extraction was performed by the first author, including the extraction of author, year, inclusion criteria, educational material/type, frequency and volume of patient education, a brief summary of the educational content (without rating it as positive or negative), the comparative treatment (if applicable), and the type of pain and outcome evaluated.

Risk of bias

All randomized controlled trials (RCTs) were assessed using The Pedro scale, an established instrument designed to evaluate the quality of physiotherapy intervention studies [25]. The Pedro scale consists of 11 items. However, since the first item (eligibility criterion) is not included in the count, the scale ranges from 0 to 10 [26]. A score of zero indicates the lowest quality, whereas a score of 10 representing the highest quality. Trials were independently rated by the first author (SV) and postdoctoral researcher (LBD), and any disagreements were resolved through discussion.

PEDro scores were categorized as follows: 0–3, 'poor'; 4–5, 'fair'; 6–8, 'good'; and 9–10, 'excellent'. Studies of lower methodological quality, such as cluster-controlled trials, nonrandomized trials, and case studies, were not rated using the PEDro scale because of their inherently low-quality design [27]. The number of included participants were also extracted, as sample sizes and power calculations are not included in the PEDro score rating. This allows for consideration of sample size when evaluating the quality of the reported results.

Results

Search results

Figure 1 illustrates the study selection process. Following the removal of duplicates, the database search yielded 891 papers. After screening the titles and abstracts, 822 papers were excluded, and three articles were added after screening the reference lists. Subsequently, 72 full-text articles were assessed for their eligibility. The primary reasons for excluding 54 papers during the full-text review process were that information, education, or advice was not a primary component of the intervention, or that the studies focused solely on exercise-related patient education. A total of 18 papers were ultimately included in this review, including nine RCTs, two quasi-RCTs, one cluster-controlled trial, five non-RCTs, and one case study.

Risk of bias

Table 2 describes the study characteristics, evaluated type of pain, results and quality of the included studies. Two of the RCTs reported data from the same trial (short-term and long-term outcomes) [28,29]. Five RCTs [28–32] and one quasi-RCT [33] met the requirements for good quality, four RCTs had fair methodological quality [34–37], and one quasi-RCT [38] had poor quality. The studies with fair quality included no 'intention-to-treat' analysis, two had more than 25% lost to follow-up [35,36], two had no assessor blinding [34,35], and one presented no measures of variability [37].

Study characteristics

Study population. A total of 2,375 women with and without LBP, LPP or PGP were included in the 18 studies reviewed. In 13 of these studies, participants were recruited during pregnancy, ranging from the 8th to the 36th gestational week [33]. In the first three studies (as presented in Tables 2 and 3), participants did not necessarily have LBP or PGP [38–40]; instead, the educational programs or advice were primarily used as preventive measures to avoid pain. In the following eight studies [30,31,34–36,41–43], women who experienced pain were treated using various educational programs. The onset of pain was assessed through self-reports [31,41,43], interviews [30], or clinical testing. In five of these studies [33–35,37,42], the authors distinguished between LBP and PGP using clinical testing.

In two of the included studies [33,37], participants were recruited during pregnancy, but follow-up assessments were conducted postpartum. The aim of these interventions was to positively influence the development of pain during the postpartum period. Four of the

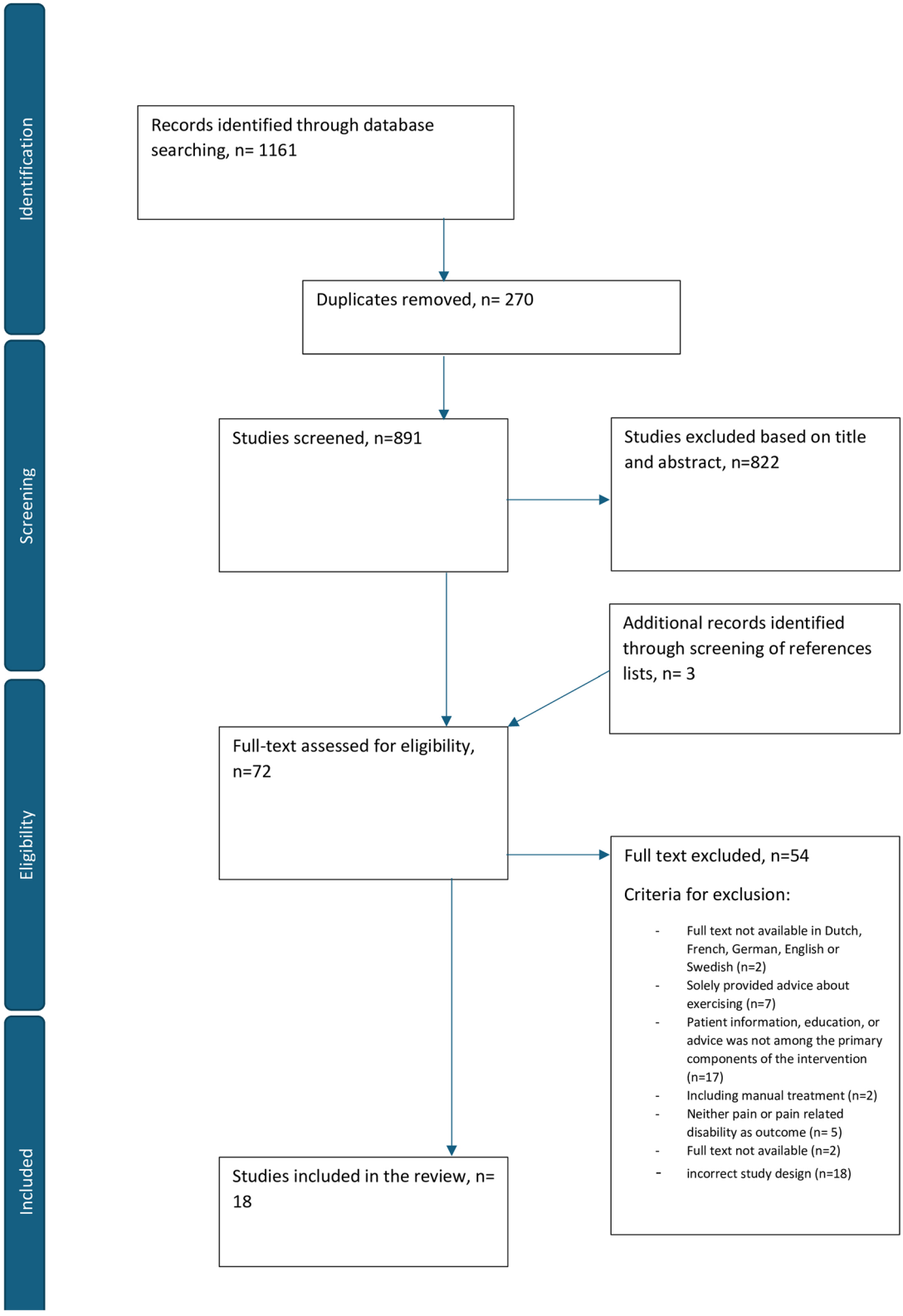

Figure 1. PRISMA Flow diagram of study selection.

included studies were conducted only during the postpartum period [28,32,44,45], with one of these studies reporting both short-term and long-term follow-up results [28,29]. In these studies, women were recruited between ten days [44] and six months postpartum [32] and followed up to one year after delivery [29]. The distinction between PGP and LBP was made in two of these studies [32,45], although no clinical testing was used to confirm this. One study employed adapted tests that participants could perform at home [45].

Table 2. Study characteristics, including study design, inclusion criteria, number of participants, evaluated type of pain, results, rated study quality.

