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## The lack of knowledge regarding pain during pregnancy

A literature review of the experience of manual therapy and pain relief in pregnant women with lower back pain and/or pelvic girdle pain

Metropolia University of Applied Sciences

Bachelor of healthcare

Osteopathy

Bachelor's Thesis



**Metropolia**

2024-03-20

## Abstract

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Title: The lack of knowledge regarding pain during pregnancy

Number of Pages: 37 pages + 3 page appendices

Date: 20 March 2024

Degree: Bachelor of Healthcare

Degree Programme: Osteopathy

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This study aims to investigate how pregnant women with lower back pain and/or pelvic girdle pain experience manual therapy and if it reduces pain. A review of available literature from 2010-2023 was made on PubMed and CINAHL. The articles included in the review have been evaluated using the CASP checklist and ethical evaluation protocol. Six qualitative articles containing 69 women were included. Only three articles included manual therapy in the objective; however, all articles discussed it to some degree. The articles were analysed, and the results emerged into four themes: living with LBP and/or PGP, the importance of support, the experience of treatment, and the importance of knowledge. The results showed that pregnant women with LBP and/or PGP seem to have positive experiences from manual therapy, and it shows a reduction in pain levels. More research is needed to gain better insight into pregnant women's experience of LBP and/or PGP receiving manual therapy.

Keywords: Pregnancy, Lower back pain, Pelvic girdle pain, Experience, Manual therapy, Osteopathy, Chiropractic, Physical therapy

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Table 1. List of abbreviations

<b>Abbreviations</b>	<b>Meaning</b>
LBP	Lower Back Pain
PGP	Pelvic Girdle Pain
PPGP	Pregnancy related Pelvic Girdle Pain
SI joint	Sacroiliac Joint
PMI	Pregnancy Mobility Index
CT	Computer Tomography
MRI	Magnetic Resonance Imaging
HVLA	High-Velocity and Low-Amplitude
SMT	Spinal Manipulative Therapy
MET	Muscle Energy Technique
OMT	Osteopathic Manipulative Treatment
PCC	Person-Centered Care
CASP	Critical Approach Skill Programme
QBPDS	Quebec Back Pain Disability Scale
COVID-19	Coronavirus Disease of 2019
LBPP	Low Back and/or Pelvic Pain
hCG	Human Chorionic Gonadotropin
MH	Exact Subject Heading
4P	Posterior Pelvic Pain Provocation test
LDL	Long Dorsal Sacroiliac Ligament Test
ASLR	Active Straight Leg Raise

# 1 Introduction

Low back pain (LBP) and/or pelvic girdle pain (PGP) are musculoskeletal disorders that can affect women in their pregnancy, with symptoms usually appearing around the first to second trimester (Casagrande et al., 2015). It is estimated that the occurrence of LBP ranges from 57-90% and PGP from 4-76% in pregnant women, with a mean average of 45% (Santos et al., 2022; Vermani et al., 2010). These disorders cause discomfort and pain that may have a negative impact on women physically and mentally during gestation. The cause is relatively unknown, but the highly suggested mechanisms include hormonal factors and biomechanical changes (Daneau et al., 2021).

Symptoms of LBP can be described as a dull pain in the lumbar area, superior to the sacrum, and may radiate into the leg. Pain can be provoked by forward flexion of the spine and palpation of the erector spinae muscles (Starzec & Truszczyńska-Baszak, 2017). PGP is experienced as stabbing pain between the posterior iliac crest and the gluteal folds, usually in proximity to the sacroiliac joints (SI joint) and no confirmed movement provokes pain, yet evidence shows that sustained positions and prolonged activity can result in symptoms (Casagrande et al., 2015). Furthermore, symptoms of PGP can differ in location depending on the subtype of the disorder (Kanakaris et al., 2011).

The differentiation of LBP and PGP is difficult to assess because the two disorders can overlap, making diagnosis challenging. Nevertheless, PGP can be clinically diagnosed and distinguished from LBP by several pain provocation tests. Other suggested diagnostic modules include the pregnancy mobility index (PMI), Quebec back pain disability scale (QBPDS), and imaging tests such as magnetic resonance imaging (MRI) (Casagrande et al., 2015; Katonis et al., 2011).

Various studies demonstrate different hypotheses on the pathophysiology of these disorders, thus making the subject controversial. No single explanation for the cause of these disorders has been identified within the literature. The origin is proposed to be a mixture of components such as hormonal and

biomechanical, in addition to other factors such as neuromuscular, circulatory, degenerative, genetic, and psychosocial (Glinkowski et al., 2016; Katonis et al., 2011; Kanakaris et al., 2011; Daneau et al., 2021).

There are a variety of treatment methods for pregnant women with LBP and/or PGP. Two common examples are medication and manual therapy (Sinclair et al., 2014). The most frequently used medication is paracetamol, and recent studies show that it is not adequate for managing the pain during pregnancy (Hughes et al., 2018). In contrast, research on manual therapy has shown effectiveness in relieving pain (Sinclair et al., 2014). Manual therapy includes, e.g., osteopathy, chiropractic, and physical therapy. These treatments can include massage, spinal manipulation, and self-recommended exercises (Hall et al., 2016).

## 2 Background

Pregnancy is a unique time in a woman's life. While adapting to a new role, the body experiences massive changes that affect the whole body, including the endocrine, the cardiovascular, and the musculoskeletal systems, as well as the gait. These changes compensate for the fetus, which will spend the next nine months growing in the mother's uterus (Kazma et al., 2020).

### 2.1 Hormones

Hormones such as estrogen, progesterone, relaxin, and human chorionic gonadotropin (hCG) play a significant role during pregnancy. They are involved in metabolism, growth, connective tissue laxity, cardiovascular system, fetal nutrition, and more. The role of hormones and secretion differs between the trimesters of pregnancy (Kumar & Magon, 2012).

Progesterone is crucial for supporting the egg and fetus in the early stage. It thickens the uterine lining, which helps the egg grow. This hormone increases throughout pregnancy and with breastfeeding (Kumar & Magon, 2012). Progesterone can affect the tendons and ligaments by increasing flexibility (Conder et al., 2019).

Estrogen levels increase throughout the whole pregnancy as progesterone does. It improves vascularization, transfers nutrients, and supports the development of a fetus. Estrogen rises rapidly during the first trimester, which may result in nausea (VanPutte et al., 2020).

Relaxin is believed to affect many tissues by softening them, which may result in joint laxity. During labor, it helps soften and lengthen the cervix and pelvis area (VanPutte et al., 2020). Furthermore, it affects the pubic symphysis during pregnancy (Albert et al., 1998). It peaks around the 12th week of pregnancy, in the second trimester (VanPutte et al., 2020). While some studies assert a direct link between high relaxin levels and PGP, others dispute it. A study performed in 1998 by Albert et al. (1998) showed that there was no connection between high relaxin levels and PGP. There was no difference in relaxin levels in pregnant women with or without PGP.

HCG is a hormone produced by the placenta. It can be detected in maternal blood one day after implantation. It peaks in the eighth to tenth week and then decreases for the rest of the pregnancy (Kumar & Magon, 2012). It plays a vital function in supporting the corpus luteum and maintaining progesterone secretion. HCG is also thought to promote relaxin secretion (Petraglia et al., 2023).

Together, estrogen, progesterone, and relaxin affect the joints' connective tissue, allowing the joints to stretch more and relax. This involves, e.g., pubic symphysis, which is essential to open the pelvis, allow more space for the baby, and increase the dilation of the cervix for delivery (VanPutte et al., 2020).

Hormones play a crucial role in the experience of pregnancy during the nine months. Each hormone has a specific role, and collectively, they have significant effects. Nevertheless, each woman responds differently to the unique changes that occur during pregnancy. While certain studies state that hormones cause LBP and PGP, other studies prove no connection. However, a comprehensive understanding of the combination of hormones, biomechanics, and each individual is necessary when dealing with LBP and PGP (Conder et al., 2019; Fitzgerald et al., 2015; Daneau et al., 2021).