	Author, year	Study design	Inclusion criteria	Number of participants	Evaluated type of pain	Self-reported outcome measure	Results for pain/disability*	Pedro score
Pregnancy - Prevention	Akhtar et al. 2014 [39]	Controlled trial	less than 12 weeks pregnant	*n* = 200 at baseline (less than 12 weeks pregnant) *n* = 143 at follow-up (six months later)	LBP Women with preexisting LBP were excluded from the study.	Dallas Pain Questionnaire	I (patient education): 28.2% developed pain, 68.1% mild, 27.2% moderate and 4.5% severe pain C (no treatment): 56.9% developed pain, 16.2% mild, 59.4% moderate and 24.3% severe pain	Not rated
	Mirmolaei et al. 2018 [40]	Quasi experimental study	Women between 18 and 35 years old, in gestational weeks between 17 and 22, and with a singleton pregnancy.	*n* = 180 at baseline (gestation week 19) *n* = 171 at follow-up (12 weeks later)	Pregnancy-related lumbopelvic pain. No testing Also included women without pain	Visual analogue pain scale (VAS) Oswestry Disability Questionnaire (ODI)	VAS (0-10) **I (patient education): 2.9 (SD 2.4)** **C (routine care): 5.0 (SD 3.1)** ODI (0–100) **I (patient education): 16.2 (SD 12.6)** **C (routine care): 26.1 (SD 18.5)**	Not rated
	Östgaard et al. [38]	Quasi-RCT	Women before their 18th weeks and in whom pregnancies without obstetric complications were expected	*n* = 407 at baseline (between gestation week 12–18) *n* = 362 at follow-up (gestation week 36 and 8 weeks pp)	47% back pain and posterior pelvic girdle pain (four times more pelvic girdle pain) 8% combined back and posterior pelvic girdle pain Confirmed by clinical testing, also included women without pain	Visual analogue pain scale (VAS) Pain related activities	VAS (0–10) No statistically significance in pain intensity among the three groups (group education, individualized education or routine care) during pregnancy **Participants with back and posterior pelvic girdle pain who participated in the two intervention groups (group education, individualized education) experienced reduced pain.** **Participants with back pain who participated in the individualized education experienced greater pain reduction (3.2 SD 1.9) than the other participants (4.4 SD 2.2) 8 weeks pp**	2/10
Pregnancy-Treatment	Barbier et al. 2023 [30]	RCT	Women with a singleton, low-risk pregnancy between 15 and 32 weeks of gestation and experiencing back, lumbar, or sacroiliac pain (no preexisting major chronic back pain before pregnancy)	*n* = 60 at baseline (15 to 32 weeks of gestation) *n* = 52 at follow up (eight weeks later)	LBP, assessed by personal interviewing	NRS (0–10), Brief pain inventory (BPI) including severity scores and interference scores Daily consumption of analgesics	NRS (0–10) **I (advice + stretching): 1.6 (SD 1.4)** **C (advice) : 4.1 (SD 2.2)** BPI: **I (advice + stretching: 6.8 (SD 5.3)** **C (advice): 13.8 (SD 7.9)**	7/10
	Beyaz et al. 2011 [41]	Controlled trial	Pregnant women (second trimester) who could attend exercises three days a week	*n* = 36 at baseline (second trimester)	Self-reported LBP	VAS (scale steps unspecified)	**Statistically significant reduction in pain severity (VAS) and pain frequency in the intervention group (patient education) compared to the control group (routine care)**	Not rated

(*Continued*)

Table 2. Continued.

Author, year	Study design	Inclusion criteria	Number of participants	Evaluated type of pain	Self-reported outcome measure	Results for pain/disability*	Pedro score
Kordi et al. 2013 [34]	RCT	Healthy women < 40 years (singleton pregnancy) with pain in lumbar region radiating between gluteal fold and posterior iliac crest	*n* = 105 at baseline (gestation week 20–32) *n* = 96 at follow-up (six weeks later)	PGP Confirmed by pain drawing and clinical testing	VAS (0–100) Oswestry Disability Questionnaire (ODQ)	VAS (0–100) **C (patient education: 45.2 (SD 14.57)** **I (belt): 11.0 (SD 15.94)** **I (exercise): 31.1 (SD 17.59)** ODI (0–100) **C (patient education): 25.7 (SD 9.67)** **I (belt): 20.1 (SD 7.61)** **I (exercise): 21.5 (SD 7.71)**	5/10
Martins& eSilva et al. 2014 [35]	RCT	Women between the 12th and 32nd weeks of gestation With confirmed PLBP or PGP by marking pain sites on a drawing of a human figure	*n* = 60 at baseline (gestation week 19) *n* = 45 at follow-up (10 weeks later)	15% LBP 20% PGP 63% combined pain According to pain drawing and clinical tests	Visual analogue pain scale (VAS) Lumbar pain provocation test Posterior pelvic pain provocation test	VAS (0–10) I (yoga): 71.4% painfree (VAS = 0) C (patient education) 20.8% painfree (VAS = 0)	5/10
Norén et al. 1997 [42]	Cluster controlled trial	All pregnant women with any type of back pain who attended the antenatal clinic at Trandared, Borås, Sweden, from April 15, 1991, to February 5, 1993, were included in the physiotherapy program.	*n* = 135 at baseline (between gestation week 11–36) and follow-up (appr. 4 weeks later)	6% LBP 46.3% posterior PGP 37% combined PGP and LBP Confirmed by patient history, pain drawing and clinical testing	Visual analogue pain scale (VAS) Pain drawing	VAS (0–10) Maximum pain **At baseline: 7.3 (SD 1.4)** **At gestation week 36: 6.2 (SD 3.2)** No group comparison for the outcome pain. Statistically significant difference in sick leave between the intervention group (mean 30.4 days/women) and the control group (53.6 days/women)	Not rated
Ozdemir et al. 2015 [31]	RCT	Women >18 years who had had pregnancy related LBPP	*n* = 96 at baseline (between gestation week 20–35) *n* = 96 at follow-up (four weeks later)	LBP and PGP According to oral patient history	Visual analogue pain scale (VAS), Oswestry Disability Questionnaire (ODI)	VAS (0–100) Relaxation **I (patient education): 29.75 (SD 23.84)** **C (routine care): 49.02 (SD 24.99)** Activity **I (patient education):35.40 (SD 23.57)** **C (routine care: 62.50 (SD 21.31)** ODI (0–100) **I (patient education): 26.40 (SD 8.03)** **C (routine care): 31.96 (SD 7.12)**	7/10
Pekçetin et al. 2019 [36]	RCT	Women > 18 years, with a singleton pregnancy less than 32 weeks gestation, experiencing LBP with a score greater than 3 out of 10 on the Visual Analogue Scale (VAS), and proficient in reading and speaking Turkish.	*n* = 124 at baseline (less than gestation week 32) *n* = 110 at follow-up (three weeks later)	Pregnancy-related LBP Diagnosed by a medical doctor	Visual analogue pain scale (VAS) Oswestry Disability Questionnaire (ODI)	VAS (0–10) **I (patient education): 2.25 (SD 2.38)** **C (single session): 4.44 (SD 2.32)** ODI (0–100) **I (patient education): 26.96 (SD 13.69)** **C (single session): 33.52 (SD 18.06)**	5/10

(*Continued*)

Table 2. Continued.

	Author, year	Study design	Inclusion criteria	Number of participants	Evaluated type of pain	Self-reported outcome measure	Results for pain/disability*	Pedro score
	Shim et al. 2007 [43]	Cluster controlled trial	Women between 17 and 22 weeks of gestation, agreed to participate in the study, be aged between 20 and 35 years, and report lumbar and/or posterior pelvic girdle pain during pregnancy.	*n* = 62 at baseline (between gestation week 17–22) *n* = 56 at follow-up (gestation week 29–34)	Pregnancy-related lumbar and/or posterior pelvic pain. According to patient history In this study, the term used was low-back pain, which includes lumbar back pain, posterior pelvic pain, and a combination of the two.	Visual analogue pain scale (VAS) Pain drawing Oswestry Disability Questionnaire (ODI)	VAS (0–10) **I (patient education): 4.2 (SD 2.6)** **C (routine care):5.7 (SD 2.2)** ODI (0–100) I (patient education): 41.7 (SD 17.2) C (routine care): 43.4 (SD 14.8)	Not rated
Baseline: pregnancy, follow-up: postpartum	Haugland et al. 2005 [37]	RCT	Positive posterior pelvic pain provocation test (P4 test) and/or positive symphysis pressure test. PGP caused by a minimum of two of the following activities: walking 10 min, standing 10 min, climbing stairs 2 floors, and turning in bed. Negative neurological back examination, which included active movement of columna, test of sensation, reflexes, straight leg raising, muscle strength.	*n* = 569 at baseline (between gestation week 18–32) *n* = 427 at six months pp *n* = 104 at 12 months pp	PGP: 26% a combination of positive symphysis pressure and P4 test 20% had positive symphysis pressure test only 54% positive P4 test only tested by clinical assessment	Visual analogue pain scale (VAS) in relation to four daily activities (standing, walking, steps, turning)	Baseline: VAS (0–10): I (patient education): 6 (median) C (routine care): 6 (median) Six months pp VAS (0–10): I (patient education): 0–1 (median) C (routine care): 0–1 (median) 12 months pp VAS (0–10): I (patient education): 0–1 (median) C (routine care): 0–1 (median) VAS for standing, walking, steps and turning	5/10
	Nilsson-Wikmar et al. 2005 [33]	Quasi-RCT	Pregnant women until gestation week 35 with pelvic girdle pain	*n* = 118 at inclusion (between gestation week 8–35) *n* = 103 at gestation week 38 *n* = 101 at 3month pp *n* = 92 at 6month pp *n* = 97 at 12 months pp	PGP confirmed by clinical assessment Women who tested positive in at least 3 pelvic pain provocation tests including the symphysis, while testing negative for pain in the lumbar spine area including radiating pain, were included	Visual analogue pain scale (VAS) Pain localization and sensation by pain drawing Disability Rating Index (DRI),	VAS (0–100), change score (median (range)) Inclusion to gestation wk 38 C (patient education): −5(−72–72) C (exercise 1): −6(−81–79) I (exercise 2): 1 (−65–73) Gestation wk 38 to 12 months pp, change score (median (range)) C(patient education): 44 (−8–94) C (exercise 1): 60 (−29–94) I (exercise 2): 43 (−15–87) DRI (0–100), change score (median (range)) Inclusion to gestation wk 38 C(patient education): −21 (−72–26) C (exercise 1): −23 (−61–24) I (exercise 2): −25 (−61–28) Gestation wk 38 to 12 months pp, change score (median (range)) C (patient education): 56 (16–84) C (exercise 1): 56 (−6–87) I (exercise 2): 51 (14–88)	6/10

(*Continued*)

Table 2. Continued.