## 2.2 Anatomy

The pelvis comprises the sacrum, coccyx, and two coxal bones, fusing the coxal bone together. The coxal bone consists of the ilium, ischium, and pubic bone. The pelvis supports the body's weight and protects the internal organs, to name but a few functions. The female pelvis is larger, broader, and more rounded than the male pelvis. It has a bigger role than in males; in addition to the roles mentioned above, it protects the fetus and must have space for the baby to be delivered. The SI joint and pubic symphysis connect the hip. Anterior is the pubic symphysis and posterior is the SI joint (VanPutte et al., 2020). During pregnancy, pubic symphysis undergoes significant changes, the mobility increases, and the gap between the pubic widens. These changes in the pelvis prepare the woman for delivery. Pregnant women who experience PGP often

have more width in the pubic symphysis than those who do not experience it (Becker et al., 2010).

The pelvic floor is located between the pubic bone anterior and the tailbone posterior. It supports the organs in the pelvis, stabilizes the pelvic region, and maintains good posture. It is made up of muscles and connective tissue that form a "bowl." The muscles that make up the pelvic floor are the levator ani muscles and the coccygeus muscles. The levator ani muscles consist of pubococcygeus, puborectalis, and iliococcygeus muscles, while the coccygeus muscle is a smaller muscle posterior to the levator ani muscle group (Bordoni et al., 2023). During pregnancy, these muscles may stretch to make more space for the fetus, and the weight of the fetus exerts pressure on them (VanPutte et al., 2020).

The lower back is between the thoracic spine and the sacrum and comprises five vertebrae. It supports the whole upper body (Sassack & Carrier, 2023). The lumbar vertebrae are larger and stronger than others in the spine to support the body. Between each lumbar vertebrae, there is an intervertebral disk that absorbs shock. The fifth lumbar vertebrae connect the lower back to the sacrum (VanPutte et al., 2020).

Muscles located in the lower back, both anterior and posterior, play an essential function in supporting the structure around and contributing to other body movements. Anterior muscles such as rectus abdominis, external abdominal oblique, internal abdominal oblique, and transversus abdominis. These muscles flex and rotate the lumbar spine. The posterior musculature consists of erector spinae, which are three muscles: iliocostalis, longissimus, and spinalis. Other muscles are the interspinales, latissimus dorsi, quadratus lumborum, multifidus, and serratus posterior inferior. Their function is to extend, lateral flex, and rotate the lumbar vertebrae (VanPutte et al., 2020).

### 2.3 Gait changes during pregnancy

During pregnancy, women experience an approximate increase of 10-15 kg in body mass (Fitzgerald et al., 2015). This change in body mass alters the center of gravity and center of mass (Damen et al., 2001; Fitzgerald et al., 2015). The shift in the center of mass is due to the enlarged uterus, causing it to shift

anteriorly, resulting in anterior pelvis tilt for compensation (Fitzgerald et al., 2015). Additionally, spine curvature is affected, with an increase in thoracic kyphosis due to increased breast tissue and lumbar lordosis associated with an enlarged uterus (Conder et al., 2019). These changes arise from both biomechanical and hormonal changes. All these factors are involved in a changed gait cycle. It has been shown that during pregnancy, the step length decreases, the step width increases, and the walking rate is slower. Many factors can be the cause, e.g., increased fear of falling, a decrease in hip flexion, hip extension, hip abduction, and hip external rotation, increased body mass, or increased laxity in ligaments due to hormones (Mei et al., 2018; Fitzgerald et al., 2015).

Research made by Wu et al. (2008) demonstrated that pregnant women who experience PGP have slower walking speeds than pregnant women without it. This finding highlights how PGP affects mobility throughout pregnancy. The gait cycle is most affected in the third trimester of pregnancy, highlighting the changes during the last trimester (Conder et al., 2019).

## 2.4 Pathophysiology

The etiology of pregnancy-related LBP and PGP remains uncertain, and different studies report conflicting results, thus making the subject controversial. The considered origin of these two disorders appears to be a mixture of mechanical, hormonal, neuromuscular, circulatory, degenerative, genetic, and psychosocial factors (Glinkowski et al., 2016; Katonis et al., 2011; Kanakaris et al., 2011; Daneau et al., 2021). The most frequent and suggested mechanism in the pathogenesis of pain formation is changes in the curvature of the spine. This results in an increased lordosis, additionally shifting the body's gravity center anteriorly and increasing the load on the lumbar spine (Glinkowski et al., 2016). Another outcome of pregnancy affecting the body is the axial loading of the intervertebral discs, resulting in diminished height and compression of the spine. Furthermore, the biomechanical process indicates that the abdominal muscles of pregnant women stretch to accommodate the enlarging uterus, leading to muscle fatigue and increased stress on the spine. However, evidence fails to show a relationship between postural changes in the body and pain. As

mentioned above, the suggested hormonal factors considered to play a role in LBP and PGP is the increased release of relaxin, leading to ligamentous laxity and discomfort in the pelvis and lower spine (Katonis et al., 2011). Current evidence suggests that estrogen, relaxin, and progesterone may contribute to the progression and intensity of the disorders, but further studies are needed (Daneau et al., 2021).

## 2.5 Symptoms of LBP and PGP

LBP and PGP describe separate disorders occurring in different body structures, with specific characteristics of nociceptive input and dissimilar aggravation of symptoms by specific biomechanical loading of anatomical structures. However, it has been shown that both disorders tend to overlap, making diagnosis difficult. It is essential to underline that the available literature discussing the difference between these two disorders is a rough estimate. Symptoms for each disorder are shown in Table 2. On average, LBP tends to present itself by the end of the first trimester. LBP is described as pain in the lumbar region above the sacrum, which may radiate into the lower limb. The pain has a dull character and is worsened by forward flexion of the spine. Spinal movement is restricted in the lumbar region, and palpation of the erector spinae muscles provokes the pain. On the other hand, PGP is often felt as a deep pain occurring between the posterior iliac crest and the gluteal fold in proximity to one or both SI joints and, in some cases, radiating into the posterior thigh. The pain may also radiate into the anterior thigh in conjunction with or separately from the pubic symphysis. Pain comes in intervals, may be associated with sustained posture for a longer time, and can occur within 30 minutes of daily activities (Casagrande et al., 2015).

Table 2 Matching disorders and symptoms are marked with “X” (Casagrande et al., 2015; Starzec & Truszczyńska-Baszak, 2017)

Symptoms	LBP	PGP
Dull pain in the lumbar spine and may spread to the lumbar region of the back.	X	
Deep, one or two sided pain in the gluteal region (in proximity to the sacroiliac joint) and/or in the pubic symphysis.		X
Increased tonus in the erector spinae muscles.	X	
Radiating pain down the groin and/or posterior/anterior thigh.		X
Constant pain.	X	
Symptoms worsened by forward flexion of the spine.	X	
Restriction in ranges of motion including abduction and external rotation of the coxofemoral joint.		X
Pain occurs at intervals.		X
Palpation of erector spinae provokes symptoms.	X	
Pain may be associated with sustained posture.		X
Pain tends to occur in connection with activity. Usually within 30 minutes of daily activity.		X
Radiating pain down the lower limb.	X	

## 2.6 Diagnosis and Differentiation of LBP and PGP

Due to limited existing diagnostics tests, diagnosing LBP and PGP is commonly based on symptoms. Performing a physical examination can help differentiate and distinguish the two disorders because they present differences in the location of pain and the outcome of provoking tests. However, the individuality of the pain and the disability caused by back pain makes the evaluation more difficult. For example, there are five current subtypes for the pain localization of pregnancy-related pelvic girdle pain (PPGP) (shown in Table 3) (Katonis et al., 2011). In addition, many studies on LBP epidemiology demonstrate no differentiation between the disorders, making it more problematic to accurately

diagnose isolated LBP and PGP in pregnant women (Starzec & Truszczyńska-Baszak, 2017). Starzec and Truszczyńska-Baszak (2017) suggested the examinations shown below to diagnose PGP and distinguish from LBP:

- 1) "4P Test (Posterior Pelvic Pain Provocation test)
- 2) Patrick's Test (FABER Test – Flexion, Abduction and External Rotation)
- 3) Long dorsal sacroiliac ligament test (LDL Test)
- 4) Active Straight Leg Raise (ASLR) test without manual pelvic compression
- 5) Modified Trendelenburg Test
- 6) Palpation of the pubic symphysis
- 7) Gaenslen's Test
- 8) Distraction Test
- 9) Compression Test"

Olsén and his colleges (2009) were inspired by the same model and introduced the tenth step.

- 10) "Pulling-a-mat (MAT-test)"

The recommended tests are characterized by high specificity and low sensitivity. Thus, it is advised to use several different tests to enhance the trustworthiness of the results. The literature also suggests that provocation tests have greater reliability and sensitivity than palpation tests (Starzec & Truszczyńska-Baszak, 2017). The PMI is a self-report questionnaire developed by Van de Pol et al. to evaluate mobility and quality of life concerning LBP and/or PGP. Disability caused by LBP and PGP is frequently measured using the QBPDS (Katonis et al., 2011). Radiological imaging seems to play an essential role in assessing the disorders. Different imaging tests, such as computer tomography (CT) and MRI, appear to be useful in evaluating the degree of pelvic girdle instability. According to the European guidelines, an MRI scan is proposed to make differential diagnosis of PPGP in all stages. Additionally, MRI is considered a more favourable and safer option for pregnant women since it offers increased resolution, allowing better visualization of soft tissue and marrow reactions, as well as not exposing the fetus to ionizing

radiation. Nonetheless, studies demonstrate that no direct connection has been found between the extent of separation or the radiologic irregularities and the severity of the disorder. Furthermore, history taking and examination of the localization of pain, with the addition of pain referral maps, can aid in differentiation between other lower-back pain disorders and LBP or PGP (Kanakaris et al., 2011).

Table 3 Classification system for PGP localization.(Kanakaris et al., 2011).

<b>Type 1</b>	Pelvic girdle syndrome	Consists of symptoms of anterior and posterior pelvic girdle, symphysis pubis, and bilateral sacroiliac joints.
<b>Type 2</b>	Double-sided sacroiliac syndrome	Consists of symptoms of the posterior pelvic girdle and bilateral sacroiliac joints.
<b>Type 3</b>	Single-sided sacroiliac syndrome	Consists of symptoms of the posterior pelvic girdle and unilateral sacroiliac joint.
<b>Type 4</b>	Symphysiolysis	Consists of symptoms of the anterior pelvic girdle and pubic symphysis.
<b>Type 5</b>	Miscellaneous	Consists of inconsistent findings of the pelvic girdle.

## 2.7 Risk Factors for LBP and PGP

Identifying a single risk factor for LBP and PGP is difficult since the etiology remains relatively unclear. Research on lumbopelvic pain (LBP, PGP, or a combination of both) is relatively poor, and various studies have found conflicting results. Factors that seem to be positively associated with lumbopelvic pain are among the following: having a history of LBP and/or PGP, obesity, younger age, no previous exercise, having a child, physical work, previous back trauma/disease, low education, progestin-intrauterine device use, anxiety, depression, and stress. However, there seems to be a lack of repetition in drawing solid conclusions from these claims. The strongest predictors for lumbopelvic pain are thought to be a history of LBP, PGP, or previous trauma to the bony pelvis (Kanakaris et al., 2011; Wuytack et al., 2020; Casagrande et al., 2015).

## 2.8 Treatment

There are many different types of treatment methods for pregnant women with LBP and/or PGP that are used to manage pain. These include medication, manual treatment, exercises, hot and cold compresses, support belts, and yoga. Medication and manual therapy are the most common methods of treatment (Sinclair et al., 2014). Medication is used by 64% of women, and paracetamol is the most frequently used. Recent studies show that paracetamol is not adequate for managing pain in pregnant women (Hughes et al., 2018). Whereas manual therapy has studies supporting the effectiveness of helping relieve the pain of pregnant women with LBP and/or PGP (Sinclair et al., 2014).

## 2.9 Manual Therapy

With manual therapy, clinicians apply a passive and skilled movement that directly or indirectly targets different anatomical systems or structures. The goal is to relieve the pain with beneficial changes (Bishop et al., 2015). Manual therapy is one of the oldest interventions in medicine, and its documentation dates back over 4,000 years. Indeed, many relate manual therapy entirely with the manipulative thrust or high-velocity and low-amplitude technique (HVLA). Many professions, including osteopathy, chiropractic, medicine, physical therapy, and naprapathy, practice this manual therapy technique. However, manual therapy includes many other techniques, e.g., soft tissue, muscle-energy technique (MET), mobilization without impulse, and strain-counterstrain. The indications for these techniques are to increase the range of motion, modulate pain, improve tissue extensibility, manipulate soft tissue and joints, induce relaxation, and reduce soft tissue swelling or inflammation (Huijbregts, 2011).

### 2.9.1 Osteopathy

In April 1855, osteopathy was founded by Andrew Taylor Still, who claimed that a mechanical disturbance of normal bodily function was responsible for ailments in the body. He believed that pathological mechanisms caused derangements in the structure of the human body, which would need to be corrected with

manipulation (Hamonet, 2003). Many of those who seek osteopathic manipulative treatment (OMT) for conditions related to the musculoskeletal system, especially LBP. OMT has a remarkable effect on LBP, whether acute, chronic, pregnancy-related, or postpartum (Task Force, 2016). OMT consists of different techniques that enhance the body and its homeostatic function as a holistic unit. Osteopathy also contributes to full-body healing as it views the body as a single, functioning unit. The techniques primarily applied are balanced ligamentous tension, MET, HVLA, soft tissue massage, and cranial osteopathy (Roberts et al., 2022).

### 2.9.2 Chiropractic

Chiropractic was founded by Daniel David Palmer in 1895. After that, it gradually received attention from doctors and other healthcare professionals. Over recent decades, chiropractic has grown increasingly in different countries. It is a complementary medicine that includes preventing, diagnosing, and treating neuromusculoskeletal system disorders and their effects on the body. The chiropractic approach focuses on the relationship between structure (musculoskeletal system) and function (nervous system), viewing the body as a neuromusculoskeletal system. This means that a disorder in one part of the system also affects the other body parts. The goal is to rid the body structure of these disorders to alleviate stresses on the nervous system and restore the body's general health (Salehi et al., 2015). An essential modality used in chiropractic is HVLA spinal manipulative therapy (SMT). This technique is used to treat many musculoskeletal and other conditions, which have been shown to have various positive physiological effects (Downie et al., 2010).

### 2.9.3 Physical Therapy

Physical therapy has a long history, but limited research exists. However, in 1985, Glenn Gritzer and Arnold Arluke highlighted this field of interest, and from there, historical research started to get a better insight into this treatment method (Terlouw, 2007). Physical therapy aims to relieve pain, improve movement, and increase muscle strength. It may include specific exercises, massages, acupuncture, and other treatments based on physical stimuli.

Additionally, the prescription of home exercises is a big part of the treatment. The main factor of physical therapy involves learning these exercises. The mechanisms of these exercises include improving mobility, coordination, and muscle strength. These approaches are applied to treat chronic and acute conditions and reduce the likelihood of future health problems (Informedhealth.org, 2020). A study by Gutke et al. (2015) evaluated how acupuncture can help pregnant women with LBP and/or PGP. The results showed that the treatment reduced pain and increased function.

## 2.10 Experience

Research on pregnant women's experience of manual therapy is limited in existing literature. However, studies on prenatal care experience during pregnancy can provide valuable insight to enhance understanding of this concept.

Giving consideration to pregnant women's experience is an essential factor in providing good medical care, encompassing both external and internal factors (Ahmed et al., 2014). In a study investigating women's experience of prenatal care, the importance of inquiry about their needs and preferences was highlighted. Women emphasized clinicians taking the time to address their concerns and provide explanations. The relationship between the women and their practitioner is crucial, with a more personal connection being deemed particularly important. Other factors include women being involved in the decision-making process, receiving individual care, feeling listened to, and their opinions being taken seriously (Novick, 2009). Many of the factors women mentioned being important are part of the person-centered care (PCC) and discussed in the next paragraph.