	Author, year	Study design	Inclusion criteria	Number of participants	Evaluated type of pain	Self-reported outcome measure	Results for pain/disability*	Pedro score
Postpartum	Bastiaenen et al. 2006 [28]+2008 [29]	RCT	Women who were over 18 years old and pregnant, proficient in Dutch, experiencing limitations in daily life due to pregnancy-related PGP and delayed recovery, and did not express a specific treatment preference.	*n* = 126 at baseline (3 weeks pp) *n* = 114 at 12 weeks pp *n* = 105 at 6 and 12 months pp	Pregnancy-related PGP and/or LBP Not confirmed by clinical testing, however, nerve root pathology was excluded	Visual analogue pain scale (VAS) today Visual analogue pain scale (VAS) this week Roland Disability Questionnaire (Limitation in activities)	12 weeks pp: VAS (0–100) Pain today I (patient education): 24.3 (SD 24.1) C (routine care): 26.3 (SD 19.9) Pain this week I (patient education): 25.3 (SD 23.0) C (routine care):29.6 (SD 21.7) RDQ (0–24) **I (patient education): 4.5 (SD 4.9)** **C (routine care): 6.8 (SD 5.5)** 12 months pp: VAS (0–100) Pain today I (patient education): 20.7 (SD 23.1) C (routine care): 17.4 (SD 19.9) Pain this week I (patient education): 23.7 (SD 23.8) C (routine care): 18.5 (SD 19.7) RDQ (0–24) I (patient education): 3.5 (SD 4.9) C(routine care): 3.4 (SD 4.2)	2006 8/10 2008 8/10
	Mens et al. 2000 [32]	RCT	Women experiencing pelvic girdle pain defined as pain between the plane through the 4 superior iliac spines and the horizontal plane through the inferior border of the pubic symphysis. Pain that influenced by position and movement, localized both posteriorly and anteriorly to the pelvis, and began during pregnancy or within 3 weeks after delivery.	*n* = 44 at baseline (6 weeks to six months pp) *n* = 44 at follow up (8 weeks later)	Peripartum Pelvic Girdle Pain, confirmed by questions	Visual analogue pain scale (VAS) Nottingham Health Profile (NHP)	VAS (0–100) Pain in the morning C(patient education): 11.4 (SD 17.8) C (exercise 1): 8.9 (SD 15.7) I (exercise 2): 3.6 (SD 23.6) Pain in the evening C (patient education): 6.9 (SD 18.4) C (exercise 1): 8.6 (SD 14.2) I (exercise 2): 2.0 (SD 23.1) NHP physical mobility (0–100) C (patient education): 6.5 (SD 17.5) C (exercise 1): 5.2 (SD 12.7) I (exercise 2): 6.2 (SD 25.6)	8/10

(*Continued*)

Table 2. Continued.

Author, year	Study design	Inclusion criteria	Number of participants	Evaluated type of pain	Self-reported outcome measure	Results for pain/disability*	Pedro score
Oh et al. 2007 [44]	Cluster controlled trial	Women between 36 and 39 weeks of gestation, agreeing to participate in the study, aged between 20 and 35 years, and reporting LBP during pregnancy.	$n = 52$ at baseline (10 days postpartum) $n = 52$ at follow-up (8 weeks pp)	Pregnancy-related lumbar and/or posterior pelvic back pain. In this study, the term used was low-back pain, which includes lumbar back pain, posterior pelvic girdle pain, and a combination of the two.	Visual analogue scale (VAS) Pain drawing Functional limitations were assessed on self-reported 20-items, 3-point Likert scale Flexibility was measured using a digital forward flexmeter Inventory of Functional Status after Childbirth (IFSAC)	VAS (0–10) I (patient education): 1.8 (SD 2.0) C (routine care):2.9 (SD 1.8) Functional limitation (0–60) I (patient education): 23.4 (SD 2.9) C (routine care): 26.02 (SD 5.4)	Not rated
Starzec-Proserpio& M. [45]	Case study	Participant experiencing pain mainly in the pelvic girdle region, especially in the perineal area, interior and upper thighs, coccygeal, and lower back area	Participant ($n = 1$)	PGP, Confirmed by battery of self-administered provocation tests	Pelvic Girdle Questionnaire (PGQ) Central sensitization inventory, Pain self-efficacy questionnaire	PGQ: 72.2 at baseline 15.3 at follow Activity subscale Baseline: 41/57 Follow up: 8/57 Symptom subscale Baseline: 11/15 Follow up: 3/15	Not rated

*$p < 0.05$ in bold.
BPI: Brief pain inventory; C: Control group; DRI: Disability Rating Index; I: Intervention group; N: number, NRS: Numerical Rating Scale; NHP: Nottingham Health Profile; ODI: Oswestry Disability Index; PGP, pelvic girdle pain ad LBP low back pain; PGQ: pelvic girdle questionnaire; pp: postpartum; RCT: randomized controlled trial; RDQ: Roland Disability Questionnaire; SD: standard deviation; VAS: visual analogue scale.

Outcome assessment. Pain was assessed in all but one study [45] *via* the visual analogue scale (VAS) or numerical rating scale (NRS). VAS requires patients to mark their pain on a 10 cm line from 'no pain' to 'worst imaginable pain,' rated from 0 to 10 or 0 to 100. The NRS asks patients to rate their pain on a scale of 0 to 10 or 0 to 100, with higher numbers indicating more pain. In some studies, distinctions were made between rest and activity pain [31], morning and evening pain [32], pain during activities such as walking, going steps and standing [37] or pain experienced today versus over the past week [28].

Various instruments have been used across studies to assess pain-related disabilities. The Oswestry Disability Index (ODI) is the most frequently utilized tool [31,34,36,40,43]. Other outcomes included the Roland–Morris Disability Questionnaire [28,29], Nottingham Health Profile [32], Disability Rating Index [33], Brief Pain Inventory [30], measures for functional limitations [44], pain prevalence [39,41], and sick leave [42]. The Pelvic Girdle Questionnaire, which is recommended by the core outcome set for PGP [46], was used in only one study [45].

Type, frequency and volume of patient education. Table 3 describes the content, type, frequency, and volume of patient education received. Written information was used in most studies (12 of 18) as a part of patient education. The case study provided explanatory video recordings instead [45]. Another frequently used tool was phone calls, in one study as active treatment [36], in another to adapt exercises [31], but also to provide additional support [43], to remind the participants of their exercise program [40] or to give the participants the possibility to ask questions during the course of the treatment [32,33]. All but two studies [32,45] provided at least one in-person session. The volume and frequency of patient education varied greatly among the studies, from three phone calls per week on four weeks [31] to single sessions and pamphlets or phone call [33,35].

Content of patient education. In single-session studies, patient education was used as a control intervention for other treatments such as yoga, exercise, or the pelvic belt [30,33–35]. These studies provided basic education about anatomy, pregnancy-related changes, and ergonomic advice on lying and sitting postures. In the remaining studies, patient education was either active treatment or part of it. As reported in Table 3, the content of patient education was more extensive in these studies, including information on specific exercises [31,40], breathing exercises, relaxation techniques [41], personalized education to understand unique circumstances [42], and ergonomic solutions for daily activities. All patient education included some details about the body's anatomy, biomechanical pregnancy-related changes, and mechanical causes of pain.

Table 3. Detailed descriptions of the provided patient education, including the type, frequency, and volume of education, the content covered, and the comparison group.

	Author and year	Educational material/ type	Frequency and volume	Content of the patient education/ advice	Compared to
Pregnancy-Prevention	Akhtar et al. 2014 [39]	Personal advice Written advice Pictorial handouts	Unsure, no information if the advice was given in a single session or more often.	Detailed advice regarding back care during pregnancy was provided, with special emphasis placed on teaching women good postural practices and the importance of avoiding heavy weightlifting and taking rest during prolonged periods of standing	Control group was not given such an advice.
	Mirmolaei et al. 2018 [40]	A prenatal education class with specific exercises, Exercise diary Phone calls	1 lecture 12 weeks exercise program (10 exercises- 20 min), every day Weekly phone calls	The intervention, developed by an expert physiotherapist, included a prenatal education class covering basic anatomy and physiological changes during pregnancy. It addressed factors contributing to LBP and emphasized proper posture in lying, sitting, and standing, along with correct lifting techniques. Specific exercises such as pelvic tilting, knee pull, Kegel exercises, wall squats, adductor stretches, pelvic elevation, pelvic rotation, and arm and leg raises were also included. Women in the intervention group were encouraged to maintain the exercise regimen at home, receiving weekly phone calls from the researcher to support their adherence.	The control group received routine prenatal care.

(*Continued*)

Table 3. Continued.

	Author and year	Educational material/ type	Frequency and volume	Content of the patient education/ advice	Compared to
	Östgaard et al. 1994 [38]	Back school, written information, music cassette	Group B 2 × 45 min Group C: 5 × 30 min	Group B received a modified back school education and training program tailored for pregnant women, delivered by a specially trained physiotherapist. The program covered basic anatomy, posture physiology, lifting and working techniques, muscle training, and relaxation training. Participants also received a written summary of the class content. Group C participated in individualized sessions of the back school program, adapted specifically for back pain, posterior pelvic girdle pain, or combined pain conditions. Like Group B, they received the same educational content but additionally benefited from individually tailored ergonomic advice, an exercise program, and guidance on adapting their working conditions. Participants in Group C were provided with the exercise program on a music cassette and written instructions for reference.	Group A Usual care at the maternity unit (any development of back or posterior pelvic girdle pain was recorded on a pain drawing and a VAS scale)
Pregnancy-Treatment	Barbier et al. 2023 [30]	Consultation by a stretching postural teacher	Single session	The women received basic ergonomic advice for back protection and were encouraged to engage in regular, personalized, and adapted physical activity	Additional to the basic advice, they were taught a Stretching Postural program, created by sports physiotherapist Jean-Pierre Moreau in 1965. Static postures for muscle contractions, stretching, body awareness, and muscle tone, with a focus on the back. Incorporates a specific mouth-breathing technique. Sessions 20 to 30 min, at least 2 times a week for 8 weeks. Support materials: Explanatory card and audio tape for real-time guidance. Follow-up calendar to encourage program completion

(*Continued*)

Table 3. Continued.

Author and year	Educational material/ type	Frequency and volume	Content of the patient education/ advice	Compared to
Beyaz et al. 2011 [41]	Group training sessions, written information	The intervention started in the second trimester and continued until 37 weeks of gestation (three times/week)	Participants engaged in both aerobic and nonaerobic exercises, including activities like range of motion exercises, stretching, posture correction, strengthening routines, breathing exercises, relaxation techniques, and Kegel exercises. They received education sessions that covered essential topics such as physiological changes during pregnancy, strategies for preventing musculoskeletal disorders, proper body mechanics, nutritional guidance, and preparation for labour and delivery. During the initial training session, participants learned about physiological changes specific to pregnancy, correct posture principles, and methods to protect their back. They were encouraged to incorporate regular breathing and relaxation exercises into their routine, and on non-exercise days, they were advised to walk to maintain activity levels. Hydration was emphasized as crucial, with participants advised to consume water before, during, and after exercise sessions to maintain optimal hydration levels throughout the program.	Recommendation to attend to the theoretical training in the Maternal-Child Unit at Istanbul Medical Faculty which included: Information on physiological changes in pregnancy, Proper posture and body mechanics, Preparation for labor and postpartum care for mother and baby.
Kordi et al. 2013 [34]	unsure	Single session	General patient education about the anatomy, body posture, and ergonomic advice regarding sitting, walking and lying.	Belt group: Additional to the patient education, they received a nonrigid lumbopelvic belt. They were asked to use the belt during the course of the study. The subjects in this group were allowed to remove the belt only during the sleeping. Exercise group: Additional to the patient education, they were given a home based exercise program. Exercises were designed to strengthen the pelvic girdle muscles.
Martins & e Silva et al. 2014 [35]	Pamphlet on postural orientation	Single session, evaluated after 10 weeks	Figures and text explaining some possible changes in the curvature of the vertebral spine during pregnancy (hyperlordosis and hyperkyphosis). Suggestions concerning spinal positioning were made for daily activities: While laying down (to lie on one's side with a proper support for the head and abdomen and between the knees) While sitting (to have adequate lumbar and foot support), while standing (to have feet supported and to lengthen the handle of the broomstick).	Yoga sessions weekly, 10 sessions once a week for 1 h each, 34 poses were chosen to stimulate the psychophysical effects, breathing exercises (complete breathing, square breathing, and polarized breathing)

(*Continued*)

Table 3. Continued.

Author and year	Educational material/ type	Frequency and volume	Content of the patient education/ advice	Compared to
Noren et al. 1997 [42]	In-person contact	The women were seen by a physio therapist, on average, 3.4 times, for a total of 4 h between gestation week 26 and 36	The women received personalized education to understand their unique circumstances, including information on anatomy, body posture, vocational ergonomics, gymnastics, pelvic floor training, and relaxation techniques. An individualized exercise program was developed based on the type and intensity of their pain. Women with lumbar back pain underwent exercises similar to those prescribed for nonpregnant patients, focusing on strengthening the back muscles. Those with posterior pelvic girdle pain were instructed to avoid overloading the pelvis. Respecting pelvic girdle pain and adjusting vigorous movements accordingly was emphasized as important. Additionally, women experiencing posterior pelvic girdle pain were provided with a nonelastic pelvic support for added comfort and support.	A control group of pregnant women with back pain was drafted from a similar antenatal clinic at Heimdal, Borås. At this clinic, no special intervention for back pain was available. Information on back pain history, social and obstetric factors, and sick leave was registered.
Ozdemir et al. 2015 [31]	Counselling, + Telephone Booklets	45 min counselling Exercise program 4 weeks 3 phone calls per week, one face-to-face interview at the end of the fourth week.	Participants received education encompassing the structure and function of the vertebrae, the physical changes occurring during pregnancy, the causes and implications of pregnancy-related LBP and pelvic girdle pain, methods for managing pain, development of correct posture, principles of body mechanics during daily activities and ergonomic practices. They were also instructed on behaviours that could harm the low back and pelvic regions. Practical demonstrations were provided to illustrate proper movement techniques and methods for protecting the low back and pelvic regions during daily life. Additionally, each participant received an individualized exercise program designed to be performed for at least 30 min, at least three days a week	Control group received usual care, no physiotherapy, no paracetamol, no exercising One phone call per week to follow up perceived pain
Pekçetin et al. 2019 [36]	1 face-to face session Telephone-supported ergonomic education and + pamphlet	Three weeks, 1 phone call per week, 8–10 min per call.	Ergonomic principles to prevent LBP Adjustment of activities which increased pain Ergonomic solution for activity, preparing meals. Advice to not stay in a static position for a long time	Single session with a therapist, the participants received a pamphlet about ergonomic principles to prevent back pain, they had the possibility to ask questions and a therapist helped them to adjust painful activities

(*Continued*)

Table 3. Continued.

	Author and year	Educational material/ type	Frequency and volume	Content of the patient education/ advice	Compared to
	Shim et al. 2007 [43]	Lectures, pamphlet, audio visual tape and telephone calls.	45-min lecture (2–7 participants) 12 min tape with exercises Exercising 5–7 times/ week in 12 weeks 1–2 phone calls per week	Simple anatomy and function of the vertebrae Normal pelvic changes that occur during pregnancy, factors related to lumbar and pelvic girdle pain during pregnancy The appropriate body posture to prevent back pain, was given during an antenatal class Back-pain-reducing exercise and then asked to do them at home. Two to seven subjects participated The pamphlet and an audio-visual tape was distributed to all of the women in the intervention group. The 12- min-long tape demonstrated an exercise program to reduce back pain during pregnancy. The women were encouraged do this exercise at home 5–7 times a week and record their daily exercise on a daily exercise record.	The control group were women in another antenatal clinic, attending to regular check-ups at their clinic
Baseline:pregnancy, follow-up: postpartum	Haugland et al. 2006 [37]	Education program in small groups	One session for 2 h once a week in 4 consecutive weeks.	Patient education about the pelvis, anatomy, functional structures, and causes of PGP. Ergonomics/body posture in walking, standing, sitting, lying, and different working positions. Exercises: especially for stretching, stabilizing, and relaxing in pain-free positions like lying in side position. Pain management, understand the meaning of the pain, reasons for pain, and how to influence and reduce the pain. Advice on daily life movement like getting out of bed, rest with extra pillows, housekeeping, lifting, and bending. Demonstration of pelvic belt, crutches, easy- slide for turning in bed. Information about delivery, and how to take care of the pelvis in the puerperal period.	They were not offered any treatment, but they were free to seek advice for their pelvic problem or receive other treatment, 60% of the control group had searched for treatment from physiotherapist, chiropractor or others.
	Nilsson-Wikmar et al. 2005 [33]	Oral/written information Telephone	One contact with a physiotherapist Possibility to call the responsible physiotherapists at any time during pregnancy should more questions arise about the condition	<u>Patient education group:</u> Anatomy Body posture, and ergonomic advice Provided with a nonelastic sacroiliac belt (Rehband®, Stockholm, Sweden).	<u>The Home Exercise Group:</u> Patient education and a sacroiliac belt as the Information Group, but in addition, they were given a home exercise program consisting of 3 exercises aiming to stabilize the muscles around the pelvic girdle. <u>Clinic Exercise Group:</u> Patient education and a sacroiliac belt in the same way as the Information Group, training program comprised of 4 different strengthening and stabilization exercises with different pieces of equipment; the lateral pulls, standing leg-press, sit-down rowing, and curl-ups.