## 2.11 Person-Centered Care

The approach of PCC aims to understand and connect with pregnant women as autonomous individuals instead of focusing merely on the disease or problem at hand (Ekman et al., 2011). This means that the therapist actively tries to understand them and their thoughts, feelings, and future goals (El-Alti et al.,

2017). It is crucial to have insight into their beliefs, values, preferences, and expectations regarding treatment. Part of PCC is building partnerships, having the women actively involved in treatment planning, and making decisions together (Ekman et al., 2011). This ensures that manual therapy is both effective and responsive, resulting in a personalized treatment approach (El-Alti et al., 2017). Personalized care planning is a collaborative approach in PCC. This approach aims to provide individual support tailored to their needs. After agreeing on the goals and actions for managing symptoms, a series of conversations are followed. This approach encourages pregnant women to work together with the clinician to identify the help they need to achieve their goals instead of the clinician only giving advice and instructions. During the conversations, both individuals need to understand each other's priorities well. Studies using this type of approach have shown improvements in both physical and psychological health (Coulter et al., 2016).

## 2.12 Problem Statement

When it comes to manual therapy and pregnant women's experience of LBP and/or PGP, the existing evidence seems to be limited. While many articles about pregnant women's experience of LBP and/or PGP have been written, there appears to be a significant knowledge gap when it comes to manual therapy specifically. This may be attributed to the challenge of diagnosing the disorder and distinguishing between LBP and PGP. Determining the most effective treatments for these disorders is difficult, as it is challenging to ascertain which approach gives the best outcome. Doing quantitative research in this area could offer more advantages. However, it is essential to recognize that quantitative methods have limitations, particularly regarding experience and feedback, which can sometimes provide better information than mere statistics.

### **3 Objective**

The primary aim of this study is to investigate the experience pregnant women with LBP and/or PGP have with manual therapy and explore whether manual therapy reduces pain for pregnant women dealing with these disorders.

#### **3.1 Research Question**

How do pregnant women with lower back pain and/or pelvic girdle pain experience manual therapy, and does it reduce pain?

## 4 Method

### 4.1 Methodology

Literature review was chosen as the primary method of this study. A literature review gives an understanding of the research that has been published. It provides insight into key questions for each topic that need additional research, identifies knowledge gaps, and reveals who the experts are on the subject. It gives the researchers an image of what is missing in existing literature (Bolderston, 2008).

Data collection was carried out using the online databases PubMed and CINAHL. The initial database searches were conducted to identify articles addressing the effects of osteopathic treatment on pregnant women experiencing LBP and PGP. The authors encountered difficulties during the database search, as that area remains relatively unexplored, so the focus shifted to pregnant women's experience with manual therapy, specifically. Thus, the authors began searching for qualitative articles to gain a deeper insight into women's experience of manual therapy. The aim changed from "*What are the effects of osteopathic treatment on pregnant women with lower back pain and pelvic girdle pain?*" to "*How do pregnant women with lower back pain and/or pelvic girdle pain experience manual therapy, and does it reduce pain?*" Altering the aim of the research provided a broader result. The search continued by searching for qualitative articles with a refined emphasis. This resulted in additional articles that were appropriate for the goal of this research.

### 4.2 Search String

The search string was found by using concepts for each category. Specifically, Concept 1, "pregnancy", Concept 2, "lower back pain and pelvic girdle pain", Concept 3, "manual therapy", and Concept 4, "qualitative study or experience". The authors searched PubMed and Cinahl for relevant articles.

#### 4.2.1 PubMed

The search began on PubMed, where the authors used the abovementioned concepts. The authors used appropriate language and techniques to optimize the result, such as MeSH-terms, “\*”, and boolean search. MeSH terms were utilized to ensure optimal outcomes and capture all relevant words. The sign “\*” was applied to get all the various word endings to increase the outcome. Additionally, the authors employed the use of “OR” between each word for each concept to combine words and define the search.

#### 4.2.2 Cinahl

For the search on Cinahl, the same concepts used on PubMed were applied to get optimal results. On Cinahl, the term “exact subject heading (MH)” was used rather than MeSH-term. The term MH was identified using “Cinahl Subject headings”. The sign “\*” was applied to get various word endings, and the boolean phrase “OR” was utilized to capture the best possible outcome.

Two search strings were created for this research, one for PubMed and another for CINAHL, as shown in Tables 4 and 5 below.

Table 4. Search string for PubMed.

<b>Concepts 1</b>	"Pregnancy"[Mesh] OR "pregnant*"
	AND
<b>Concept 2</b>	"Low back pain*" OR "Low Back Pain"[Mesh] OR "pelvic girdle pain" OR "Pelvic Girdle Pain"[Mesh] OR "Pregnancy-related pelvic girdle pain" OR "Pregnancy-related low back pain"
	AND
<b>Concept 3</b>	"Manual therapy" OR "Musculoskeletal Manipulations"[Mesh] OR Osteopath* OR "Osteopathic Physicians"[Mesh] OR Chiropractor OR "Chiropractic"[Mesh] OR "physiotherapy" OR "Physical Therapists"[Mesh]
	AND
<b>Concept 4</b>	"Experience*" OR Attitude OR "qualitative research"

Table 5. Search string for CINAHL.

<b>Concept 1</b>	MH "Pregnancy" OR pregnant*
	AND
<b>Concept 2</b>	"Low back pain" OR MH "Low Back Pain" OR "Pelvic girdle pain" OR MH "Pelvic Pain" OR "Pregnancy-related pelvic girdle pain" OR "Pregnancy-related low back pain"
	AND
<b>Concept 3</b>	"Manual therapy" OR MH "Manual Therapy" OR Osteopath* OR MH "Osteopathy" OR MH "Osteopaths" OR chiropractor OR MH "Chiropractic" OR physiotherapy OR MH "Physical Therapy"
	AND
<b>Concept 4</b>	"qualitative study*" OR MH "Qualitative Studies"

#### 4.3 Screening of Studies

The authors searched individually for search strings using the concepts mentioned above. After conducting a comprehensive search, the authors identified a search string that met their criteria. The authors each looked through the results and selected articles with relevant headings. After identifying relevant article headings, the abstract was thoroughly examined to determine if the articles met the inclusion and exclusion criteria (shown in Table 6). The authors used inclusion and exclusion criteria to get the most relevant articles in relation to their research question. The authors proceeded to read all the articles thoroughly to evaluate if they were suitable.

Table 6. Inclusion and exclusion criteria.

<b>Inclusion</b>	<b>Exclusion</b>
Manual therapy as treatment method	“Usual care” only
Articles from 2010 to present	Articles older than 2009
Articles written in English	Articles not written in English
Meta-synthesis, qualitative study	Meta-analysis, quantitative study
Women’s experience	
All age groups	
Currently pregnant receiving treatment or received treatment during last pregnancy	
Experiencing pregnancy related pelvic girdle pain or lower back pain	

#### 4.4 Final Inclusion

##### 4.4.1 PubMed

The PubMed search string gave 63 articles using the four brackets mentioned earlier. After applying filters to include only English articles from 2010, they resulted in a refined dataset of 49 articles. The authors thoroughly read eight articles; two were included in this research. The authors included two additional articles to enhance the study’s comprehensiveness. These articles met the inclusion and exclusion criteria. Although these articles did not specifically focus on manual therapy, they were still included since they comprised a discussion of pregnant women’s experience with manual therapy and its effects. In addition, both articles were evaluated using the Critical Approach Skill Programme (CASP) checklist and received high scores. Resulting in four articles from the PubMed search string. The process is shown in Figure 1.

#### 4.4.2 Cinahl

The Cinahl search string produced 135 articles using the same method mentioned above. Subsequently, filters were applied to English articles from 2010, resulting in 119 articles. When the authors went through the search string and removed duplicates, two articles were fully read and included in the research. The process is shown in Figure 1.