(*Continued*)

Table 3. Continued.

	Author and year	Educational material/ type	Frequency and volume	Content of the patient education/ advice	Compared to
Postpartum	Bastiaenen et al. 2006 [28] + 2008 [29]	Individual sessions with a physiotherapist trained in an individualized self-management approach	7–9 sessions	The self-management approach involved empowering individuals to manage their symptoms, treatment, and physical and psychosocial consequences, along with making lifestyle changes. This approach included: Providing standardized information. Engaging women in complaint-related problem-solving techniques to identify daily challenges related to their symptoms. Setting personal goals through action planning. Reviewing action plans and monitoring progress toward goals. Shifting from an expert role of the physiotherapist to fostering an equal partnership between physiotherapists and patients, where the physiotherapist acted as a teacher to develop the patient's skills in managing their health problem. Establishing a hierarchy of fear-eliciting movements and activities for gradual exposure. Incorporating specific stabilizing exercises for the lumbar spine and pelvic girdle, along with fitness training to enhance overall physical conditioning.	The control group was free to choose usual care treatment by a physiotherapist not providing the experimental intervention, guidance by a general practitioner or do nothing. In the usual care group 22 women were treated by a physiotherapist, 4 women by a manual therapist, and 4 women were guided by their general practitioner. The other ($n = 34$) chose not to seek help for their complaints during the same period. Prior to the study, "usual care" physiotherapists were interviewed about the usual content of care. Goal setting and focus on disease management, pain contingent regimen of avoiding and limiting several day-to-day activities were important.
	Mens et al. 2000 [32]	Videotape Brochure Telefon	30 min videotape Possibility to call the responsible physiotherapists at any time during pregnancy should more questions arise about the condition	Participants received a brochure containing information about peripartum pelvic girdle pain, including ergonomic advice. The brochure also explained potential causes of peripartum pelvic girdle pain, prognosis, and available therapeutic options. Additionally, participants were instructed on how to modify activities that caused pain and how to correctly use a pelvic belt, a nonelastic strap designed to provide support to the pelvic girdle.	Exercise 1: Same ergonomic advice and patient education + light exercises of the longitudinal trunk muscle systems (placebo exercises) Exercise 2: Same ergonomic advice and patient education + instructions how to train the diagonal trunk muscle systems
	Oh et al. 2007 [44]	Pamphlet, lecture, audio-visual tape, telephone calls	40-min lecture at 35 to 39 weeks of gestation (1–3 participants) Exercising (30 min) 3 to 5 times/week in 8–12 weeks 1–2 phone calls per week	Participants received instruction on simple anatomy, posture physiology, lifting and working techniques, muscle training, and relaxation training. They were encouraged to perform their exercises three times a day, three to five days a week, starting from the day they attended the education class and continuing for eight weeks after delivery. Each exercise session lasted approximately 30 min. Participants were provided with a daily exercise record to track their workouts.	Control group: care as usual

(*Continued*)

Table 3. Continued.

Author and year	Educational material/ type	Frequency and volume	Content of the patient education/ advice	Compared to
Starzec-Proserpio & Vandyken 2022 [45]	Video consults Video recordings from the embodia plattform	Six telerehabilitation consults of 45 min duration	The participant received education on sensitization of the nervous system, emphasizing nonthreatening movements at home to alleviate fear of movement. The program aimed to build confidence through calming and relaxation exercises, with a detailed description of pain neurophysiology provided. Discussions covered changes in the central nervous system common in persistent pain and the impact of fear and catastrophizing on nervous system sensitization. Graded exposure to functional activities was incorporated, along with exercises to increase awareness of the pelvis and pelvic floor. These awareness exercises were refined after the third visit, and discussions focused on the participant's perception of the pelvic area and pelvic floor during both exercises and daily activities.	No control group

LBP, Low back pain.

An important distinction in the educational content was whether it was delivered in a standardized format to a group [32,33,35,37,40], or if it was individually adapted [28,31,36,38,42,45]. The individual adaptations in two studies were based on the type of pain experienced (LBP vs. PGP) [38,42], whereas in other studies, they were more focused on finding solutions for activity limitations [28,29,45] or adapting exercises [31].

In most of the reviewed studies, readers were left to interpret the content of patient education. The authors mentioned providing information about, that is, proper posture in lying and sitting [40] posture physiology, lifting and working techniques [37,38], posture corrections [41], anatomy and physical changes during pregnancy, and causes of pain [31,32,37,42]. However, it was not clear if the information was about avoiding some activities or encouraging them. Similarly, information regarding ergonomic principles to prevent pain is vague [36,43,44].

Several patient education programs have provided guidance on how to avoid injury to the lower back and pelvic regions by emphasizing the use of techniques for back protection [30] and safe movement during daily activities [31]. Others have taught the avoidance of different behaviours, such as bending at the waist, lifting heavy objects, and sleeping on the back [39]. They have suggested maintaining an appropriate body posture to prevent back pain [43] and to utilize proper body mechanics [41].

Only three studies worked with fear avoidance techniques, finding solutions for pain-related activities instead of focusing on avoidance [28,31,45].

Effectiveness of patient education to reduce pain/ disability

Pregnancy – Prevention. In a quasi-RCT including participants with and without LBP and PGP [38], patient education had no significant effect on preventing pain onset. There was no significant difference in the incidence of pain between the intervention and control groups. Conversely, two studies with lower methodological quality indicated that patient education effectively prevented pregnancy-related LBP or lumbopelvic pain, as demonstrated by a reduction in both pain incidence [39] and severity [40]. Notably, these studies did not differentiate between LBP and PGP, making it difficult to determine whether information about proper posture and correct lifting techniques (as provided in these educational programs) was effective for both pain conditions.

Pregnancy – Treatment. Five studies (two randomized controlled trials (RCTs) [31,36], two cluster-controlled studies [42,43], and one non-randomized controlled trial [41] evaluated various forms of patient education as experimental treatments for LBP or PGP during

pregnancy. Determining the effects on specific pain conditions is challenging, as the two RCTs [31,36] and one cluster-controlled studies [43] included women who self-reported some form of LBP or PGP. On the basis of data from a study examining the distribution of LBP and PGP, we estimate that approximately 54% of the participants had PGP, 17% had LBP and 29% had combined pain [5]. Only the second cluster-controlled study differentiated between LBP and PGP [42].

The summarized findings from the two RCTs [31,36] indicate that intervention groups receiving patient education experienced statistically significant reductions in pain and pain-related disability compared with control groups, which received care as usual or an information pamplet. One of the cluster-controlled trials [43] and one of the nonrandomized controlled trials [41] strengthened these results. In a study differentiating between LBP and PGP [42], cases of pain reduction were not compared between the intervention and control groups; however, sick leave was significantly reduced in the group receiving patient information.

Compared with other active treatments, studies that used patient education as a control treatment have indicated that combining patient education with interventions such as breathing and stretching techniques [30], pelvic support/belt [34[, or yoga training [35], is more effective than patient education alone. However, the effectiveness of these treatments varies depending on whether LBP or PGP are the outcome of interest. For example, yoga interventions statistically reduce LBP during provocation tests, whereas PGP provocation tests show no significant post-intervention differences in either group [35]. Similarly, the quasi-RCT [38] highlighted differing effects between LBP and PGP, with the intervention being less effective for PGP than for LBP during postpartum follow-up.

Postpartum – Prevention. Two studies (1 RCT and 1 quasi-RCT) provided patient education at the end of pregnancy in patients with PGP, as confirmed by clinical testing [33,37]. The results revealed no statistically significant difference in the effect of patient education on pain or disability compared with usual care or various exercise interventions. All participants experienced improvements in pain and disability during the postpartum period, regardless of the intervention.

Postpartum – Treatment. Five studies (three RCTs [28,29,32], one nonrandomized trial [44], and one case study [45] evaluated the effects of patient education on LBP and PGP during the postpartum period. One RCT and its long-term follow-up [28,29], along with a nonrandomized trial [44], showed that patient education, compared with no treatment or "usual physiotherapy," had no additional value in reducing pain. Bastiaenen et al. reported a statistically significant effect on disability in the short term [28] but not in the long term [29]. In both studies, no distinction was made between PGP and LBP. Only one case study supported the effectiveness of patient education for PGP in the postpartum period [45]. Additionally, one RCT reported that patient education given to the control group was as effective at reducing pain as the active intervention, which included various types of exercise, in women with PGP [32].

Discussion

On the basis of eighteen studies of varying quality, this review indicated that patient education during pregnancy has beneficial effects on women who self-reported LBP or PGP during pregnancy. However, the effects of these two pain conditions cannot be determined separately. In the postpartum period, patient education showed no long-term benefits but had a short-term benefit on perceived disability.

During pregnancy, patient education alone was found to be less effective than when combined with other treatments such as pelvic belts, exercise, or relaxation therapies. This finding aligns with another review, which showed that active interventions, such as supervised exercise combined with theoretical content, are more effective than patient education alone [47]. Additionally, other studies on pain education support the inclusion of exercise as a key component of treatment, suggesting that pain education should not be used in isolation undefined[48].

The type, frequency, and content of patient education varied significantly across the included studies, indicating the need for further research to determine the most effective form of education. One question raised by the results of two of the reviewed studies [35,38] is whether patient education is more effective for LBP than PGP. Östgaard et al. and Norén et al. emphasized the importance of distinguishing between these conditions during pregnancy. This is also highlighted in the European guidelines for pelvic girdle pain [11].

LBP is a common condition that affects approximately 10% of pregnant women [5] which is comparable to the prevalence in other healthy adults of the same age group. Physical activity and exercise are well-established components for LBP prevention and treatment. In contrast, PGP is often a new and distinct experience for pregnant women [49]. Walking and other exercises can be challenging and may increase pain in those with PGP. This might explain why general advice

for LBP was less effective for women with PGP [38], as well as why yoga intervention showed limited impact [35]. Another explanation could be that healthcare providers have more experience treating LBP, as it is more common, whereas PGP is a rarer condition.

When reviewing the studies, it was often difficult to determine the specific advice on physical activity and exercise provided regarding pain, posture, and ergonomics. Research indicates that pregnant women prefer advice tailored to their individual life situation [49]. General recommendations may not be effective. For example, one woman might benefit from advice on resting more and taking shorter walks, whereas another with LBP may need guidance on lifting and carrying her firstborn. Stuge et al. showed [50] that personalized advice on pain-free exercises that do not provoke new pain is a key factor in pain reduction. The pain-free aspect could be important, but according to pain neuroscience, the decrease in the perceived threat of exercising and the demonstrated possibilities of being physically active may be even more significant. These aspects should be more thoroughly explored in future studies.

Another important factor is women's beliefs and concerns regarding pain. An interview study with first-time pregnant women revealed that they attributed PGP to instability, hormonal laxity, and the necessary preparation for childbirth, resulting in low expectations for improvement [51]. Beliefs that pain is uncontrollable, a signal of harm, and that activity should be avoided can negatively impact women's pain experiences and their responses to patient education and exercise [52,53]. A recently published editorial [54] discusses the importance of updating healthcare providers' and patients' perspectives on pregnancy-related PGP. The authors emphasize moving away from outdated biomechanical views that focus solely on instability and weakness, advocating instead for a biopsychosocial approach that considers the complex interplay of biological, psychological, and social factors influencing pain.

Statements about pelvic instability were not found in the reviewed articles. However, the information provided on anatomy and physiology is limited, and several studies addressed muscular weakness through exercises. The editorial [54] also highlights the issue of discussing poor alignment and posture as causes of pain, and this information was found in several of the reviewed articles [31,39,40]. As patients seek to understand their symptoms [55] – including their cause, consequences, management strategies and duration – clinicians are responsible for addressing these concerns [52]. The reviewed articles showed that current patient education has focused primarily on the biomedical aspects of pain, such as anatomy, physiology, posture, and alignment, and on how to adapt these factors while the biopsychosocial understanding of pain is absent. According to modern pain neuroscience education, an integrated approach that includes both biomedical factors and psychosocial factors (such as pain perception and interpretation) is essential. Traditional biomechanical explanations in patient education may inadvertently increase stress and fear about bodily functions, potentially amplifying pain perception. In contrast, pain neuroscience education aims to improve understanding of pain, reduce perceived threats, and normalize movement and posture, helping patients regain function and confidence in their bodies [16]. For pregnancy-related LBP and PGP, this approach could involve asking patients where they believe their pain originates, addressing these thoughts, and guiding them in staying physically active and exercising. Providing information on how physical activity can reduce pain, rather than being a cause of it, may also be beneficial. However, Beales et al. [56] noted that many therapists' beliefs about PGP and its aetiology are still based on concepts of instability, weakness, and the need to strengthen specific muscle groups, which can bias the information provided to patients. As pregnancy-related PGP is not fully understood [57], this presents a significant challenge, underscoring the need of more research about this pain condition and for more education for clinicians.

Only two of the included studies [28,31] examined the use of problem-solving techniques and personal action plans to enable daily activities rather than to avoid them. Interview-based studies on women's experiences with PGP have highlighted the importance of this approach in education. Women seek information to manage their pain and develop effective self-care strategies tailored to their unique situations [49,55]. Bastianen et al. evaluated this approach in the postpartum period and reported no effect on pain or disability in their long-term analysis [29]. However, it is important to note that this intervention was administered very early postpartum (within three weeks), a challenging time for engaging in complex interventions because most women focus on breastfeeding, sleep, and acute recovery.

Furthermore, postpartum pain can differ significantly from the LBP or PGP experienced during pregnancy. Known risk factors for persistent pain after pregnancy include prepregnancy lumbar pain, widespread pain, and high pain severity during pregnancy [58]. This pain is could be associated with hypersensitivity in the nervous system, as indicated in two

studies [59,60]. During the postpartum period, increased stress and sleep deprivation could contribute to the persistence of long-term pain. While research on patient education for long-term pain emphasizes the importance of helping patients understand their individual pain experiences and the impact of behaviour, lifestyle, sleep, and activity on pain [18], none of the reviewed studies included aspects such as sleep, stress management, and nutrition in their patient education. Investigating these effects could be an important step in preventing and treating long-term pain related to pregnancy and childbirth in women. Additionally, it would be valuable to explore how participants perceive the information provided, identify what aspects are helpful and which are not, and determine the optimal time period during or after pregnancy to deliver patient education to maximize supportive effects.

Strengths and limitations

This study conducted a broad search that encompassed various forms of advice and education. The inclusion or exclusion of articles for this review was determined through discussions and decisions made by two researchers, with approval from the entire group. Notably, the inclusion criteria were extended to articles from established systematic reviews, ensuring a thorough coverage of the topic.

However, a limitation of this review is the challenge of determining the specific impact of patient education versus other treatment components. This distinction was further complicated in studies that included exercise as a part of the intervention. We encountered difficulties in deciding whether advice on exercise should be viewed as an empowering aspect of patient education, potentially reducing fear of movement, or classified strictly as exercise therapy, which was not the focus of this review.

Moreover, the content of the provided patient education was rarely described in detail, which may have led to misinterpretation of the information given. Another limitation of our study is that we included only studies that evaluated pain and related disabilities as outcomes. The core outcome set for PGP recommends including fear-avoidance beliefs and quality of life as additional outcomes [46]. However, our search did not identify any studies evaluating these outcomes in the context of patient education. From a biopsychosocial perspective on pain, it would have been beneficial to include studies that assessed outcomes, such as sick leave and perceived improvement. Additionally, evaluating how patients understand patient education and are able to adapt their behavior accordingly could be a crucial factor influencing the success of the intervention. We did not identify any studies assessing this aspect, which we believe will be important for future research.

Conclusion

This review underscores that patient education alone is less effective than combined treatments, emphasizing the importance of multimodal approaches with different treatment modalities, such as exercise. Tailoring patient education to individuals' specific needs and pain conditions, such as pregnancy-related lower back pain or pelvic girdle pain, may play a pivotal role. The review revealed that the current focus in patient education is primarily on the biomechanical aspects of pain, lacking consideration of the psychosocial components and how patients perceive pain, its possible threat and consequences, and how they receive and utilize information. Future research should focus on the type of patient education that women with low back and pelvic girdle pain require, when it should be offered, and how it should be tailored to their individual situations. This should include aspects such as pain education to understand pain and its role, as well as factors like sleep, stress management, and nutrition, to enhance the prevention and treatment strategies for long-term pain associated with pregnancy and childbirth.

Acknowledgements

This article was part of a predoc scholarship for a visit to Vrije University in Brussels, supported by the **National Research School in General Practice Sweden**.