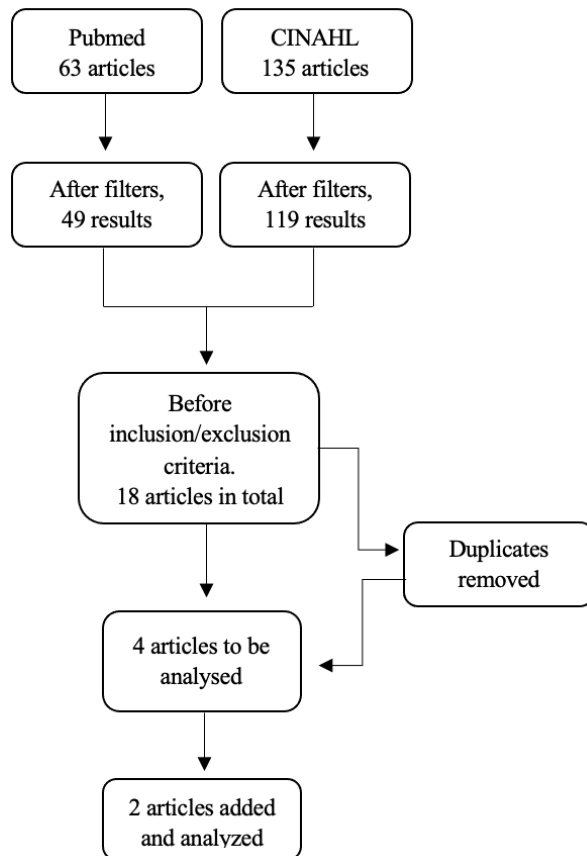


Figure 1. Flow chart of the selection process

#### 4.5 Study Assessment

The authors used the CASP checklist to assess article quality. CASP is a system used to evaluate research for its trustworthiness. This system evaluates the validity of the articles to see if there are clear results and if the results will help. Table 7 shows the results for each article (CASP, 2023).

Table 7. CASP checklist.

1= Yes, 2= No, X= Can't tell

Article	1	2	3	4	5	6	7	8	9	10
Bernard-Giglio et al. (2023)	1	1	1	1	1	1	1	1	X	1
Clarkson & Adams (2018)	1	1	1	1	1	1	1	1	1	1
Sadr et al. (2012)	1	1	X	2	1	1	2	1	1	1
Sheraton et al. (2018)	1	1	1	1	1	1	1	1	X	1
Cepnija et al. (2022)	1	1	1	1	1	X	1	1	1	1
Close et al. (2016)	1	1	1	1	1	X	1	1	X	1

#### 4.6 Ethical Declaration

A research ethics committee has approved all six articles included in this study, and informed consent was obtained from all participants (Bernard-Giglio et al., 2023; Clarkson & Adams, 2018; Sadr et al., 2012; Sheraton et al., 2018; Cepnija et al., 2022; Close et al., 2016). Table 8 illustrates what was included in the ethical declaration. Participants in all studies were offered to volunteer on their own terms, and written consent was obtained. There was no mention in any of the studies of how personal and clinical data would be protected from the public or if researchers had access to this information. One study explored the views and experiences of women with LBP and their chiropractors. The chiropractors in the study were recruited through convenience sampling using chiropractors known to the study team or recommended by other participating chiropractors. It was acknowledged that this kind of recruitment could risk bias in the study results (Sadr et al., 2012). There was no declared conflict of interest except for one article. The editorial management system blinded the author from the manuscript, and he had no part in the editorial or peer-review process of the manuscript (Bernard-Giglio et al., 2023). Interviews were conducted in a safe environment, and questions were asked about the experience of LBP and PGP and the effects of previous treatments on the disorders. Limitations were explored and discussed in all studies to minimize further risk of bias. It is

uncertain if the results of these studies were communicated to the participants in any way. The authors used the Patton, M. Q. (2002) checklist to inspire this ethical assessment. The checklist was modified since relevant information was missing. That included whether the articles had approval from ethics committees or if there was declared conflict among the authors in the articles.

Table 8. Ethical declaration. X= Yes, 0= No, U= Not mentioned

<b>Questions: Articles:</b>	<b>Approval from ethics committee</b>	<b>Patients approval</b>	<b>Declared conflict</b>	<b>Confidentiality of data</b>
Bernard-Giglio et al. (2023)	X	X	X	U
Clarkson & Adams (2018)	X	X	0	U
Sadr et al. (2012)	X	X	0	U
Sheraton et al. (2018)	X	X	0	U
Cepnja et al. (2022)	X	X	0	U
Close et al. (2016)	X	X	U	U

## 5 Results

### 5.1 Summary of Articles

Sheraton et al. (2017) conducted a study exploring women's experience receiving osteopathic treatment during pregnancy. The goal was to better understand the reasons for their choice of treatment. The women were either receiving osteopathic care during pregnancy or had previously been pregnant and received treatment. The results included two themes: osteopathic role in pregnancy health and increasing confidence with osteopathic care. The women experienced physical and emotional changes from the treatment. The osteopathic care provided pain relief from LBP and PGP as well as relieving anxiety and fear about birth. The study's limitations entailed the fact that the qualitative research results are context-dependent and are not intended to be generalized. Nevertheless, the thoroughness of the data analysis provides the authenticity of the results.

Sadr et al. (2012) conducted a study that explored the experience of pregnant women with low back pain receiving chiropractic treatment and their chiropractors' experience. The results included five themes: treatment outcome, communication between the practitioner and the women, prenatal chiropractic care, safety protocol, and self-care. The interview results showed positive treatment outcomes, and the women were generally satisfied with the care. The study includes limitations such as over-emphasizing certain pregnant women that their chiropractors referred. They could have had a particularly good relationship with them or highly valued chiropractic and its effects.

Bernard-Giglio et al. (2023) conducted a study that aimed to explore the experience of Australian pregnant women with pregnancy-related low back and/or pelvic girdle pain regarding chiropractor care. Four themes were identified: motive for treatment, knowledge gap and social perception, chiropractic interventions, and treatment outcome. The experience of pain and discomfort motivated the pregnant women to seek help. However, most women were unsure of the safety of chiropractic treatment during pregnancy. All women

experienced an alleviation in pain and felt more confident in continuing with daily life activities after treatment. In the research, women presenting with lumbar disease were not included, as well as low socio-economic status and women without healthcare insurance. Additionally, a limitation in the generalizability of this study is addressed; there needs to be more contrast in the women's experience in one of the themes.

Clarkson & Adams (2018) conducted a study to get insight into pregnant women's views on dealing with PPGP. Three themes were identified: experiencing PPGP, the importance of support, and the influence of knowledge. The women described unbearable pain and difficulties getting through the day and doing activities. They said that support was a significant factor; without it, they would not know what to do. The knowledge women had about the disorder was little to nothing. They did not know about the disorder before pregnancy, which made them worry; as soon as they got an explanation, they were relieved and could breathe more easily. The limitation of the study is potential biases due to the researcher's gender and professional role. Moreover, the location of the interviews may have influenced the women's responses.

Cepnija et al. (2022) conducted a study exploring the impact of PPGP on Australian pregnant women's lives and how women cope. Three themes were identified: the impact of PPGP, coping mechanisms, and acknowledgment among people. Women expressed unexpected pain that PPGP caused; most of them did not know about the disorder and were not expecting it to affect them. They talked about the judgment they got from others, and no empathy was shown. At the same time, support from partners and family was essential. Pregnant women sought assistance from healthcare professionals and manual therapists for effective treatment options, support, and education on managing PPGP. A few limitations are acknowledged in the study, such as the exclusion of singleton pregnancies and most of the women being in their third trimester, which may affect the severity of PPGP and the findings. Furthermore, due to the absence of focus groups due to COVID-19 restrictions, group dynamics could have given a different insight than individual interviews.

Close et al. (2016) conducted a study to explore the experiences of pregnant women with low back and/or pelvic pain (LBPP). Three themes were identified: the impact of pregnancy-related LBPP, the perception of the disorder, and treatment approaches and outcomes. The experiences of the pregnant women differed, and they used a variety of self-help tools for their symptoms. Additionally, there was a common feeling of disappointment with healthcare professionals' routine advice and treatment of LBPP. The main limitation of this study was the lack of generalizability because of the qualitative nature and the fact that the pregnant women who had the choice of participating in the study were the ones who experienced the most pain and discomfort.

Table 9 provides an overview of all studies, indicating their aims, sample sizes, methods employed, and approaches.

Table 9. Overview of selected studies.

Study	Aims	Sample	Method	Approach
Sheraton et al. (2017)	To explore the experiences of women who receive osteopathic treatment during pregnancy.	Local residents, able to attend face-to-face interviews  n=7 women	Phenomenological approach. In-depth semi-structured interviews  Interviews lasted for 1 hour	Thematic framework analysis
Sadr et al. (2012)	To explore the experience of chiropractic treatment for pregnant women with low back pain, and their chiropractors.	Convenience sampling strategy  n=11 women 17-38 weeks gestation	Semi-structured interviews  Interviews lasted 15-20 minutes	Grounded theory
Bernard-Giglio et al. (2023)	To describe and explore the experiences of Australian pregnant women who seek chiropractic care for their current pregnancy-related low back and/or pelvic girdle pain.	Purposive sampling strategy  n=9 women 20-35 weeks gestation	Unstructured interview style  One-on-one interviews via zoom	Grounded theory and thematic analysis
Clarkson & Adams (2018)	To explore the views and experiences of women with pregnancy related pelvic girdle pain, and to inform the design and development of a subsequent feasibility study.	Purposeful sample  n=8 women 21-30 weeks gestation	One-to-one audio recorded semi-structured interviews  Interviews lasted 50-70 minutes	Thematic data analysis
Cepnja et al. (2022)	To explore the lived experience of Australian women with PPGP including the impacts on daily life, the coping strategies they adopted and what additional supports they may require to help them better cope with PPGP.	Purposive sampling of pregnant women attending a single hospital  n=20 women 14-38 weeks gestation	Phenomenological framework  Semi-structured interviews  Interviews lasted 45-60 minutes	Thematic analysis
Close et al. (2016)	To explore the experiences of women suffering low back and/or pelvic pain (LBPP) during pregnancy.	Self-selecting sampling of women who had taken part in a pilot randomized controlled trial investigating reflexology for pregnancy-related LBPP.  n=14 women	Newell and Burnard framework  Focus groups interviews  Group 1: 6 women Group 2: 4 women Group 3: 4 women	Thematic analysis

## 5.2 Living with LBP and/or PGP

Four articles out of six discussed how pregnant women experience living with LBP and/or PGP. They mentioned that pain affected all their life factors (Clarkson & Adams, 2018; Bernard-Giglio et al., 2023; Cernja et al., 2022; Close et al., 2016).

The symptoms were described as:

*“It was horrific...”*

(Close et al., 2016)

*“... constantly feeling your pelvis is going to fall off...”*

(Clarkson & Adams, 2018)

The women stated how the disorder affected their daily life and work.

*“I was on crutches for the last four months ...”*

(Close et al., 2016)

It was beginning to impact my work, the impact of just being able to move, which is really, important for me, I am not someone who just wanted to put my feet up and you know, when it was that point that, I was not even enjoying even able to walk, I thought something has to change here! (Bernard-Giglio et al., 2023).

LBP and PGP also affected the biopsychosocial aspect of their lives.

*“I’m normally like a socially active person. It has made me the most miserable anti-social person. . .cos I’m in too much pain”*

(Clarkson & Adams, 2018)

*“There was the worry of not being able to deliver the baby,”*

(Close et al., 2016)

### 5.3 The Importance of Support

Two out of six articles discussed the importance of social support and its impact on pain intensity. It was emphasized that support from family and friends played a crucial role in managing the emotional side of the disorders (Clarkson & Adams, 2018; Cepnja et al., 2022).

*“I think I would be lost. . .there really is an emotional side to it you can sort of deal with it a bit more when you talk with other people”*

(Clarkson & Adams, 2018)

Not having a supportive partner by their side was something the women could imagine but would have a hard time dealing with.

*“Well I know I would struggle cos he is away now. . .so I’ve got friends coming to stay with me so I’m not on my own. . .”*

(Clarkson & Adams, 2018)

The pregnant women even mentioned how a bad relationship could affect the disorder.

*“I wasn’t in the best relationship anyway so I think that made it (PPGP). . .20 times worse...”*

(Clarkson & Adams, 2018)

### 5.4 Experience of Treatment

In all, articles pregnant women stated that the treatment had a positive effect. They described how the treatment helped them by providing immediate pain relief. Even the slightest impact was appreciated and fulfilled their expectations (Sadr et al., 2012; Sheraton et al., 2017; Clarkson & Adams, 2018; Bernard-Giglio et al., 2023; Cepnja et al., 2022; Close et al., 2016).

*“The pain is gone, but I do feel like I have more energy and I can do more activities. The pain doesn't prevent me anymore.”*

(Sadr et al., 2012)

*“. . .anything that even just took it away a little bit is helpful”*

(Clarkson & Adams, 2018)

I would say go and get help early. Ask to see the physio and don't leave until they give you the referral. See the physio and do the stretches. The stretches are really the best thing. And you don't know what you should do without the physio (Cepnija et al., 2022).

The women mentioned that they experienced a quick change in their daily activities, ranging from being unable to do almost anything at all to being able to function normally again. In effect, their sleep quality improved, and they began feeling more comfortable in their own bodies.

It really allowed me to function. I could barely walk before or stand, the pain was intense, but after I went to the chiropractor. I found I could function day to day, I could walk from the bus stop to work, I could do these things, so that was pretty significant. It's just helping me to function. It's just teaching me how to pick up my daughter so I don't hurt myself. To still function, to still play with my daughter and be able to go to the grocery store and do all these things without really hurting myself. As well as it allows me to sleep at night (Sadr et al., 2012).

The women expressed that a positive treatment experience during previous pregnancies encouraged them to pursue treatment again.

The reason that I was not that bad was because I acted quite quickly when I felt the pain, and I did that pretty quickly with pregnancy one as well, so I was not going to sit around and be in pain when I knew I could do something about it, (Bernard-Giglio et al., 2023).

It even helped them prepare for birth while also preparing them for a better postpartum recovery.

*“[Osteopathic care] really gave me the confidence that my body will know what to do and just to kind of let go and trust and go with the process.”*

(Sheraton et al., 2017)

In addition to all these factors the treatment was able to help with, the women also felt positive emotional changes. There were a variety of changes that were beneficial to their mental health.

*“... the confidence I mentally gained from osteopathic treatment knowing that my body had been looked after the best it could be so it was ready to take on labour”*

(Sheraton et al., 2017)

However, there was dissatisfaction among some pregnant women.

*“I was going to physio in the city and although the physiotherapist was brilliant. I wasn't getting any relief.”*

(Close et al., 2016)

## 5.5 Importance of Knowledge

In four out of six articles, pregnant women discussed how being informed affected them psychologically. They felt it challenging to access information, which led to an information gap—the women who were not informed sufficiently about the disorders experienced difficult times, while those informed felt it had helped them understand the disorder better (Clarkson & Adams, 2018; Sadr et al., 2012; Ceprnja et al., 2022; Close et al., 2016).

*“. . .it was quite bad at the beginning not knowing what it was”*

(Clarkson & Adams, 2018)

*“I have never heard of it before I had no idea you could have that amount of pain”*

(Close et al., 2016)

It's been emotionally helpful because at the same time I'm getting advice beyond ..there's been explanations of “physiologically this is what's

happening to your body” and “this is why your ligaments are pulling”, “this is why you’re compensating with extra weight at the front”, “this is why your posture is changing”...and things like that (Sadr et al., 2012).

*“The advice I got was very much like...it’s part of pregnancy...just get on with it...there is paracetamol...if you feel you can move with it keep moving, so it (the advice) wasn’t anything special...”*

(Close et al., 2016)

Not knowing what the disorder was made the women think of the worst scenarios and had severe psychological effects. Perhaps the most noticeable comment of all that caught the author's attention.

*“I just thought I was losing the baby”*

(Clarkson & Adams, 2018)

Some women felt that non-sufferers could not properly empathize with them.

*“I just feel like nobody understands what I’m going through”*

(Clarkson & Adams, 2018)

No empathy from others, people just expect you to deal with it. I think it is more about people just dismissing the pain and not paying any attention to it. I think for me it is just ignored really (Cepnija et al., 2022).

There were signs of relief for those who had received explanations about the disorder.

*“. . .hearing that it was manageable was quite a relief”*

(Clarkson & Adams, 2018)

Table 10 demonstrates how the themes from the articles emerged into the themes of the study.

Table 10. Summary of themes in articles.