Author contributions

CRediT: **Sabine Vesting**: Conceptualization, Formal analysis, Investigation, Methodology, Writing – original draft; **Annelie Gutke**: Methodology, Supervision, Writing – review & editing; **Liesbet de Baets**: Conceptualization, Investigation, Methodology, Project administration, Supervision, Writing – review & editing.

All authors of this study have made significant contributions to this article and take responsibility for its content, qualifying for authorship. Concept/idea/research design: Sabine Vesting, Liesbet de Baets Writing, including reviewing and editing: Sabine Vesting, Liesbet de Baets, Annelie Gutke Literature search: Sabine Vesting Literature review and selection: Sabine Vesting, Liesbet de Baets Literature interpretation and results: Sabine Vesting, Liesbet de Baets, Annelie Gutke All authors have read and approved the final manuscript

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

No external funding was received for the writing or preparation of this narrative review, aside from the scholarship for SV provided by the National Research School in General Practice, Sweden. All work was conducted independently without additional financial support from any organization, institution, or sponsor.

ORCID

Sabine Vesting http://orcid.org/0000-0002-6523-1833
Annelie Gutke http://orcid.org/0000-0003-3484-9769
Liesbet de Baets http://orcid.org/0000-0002-1370-2090

Data availability statement

This narrative review does not contain the original data. All information and findings discussed are based on previously published studies and sources, which are fully cited within the manuscript.

References

[1] Vos T, Lim SS, Abbafati C, et al. Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. The Lancet. 2020;396(10258):1204–1222. doi: 10.1016/S0140-6736(20)30925-9.

[2] Hoy D, March L, Brooks P, et al. The global burden of low back pain: estimates from the Global Burden of Disease 2010 study. Ann Rheum Dis. 2014;73(6):968–974. doi: 10.1136/annrheumdis-2013-204428.

[3] Zhang M, Cooley C, Ziadni MS, et al. Association between history of childbirth and chronic, functionally significant back pain in later life. BMC Womens Health. 2023;23(1):4. doi: 10.1186/s12905-022-02023-2.

[4] Elden H, Gutke A, Kjellby-Wendt G, et al. Predictors and consequences of long-term pregnancy-related pelvic girdle pain: a longitudinal follow-up study. BMC Musculoskelet Disord. 2016;17(1):276. doi: 10.1186/s12891-016-1154-0.

[5] Gutke A, Ostgaard HC, Oberg B. Pelvic girdle pain and lumbar pain in pregnancy: a cohort study of the consequences in terms of health and functioning. Spine (Phila Pa 1976). 2006;31(5):E149–55. doi: 10.1097/01.brs.0000201259.63363.e1.

[6] Stuge B, Garratt A, Krogstad Jenssen H, et al. The pelvic girdle questionnaire: a condition-specific instrument for assessing activity limitations and symptoms in people with pelvic girdle pain. Phys Ther. 2011;91(7):1096–1108. doi: 10.2522/ptj.20100357.

[7] Wu WH, Meijer OG, Uegaki K, et al. Pregnancy-related pelvic girdle pain (PPP), I: terminology, clinical presentation, and prevalence. Eur Spine J. 2004;13(7):575–589. doi: 10.1007/s00586-003-0615-y.

[8] Davenport MH, Marchand AA, Mottola MF, et al. Exercise for the prevention and treatment of low back, pelvic girdle and lumbopelvic pain during pregnancy: a systematic review and meta-analysis. Br J Sports Med. 2019;53(2):90–98. doi: 10.1136/bjsports-2018-099400.

[9] Liddle SD, Pennick V. Interventions for preventing and treating low-back and pelvic pain during pregnancy. Cochrane Database Syst Rev. 2015;2015(9):CD001139. doi: 10.1002/14651858.CD001139.pub4.

[10] Van Benten E, Pool J, Mens J, et al. Recommendations for physical therapists on the treatment of lumbopelvic pain during pregnancy: a systematic review. Review. J Orthop Sports Phys Ther. 2014;44(7):464–A15. doi: 10.2519/jospt.2014.5098.

[11] Vleeming A, Albert HB, Ostgaard HC, et al. European guidelines for the diagnosis and treatment of pelvic girdle pain. Eur Spine J. 2008;17(6):794–819. doi: 10.1007/s00586-008-0602-4.

[12] Beales D, Lutz A, Thompson J, et al. Disturbed body perception, reduced sleep, and kinesiophobia in subjects with pregnancy-related persistent lumbopelvic pain and moderate levels of disability: an exploratory study. Man Ther. 2016;21:69–75. doi: 10.1016/j.math.2015.04.016.

[13] Coll CV, Domingues MR, Gonçalves H, et al. Perceived barriers to leisure-time physical activity during pregnancy: a literature review of quantitative and qualitative evidence. J Sci Med Sport. 2017;20(1):17–25. doi: 10.1016/j.jsams.2016.06.007.

[14] Rashidi Fakari F, Simbar M, Saei Ghare Naz M. The relationship between fear-avoidance beliefs and pain in pregnant women with pelvic girdle pain: a cross-sectional study. Int J Community Based Nurs Midwifery. 2018;6(4):305–313.

[15] Bull FC, Al-Ansari SS, Biddle S, et al. World Health Organization 2020 guidelines on physical activity and sedentary behaviour. Br J Sports Med. 2020;54(24):1451–1462. doi: 10.1136/bjsports-2020-102955.

[16] Malfliet A, Leysen L, Pas R, et al. Modern pain neuroscience in clinical practice: applied to post-cancer, paediatric and sports-related pain. Braz J Phys Ther. 2017;21(4):225–232. doi: 10.1016/j.bjpt.2017.05.009.

[17] Tegner H, Frederiksen P, Esbensen BA, et al. Neurophysiological pain education for patients with chronic low back pain: a systematic review and meta-analysis. Clin J Pain. 2018;34(8):778–786. doi: 10.1097/ajp.0000000000000594.

[18] Nijs J, Paul van Wilgen C, Van Oosterwijck J, et al. How to explain central sensitization to patients with 'unexplained' chronic musculoskeletal pain: practice guidelines. Man Ther. 2011;16(5):413–418. doi: 10.1016/j.math.2011.04.005.

[19] Nijs J, Clark J, Malfliet A, et al. In the spine or in the brain? Recent advances in pain neuroscience applied in the intervention for low back pain. Clin Exp Rheumatol. 2017;35 Suppl 107(5):108–115.

[20] Aldabe D, Lawrenson P, Sullivan J, et al. Management of women with pregnancy-related pelvic girdle pain: an international Delphi study. Physiotherapy. 2022;115:66–84. doi: 10.1016/j.physio.2021.09.002.

[21] Baethge C, Goldbeck-Wood S, Mertens S. SANRA-a scale for the quality assessment of narrative review articles.