<b>Living with LBP and/or PGP</b> <b>Total themes: 4</b>	<b>The importance of support</b> <b>Total themes: 2</b>	<b>Experience of treatment</b> <b>Total themes: 9</b>	<b>Importance of knowledge</b> <b>Total themes: 4</b>
The physical and emotional impact that pregnancy-related LBPP has on women's lives (Close et al., 2016)	Key mechanism of support (Clarkson & Adams, 2018)	Women's use of treatments to manage pregnancy-related LBPP and dissatisfaction with standard advice and treatment (Close et al., 2016)	Attitudes and knowledge towards pregnancy-related LBPP (Close et al., 2016)
Care drivers: what drives care seeking? (Bernard-Giglio et al., 2023)	Coping strategies (Cepnija et al., 2022)	Care drivers: what drives care seeking?, response to care: what response was there to care? (Bernard-Giglio et al., 2023)	Chiropractic-patient communication (Sadr et al., 2012)
The reality of PPGP (Clarkson & Adams, 2018)		Treatment and effectiveness, pregnant patient presentation and the chiropractic approach to pregnancy care (Sadr et al., 2012)	Impact of knowledge (Clarkson & Adams, 2018)
A transformed biography (Cepnija et al., 2022)		Osteopathic care could build confidence and empower pregnant patients, Osteopathic care contributed to a healthy pregnancy, labour and post-birth recovery (Sheraton et al., 2017)	What women want (Cepnija et al., 2022)
		Key mechanism of support (Clarkson & Adams, 2018)	
		Coping strategies, What women want (Cepnija et al., 2022)	

## **6 Discussion**

### **6.1 Discussion of the Results**

The primary purpose of this study is to gather research that informs the authors about the experience of pregnant women with LBP and/or PGP receiving manual therapy. Furthermore, the authors wanted to explore if pregnant women with this particular disorder felt that the treatments reduced pain. The results were based on six articles, giving similar but different information. From these articles, the authors created four distinct themes. The themes will be discussed in more detail below.

#### **6.1.1 Living with LBP and/or PGP**

By diving into the reality of living with LBP and/or PGP, the authors want to highlight how it can have a significant effect on pregnant women—ranging from having intense pain to impacting the biopsychosocial aspect of their lives. Four articles discussed this theme, where the women mentioned that pain affected all factors of their lives. What was explicitly noticed is that the disorder affected the daily lives of the women, whereas some of them had to be on crutches for the last months of the pregnancy. Unfortunately, there can be situations where pregnant women are not shown enough attention or care when they seek help for this disorder. The women often mention how it is living with LBP and/or PGP, and the authors aim to highlight that there is more to it than most people think. When pregnant women receive care from, e.g., an osteopath who offers manual therapy, it is important to listen to them and let them speak up about how the disorder has developed. This approach can create trust so that they are more likely to express themselves how they have experienced living with LBP and/or PGP, which can help the overall effect of the treatment.

#### **6.1.2 The Importance of Support**

In this theme, the goal is to illustrate how having some support around pregnant women helped them with their physical and psychological symptoms. From the results of two out of six articles, the importance of social support was a factor

that affected the pain intensity. They felt that having someone to talk to and knowing that they had support would help them deal better with the disorders. It ranged from having a supportive partner living with them to having friends they could talk to. Knowing that they were not alone helped them manage certain factors of their lives. To highlight the importance of support even more, the results also showed that a bad relationship made the pain even worse for them.

### 6.1.3 Experience of Treatment

All of the articles included had results relating to the experience of treatment, which played a major role in this study. The articles reported that the pregnant women had a positive experience with manual therapy. The women experienced a change in their daily activities, which they highly valued. It made it easier for them to function and inspired them to feel like themselves again, from being unable to do simple things to helping them restore normal function. The results also showed that the treatment decreased the pain, and some women described that only reducing the pain slightly was highly appreciated.

A few women mentioned that receiving treatment during previous pregnancies helped them deal better with the discomfort. This highlights the importance of prior treatment experience. It made them more aware of the symptoms and led them to act quickly because they knew the treatment helped them the first time. This resulted in the women getting better sooner than they did during their previous pregnancy.

For LBP and/or PGP, the first goal for most pregnant women is to feel better as soon as possible to enjoy the remainder of their pregnancy. What a few women reported was that the treatment improved their birth experience and/or provided better postpartum recovery. Additionally, they felt that the variety of changes received from the treatment had a positive effect on their mental health. From these influences, they felt that they could manage the pain better. Although the results mention positive effects on pain relief, some women did not experience any difference post-treatment.

#### 6.1.4 Importance of Knowledge

What the authors noticed from the results was how knowledge and awareness affected the women. Simple things such as informing them about the disorders and that it does not harm the baby would help them experience a more relaxed pregnancy. The women had trouble getting access to certain information. There were difficult times for women who did not receive sufficient information, but those who were informed well felt that it helped them get through the pregnancy. There are examples where the techniques performed on the women did not help, but explaining what is happening in their bodies and giving advice can be highly beneficial.

#### 6.2 Method

This qualitative review presents some limitations. Since this review was conducted by three authors who faced their own life obstacles and had different time restraints, it was deemed necessary to divide certain tasks between the individuals. This action might have induced heterogeneity in the research.

The initial research question of this study was focused on the effect of osteopathic treatment on pregnant women experiencing LBP and/or PGP. However, that area of research has yet to be explored thoroughly. For that reason, the authors decided to change the aim of the study and the approach. The approach went from quantitative to qualitative literature review, which changed, as the authors wanted to explore the women's experience in more detail. Furthermore, the aim changed from the effect that osteopathic treatment has on pregnant women experiencing LBP and/or PGP to how pregnant women dealing with LBP and/or PGP experience manual therapy and if it reduces pain. This change resulted in an increased number of articles that could fit this literature review. By changing the approach, the authors have a more profound understanding, both regarding how pregnant women feel towards manual therapists and their own experience of the disorders. The aim of the study is broader and gives the authors more information about the women's experience and how they feel towards different manual therapy forms.

The search string used in this literature review may not catch all relevant articles that could have been used. The search was only done on PubMed and Cinahl. Other databases might have had articles that met the inclusion criteria, but the authors needed access. Some articles were excluded due to payment and language barriers; some may have been relevant but were omitted. The authors, lacking experience constructing search strings, may have influenced the results. Moreover, only two of the three authors were involved in devising the search string, which could also have influenced the results. There is a possibility that some articles that met inclusion and exclusion criteria were missed, and the authors did not notice. However, three authors went through the search string results, which is an advantage compared to one author doing this process. The authors went through the search string and chose articles that met the inclusion criteria, and the results were discussed and chosen. Only four articles were initially included, possibly due to the poor search string or the criteria used for inclusion and exclusion use. Subsequently, after completing the background, method, and results, two articles conducted by Ceprnja et al. (2022) and Close et al. (2016) were included to add more data and provide additional information for a more comprehensive analysis. Both articles were found using the search strings shown in chapter four. Although these articles were excluded initially, and the aims were not regarding manual therapy, they were included because pregnant women discussed visits to physiotherapists and the effect of such. Additionally, the authors evaluated the articles using CASP, and both articles scored high, further justifying their inclusion.

The quality assessment of the articles was conducted using the CASP checklist. The authors had little experience using this assessment tool, and each author only assessed two articles. That can affect the results as everyone can perceive information differently. Therefore, the outcome of the assessment should be interpreted with caution. The study by Sadr et al. (2012) scored the lowest in the evaluation. It is questionable if they chose a suitable method to include women. The chiropractors recruited the pregnant women themselves. It is possible that they only chose the women with the best experience while having women with worse experiences could give a better overview of their experience.

None of the authors had prior experience conducting ethical declarations, thus indicating that it should be reviewed cautiously. Furthermore, the authors divided some tasks; therefore, only one author made the ethical declaration. However, while writing this discussion chapter, the authors realised the importance of all authors being involved in the ethical declaration process.

### 6.3 Limitations of Articles

The articles included in the study used different types of approaches, which may impact the results. Four articles used thematic analysis; one used thematic analysis and grounded theory, while the last used grounded theory. Having mixed approaches can both be seen as an advantage and disadvantage. If only one approach had been used, there would have been fewer articles and less data, and some articles would have been excluded due to the approach. Using articles with a different approach gives a better overall understanding of the aim of this research.

The thematic analysis focuses on identifying and analysing the themes in the studies, while grounded theory seeks to develop a theoretical framework for the data (Villegas, 2023; QuestionPro, 2023). The study by Sadr et al. (2012) utilized a grounded theory approach. However, it identified five themes in the study and sorted the data into those themes, as the thematic analysis approach does. That contributed to a comprehensive understanding of the aim of the study. In the study conducted by Bernard-Giglio et al. (2023), thematic analysis and grounded theory were employed. Using both approaches can contribute to a broader understanding of the experience in the study, as it allows both the identification of themes and the development of theoretical explanations. The advantage of having mixed methods is that it gives a better diverse perspective of the aim of the study; it can strengthen the credibility and validity of the findings while also providing a richer and more subtle understanding of the subject (Villegas, 2023; QuestionPro, 2023).

Only three articles out of six stated that the aim was to explore the experiences of pregnant women with LBP and/or PGP and the effects of manual treatment (Bernard-Giglio et al., 2023; Sheraton et al., 2017; Sadr et al., 2012). In comparison, the other three articles did not mention manual therapy or the effects on pain in the objective section (Clarkson & Adams, 2018; Cepnja et al., 2022; Close et al., 2016). However, the experiences of pregnant women seeking care and receiving manual treatment were discussed to some degree in all six articles. Two articles, Cepnja et al. (2022) and Close et al. (2016), presented with a higher number of pregnant women since the goal was to conduct a focus group interview style. However, in one article, it was necessary to change to a one-to-one interview style because of COVID-19 restrictions. It was acknowledged that focus group interviews might have added more richness to the information than one-to-one interviews (Cepnja et al., 2022). Since four articles presented with one-to-one interview methods, it can be argued that the women would have engaged more in discussion on the topic within a group setting.

Only one article presented with a male interviewer posing the questions. It was discussed whether that could have possibly increased the rigor of the answers since it is thought that when pregnant women and interviewers share experiences, it might increase the risk of the women leaving obvious information unsaid. On the contrary, it was also suggested that a female interviewer might show more empathy in her questions, possibly resulting in the women feeling more secure (Clarkson & Adams, 2018). It is up for debate if the interviewer's gender could have affected the results of the answers from the women. The duration of the interview was mentioned in four articles (Sheraton et al., 2017; Sadr et al., 2012; Clarkson & Adams, 2018; Cepnja et al., 2022). The number of questions averaged from 7-12 in all articles. Three articles did not include a table demonstrating the questions from the interviewers, Sheraton et al. (2017), Sadr et al. (2012) and Bernard-Giglio et al. (2023), therefore making it difficult for the authors to know and understand the nature of the questions asked. Two out of the three articles that included an example of the questions showed that the interview was more oriented around the experience of daily life with LBP and PGP instead of the effects of manual therapy in reducing pain (Clarkson &

Adams, 2018; Cepnja et al., 2022). The six reviewed articles involved 69 women (and 12 chiropractors), highlighting the need for further research with a larger sample size. An article by Cepnja et al. (2022) showed that all women were either married or in relationships. This could affect the results concerning social support, while other articles presented with married and unmarried women. Overall, the nature of qualitative research presents limitations since it lacks generalizability, making it difficult for the authors to draw solid conclusions from the results (Close et al., 2016).

#### 6.4 Future Research

For future research, looking at the study design and when the pregnant women receive treatment is important. The articles used in this literature review differed regarding when women had received treatment and participated in the studies. In two of the studies, Close et al. (2016) and Sheraton et al. (2017), the women were either pregnant or had been pregnant when the research was conducted. It can affect the outcome of the studies since they might find it difficult remembering their previous gestational experience in detail. Therefore, it might be more suitable in future research to include only articles where the pregnancy of research subjects is ongoing.

Furthermore, it is relevant to explore the study design, which in this case was qualitative. A group setting could be more appropriate in a qualitative study and perhaps be more beneficial for future studies since this type of setting can give more comprehensive answers. Moreover, articles included in the study should be searched on more than two databases. Not all research is published on PubMed or Cinahl; thus, other databases should be searched for a complete picture.

Lastly, future research should explore which manual therapy intervention has the best pain management outcome. The study would be divided into two parts: the first would be quantitative research to measure and analyse numerical data, and the second would be qualitative research to gather the experiences of pregnant women living with LBP and/or PGP. Although it is hard to know exactly

which treatment is best, it would give some idea of the most beneficial treatment.

## **7 Conclusion**

Pregnant women with LBP and/or PGP appear to experience positive effects from manual therapy. The results showed how receiving treatment helped improve their physical and mental state, as well as increasing confidence and knowledge regarding the disorders. Furthermore, the review's findings demonstrated that manual therapy provided pain relief for the majority of the women. However, there is a significant knowledge gap in the available literature on pregnant women with LBP and/or PGP. Further research in this field is needed to confirm whether manual therapy has effects on pain relief in those disorders.

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## 4 Appendix

### 4.1.1.1.1 Critical Approach Skill Programme (CASP) checklist

Questions	Yes	Can't tell	No
Was there a clear statement of the aims of the research?			
Is a qualitative methodology appropriate?			
Was the research design appropriate to address the aims of the research?			
Was the recruitment strategy appropriate to the aims of the research?			
Was the data collected in a way that addressed the research issue?			
Has the relationship between researcher and participants been adequately considered?			
Have ethical issues been taken into consideration?			
Was the data analysis sufficiently rigorous?			
Is there a clear statement of findings?			
How valuable is the research?			

4.1.1.1.2 Pregnancy Mobility Index (PMI)

**Pregnancy Mobility Index**

Name \_\_\_\_\_ Date of Birth \_\_\_\_\_ Today's Date \_\_\_\_\_

Height \_\_\_\_\_ ft. \_\_\_\_\_ in. Weight \_\_\_\_\_ lbs.

Today, do you or would you have any difficulty at all with: (check one box on each line) Please provide an answer for each activity.	No problems performing this task.	Some effort performing this task.	Much effort performing this task.	Performing this task is impossible or only possible with the aid of others.
<b>Daily Mobility in the House</b>				
1. Standing up from a hard chair.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Standing up from a soft chair.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Standing up from the bed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Getting things from the floor.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Putting on shoes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Turning around in bed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Standing up from the floor.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Vacuum cleaning.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Doing laundry.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Hanging wash to dry.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Working on the knees.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Sitting in squatted position.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Working standing up.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Lifting <b>10</b> pounds ( <b>5</b> kilograms).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Lifting <b>20</b> pounds ( <b>10</b> kilograms).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Walking stairs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Mobility Outdoors</b>				
1. Traveling by train.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Traveling by car.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Traveling by bicycle.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Traveling by bus.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Walking <b>160</b> feet ( <b>50</b> meters).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Walking <b>650</b> feet ( <b>200</b> meters).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Walking <b>1640</b> feet ( <b>500</b> meters).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Walking on uneven areas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>SCORE:</b> 0				

#### 4.1.1.1.3 Quebec Back Pain Disability Scale (QBPDS)

## THE QUEBEC BACK PAIN DISABILITY SCALE (QBPDS)



This questionnaire is about the way your back pain is affecting your daily life. People with back problems may find it difficult to perform some of their daily activities. We would like to know if you find it difficult to perform any of the activities listed below, because of your back. For each activity there is a scale of 0 to 5. Please choose one response option for each activity (do not skip any activities) and circle the corresponding number.

Today, do you find it difficult to perform the following activities because of your back?

	Not difficult at all	Minimally difficult	Somewhat difficult	Fairly difficult	Very difficult	Unable to do
Get out of bed	0	1	2	3	4	5
Sleep through the night	0	1	2	3	4	5
Turn over in bed	0	1	2	3	4	5
Ride in a car	0	1	2	3	4	5
Stand up for 20-30 minutes	0	1	2	3	4	5
Sit in a chair for several hours	0	1	2	3	4	5
Climb one flight of stairs	0	1	2	3	4	5
Walk a few blocks (300-400m)	0	1	2	3	4	5
Walk several kilometers	0	1	2	3	4	5
Reach up to high shelves	0	1	2	3	4	5
Throw a ball	0	1	2	3	4	5
Run one block (about 100m)	0	1	2	3	4	5
Take food out of the refrigerator	0	1	2	3	4	5
Make your bed	0	1	2	3	4	5
Put on socks (pantyhose)	0	1	2	3	4	5
Bend over to clean the bathtub	0	1	2	3	4	5
Move a chair	0	1	2	3	4	5
Pull or push heavy doors	0	1	2	3	4	5
Carry two bags of groceries	0	1	2	3	4	5
Lift and carry a heavy suitcase	0	1	2	3	4	5

Add the numbers for a total score: \_\_\_\_\_



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