Res Integr Peer Rev. 2019;4(1):5. doi: 10.1186/s41073-019-0064-8.
[22] Maia LB, Amarante LG, Vitorino DFM, et al. Effectiveness of conservative therapy on pain, disability and quality of life for low back pain in pregnancy: a systematic review of randomized controlled trials. Braz J Phys Ther. 2021;25(6):676–687. doi: 10.1016/j.bjpt.2021.06.007.
[23] Onyekere CP, Emmanuel GN, Ozumba BC, et al. Minimal-contact physical interventions for pregnant women with musculoskeletal disorders: a systematic review of randomized and nonrandomized clinical trials. Review. J Obstet Gynaecol. 2022;42(6):1679–1692. doi: 10.1080/01443615.2022.2070731.
[24] Stuge B, Hilde G, Vøllestad N. Physical therapy for pregnancy-related low back and pelvic pain: a systematic review. Review. Acta Obstet Gynecol Scand. 2003;82(11):983–990. doi: 10.1034/j.1600-0412.2003.00125.x.
[25] Moseley AM, Rahman P, Wells GA, et al. Agreement between the Cochrane risk of bias tool and Physiotherapy Evidence Database (PEDro) scale: a meta-epidemiological study of randomized controlled trials of physical therapy interventions. PLoS One. 2019;14(9):e0222770. doi: 10.1371/journal.pone.0222770.
[26] Paci M, Bianchini C, Baccini M. Reliability of the PEDro scale: comparison between trials published in predatory and nonpredatory journals. Arch Physiother. 2022;12(1):10. doi: 10.1186/s40945-022-00133-6.
[27] Evans D. Hierarchy of evidence: a framework for ranking evidence evaluating healthcare interventions. J Clin Nurs. 2003; 12(1):77–84. PMID: 12519253 doi: 10.1046/j.1365-2702.2003.00662.x.
[28] Bastiaenen CHG, De Bie RA, Wolters PMJC, et al. Effectiveness of a tailor-made intervention for pregnancy-related pelvic girdle and/or low back pain after delivery: short-term results of a randomized clinical trial [ISRCTN08477490]. Article. BMC Musculoskelet Disord. 2006;7:19. doi: 10.1186/1471-2474-7-19.
[29] Bastiaenen CHG, de Bie RA, Vlaeyen JWS, et al. Long-term effectiveness and costs of a brief self-management intervention in women with pregnancy-related low back pain after delivery. Article. BMC Pregnancy Childbirth. 2008;8:19. doi: 10.1186/1471-2393-8-19.
[30] Barbier M, Blanc J, Faust C, et al. Standardized Stretching Postural postures to treat low-back pain in pregnancy: the GEMALODO randomized clinical trial. Am J Obstet Gynecol MFM. 2023;5(10):101087. doi: 10.1016/j.ajogmf.2023.101087.
[31] Ozdemir S, Bebis H, Ortabag T, et al. Evaluation of the efficacy of an exercise program for pregnant women with low back and pelvic pain: a prospective randomized controlled trial. J Adv Nurs. 2015;71(8):1926–1939. doi: 10.1111/jan.12659.
[32] Mens JM, Snijders CJ, Stam HJ. Diagonal trunk muscle exercises in peripartum pelvic pain: a randomized clinical trial. Phys Ther. 2000;80(12):1164–1173.
[33] Nilsson-Wikmar L, Holm K, Öijerstedt R, et al. Effect of three different physical therapy treatments on pain and activity in pregnant women with pelvic girdle pain: a randomized clinical trial with 3, 6, and 12 months follow-up postpartum. Article. Spine (Phila Pa 1976). 2005;30(8):850–856. doi: 10.1097/01.brs.0000158870.68159.d9.
[34] Kordi R, Abolhasani M, Rostami M, et al. Comparison between the effect of lumbopelvic belt and home based pelvic stabilizing exercise on pregnant women with pelvic girdle pain; a randomized controlled trial. J Back Musculoskelet Rehabil. 2013;26(2):133–139. doi: 10.3233/bmr-2012-00357.
[35] Martins RF, e Silva JLP. Treatment of pregnancy-related lumbar and pelvic girdle pain by the yoga method: a randomized controlled study. Journal of the Australian-Traditional Medicine Society. 2016;22(4):238.
[36] Pekçetin S, Özdinç S, Ata H, et al. Effect of telephone-supported ergonomic education on pregnancy-related low back pain. Women Health. 2019;59(3):294–304. doi: 10.1080/03630242.2018.1478364.
[37] Haugland KS, Rasmussen S, Daltveit AK. Group intervention for women with pelvic girdle pain in pregnancy. A randomized controlled trial. Article. Acta Obstet Gynecol Scand. 2006;85(11):1320–1326. doi: 10.1080/00016340600780458.
[38] Ostgaard HC, Zetherström G, Roos-Hansson E, et al. Reduction of back and posterior pelvic pain in pregnancy. Article. Spine (Phila Pa 1976). 1994;19(8):894–900. doi: 10.1097/00007632-199404150-00005.
[39] Akhtar S, Jan R, Askar G. Prevention of low backache in pregnancy. Article. Medical Forum Monthly. 2014; 25(2):40–43.
[40] Mirmolaei ST, Ansari NN, Mahmoudi M, et al. Efficacy of a physical training program on pregnancy related lumbopelvic pain. Article. International Journal of Women's Health and Reproduction Sciences. 2017;6(2):161–165. doi: 10.15296/ijwhr.2018.27.
[41] Beyaz EA, Özcan E, Ketenci A, et al. The effectiveness of pregnancy rehabilitation: effects on low back pain and calf cramps during pregnancy and pregnancy outcome. Article. Nobel Medicus. 2011;7(2):67–74.
[42] Norén L, Ostgaard S, Nielsen TF, et al. Reduction of sick leave for lumbar back and posterior pelvic pain in pregnancy. Spine (Phila Pa 1976). 1997;22(18):2157–2160. Sep 15. doi: 10.1097/00007632-199709150-00013.
[43] Shim MJ, Lee YS, Oh HE, et al. Effects of a back-pain--reducing program during pregnancy for Korean women: a nonequivalent control-group pretest-posttest study. Int J Nurs Stud. 2007;44(1):19–28. Jan. doi: 10.1016/j.ijnurstu.2005.11.016.
[44] Oh HE, Lee YS, Shim MJ, et al. Effects of a postpartum back pain relief program for Korean women. Article. Taehan Kanho Hakhoe Chi. 2007;37(2):163–170. doi: 10.4040/jkan.2007.37.2.163.
[45] Starzec-Proserpio M, Vandyken C. Telerehabilitation for persistent pelvic girdle pain within a biopsychosocial framework - a case report. Article. Physiother Theory Pract. 2023;39(10):2251–2261. doi: 10.1080/09593985.2022.2069618.
[46] Remus A, Lempke AFD, Wuytack F, et al. Outcome measurement instruments and evidence-based recommendations for measurement of the pelvic girdle pain core outcome set (PGP-COS): a systematic review and consensus process. J Pain. 2022;23(12):2052–2069. doi: 10.1016/j.jpain.2022.08.003.
[47] Diez-Buil H, Hernandez-Lucas P, Leirós-Rodríguez R, et al. Effects of the combination of exercise and education in the treatment of low back and/or pelvic pain in preg-

nant women: systematic review and meta-analysis. Int J Gynaecol Obstet. 2024;164(3):811–822. Mar. doi: 10.1002/ijgo.15000.

[48] Louw A, Zimney K, Puentedura EJ, et al. The efficacy of pain neuroscience education on musculoskeletal pain: A systematic review of the literature. Physiother Theory Pract. 2016;32(5):332–355. doi: 10.1080/09593985.2016.1194646.

[49] Ekdahl AS, Gutke A, Olsén MF, et al. Expertise and individually tailored interventions are expected by pregnant women with pelvic girdle pain who seek physical therapy: a qualitative study. Braz J Phys Ther. 2023;27(2):100494. Mar-Apr. doi: 10.1016/j.bjpt.2023.100494.

[50] Stuge B, Bergland A. Evidence and individualization: important elements in treatment for women with postpartum pelvic girdle pain. Article. Physiother Theory Pract. 2011;27(8):557–565. doi: 10.3109/09593985.2010.551802.

[51] van Benten E, de Kruif A, Kiers H, et al. Exploring health and illness perceptions to identify the perceived cause of pregnancy-related pelvic girdle pain. A mixed-methods study among primiparous women in The Netherlands. Article. Midwifery. 2024;129:103892. doi: 10.1016/j.midw.2023.103892.

[52] Caneiro JP, Bunzli S, O'Sullivan P. Beliefs about the body and pain: the critical role in musculoskeletal pain management. Braz J Phys Ther. 2021;25(1):17–29. doi: 10.1016/j.bjpt.2020.06.003.

[53] Turner JA, Jensen MP, Romano JM. Do beliefs, coping, and catastrophizing independently predict functioning in patients with chronic pain? Pain. 2000;85(1-2):115–125. doi: 10.1016/S0304-3959(99)00259-6.

[54] Pulsifer J, Britnell S, Sim A, et al. Reframing beliefs and instiling facts for contemporary management of pregnancy-related pelvic girdle pain. Br J Sports Med. 2022;56(22):1262–1265. doi: 10.1136/bjsports-2022-105724.

[55] Ceprnja D, Chipchase L, Liamputtong P, et al. "This is hard to cope with": the lived experience and coping strategies adopted amongst Australian women with pelvic girdle pain in pregnancy. BMC Pregnancy Childbirth. 2022;22(1):96. doi: 10.1186/s12884-022-04426-3.

[56] Beales D, Hope JB, Hoff TS, et al. Current practice in management of pelvic girdle pain amongst physiotherapists in Norway and Australia. Man Ther. 2015;20(1):109–116. doi: 10.1016/j.math.2014.07.005.

[57] Hodges PW, Cholewicki J, Popovich JM, Jr., et al. Building a collaborative model of sacroiliac joint dysfunction and pelvic girdle pain to understand the diverse perspectives of experts. Pm R. 2019;11(S1):S11–s23. doi: 10.1002/pmrj.12199.

[58] Simonds AH, Abraham K, Spitznagle T. Clinical practice guidelines for pelvic girdle pain in the postpartum population. J Women's Pelvic Health Phys Ther. 2022;46(1):E1–E38. doi: 10.1097/JWH.0000000000000236.

[59] Bajaj P, Bajaj P, Madsen H, et al. Antenatal women with or without pelvic pain can be characterized by generalized or segmental hypoalgesia in late pregnancy. J Pain. 2002;3(6):451–460. Dec. doi: 10.1054/jpai.2002.128065.

[60] Beales DJ, Gaynor O, Harris J, et al. Correlations between the active straight leg raise, sleep and somatosensory sensitivity during pregnancy with postpartum lumbopelvic pain: an initial exploration. Scand J Pain. 2019;19(1):53–60. Jan 28. doi: 10.1515/sjpain-2018-0081.