



Comparative Study on the Role of Physiotherapy in Antenatal and Postnatal Women for Musculoskeletal Symptoms Management: A Scientific Perspective

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Abstract

Background: Pregnancy and childbirth induce profound physiological, hormonal, and biomechanical changes that frequently result in musculoskeletal discomfort, reduced physical fitness, and pelvic floor dysfunction. Evidence suggests that approximately 50-70% of pregnant women experience pregnancy-related musculoskeletal disorders, with lower back pain being the most prevalent. Antenatal and postnatal physiotherapy has emerged as a scientifically supported, cost-effective approach to promote maternal health, prevent complications, and enhance postpartum recovery with minimal adverse effects.

Objective: To comprehensively examine and compare the effectiveness of antenatal and postnatal physiotherapy interventions in improving maternal well-being, functional capacity, musculoskeletal symptoms management, and quality of life, with emphasis on evidence-based practice principles.

Methods: A narrative review of scientific literature from 2010–2025 was conducted through systematic searches in PubMed, Scopus, SLJPRS, and Google Scholar databases. Selection criteria included randomized controlled trials (RCTs), systematic reviews, meta-analyses, and clinical practice guidelines examining antenatal exercise programs, pelvic floor muscle training (PFMT), postural education, diastasis recti rehabilitation, and comprehensive postnatal rehabilitation protocols.

Results: Findings from 28+ studies including high-quality RCTs demonstrate that antenatal physiotherapy incorporating moderate-intensity exercise (150 minutes weekly), targeted pelvic floor training, and postural correction significantly reduces pregnancy-related lumbar pain (50% reduction), reduces cesarean delivery rates by 34%, and decreases gestational complications. Postnatal physiotherapy demonstrated significant benefits in pelvic floor rehabilitation, diastasis recti management, reduction of musculoskeletal pain burden, and documented prevention of postpartum depression.

Conclusion: Scientific perspectives establish antenatal and postnatal physiotherapy as safe, effective, and essential interventions for comprehensive maternal health management. Incorporating structured, evidence-based physiotherapy programs enhances physical recovery, improves functional outcomes, and promotes psychological well-being.

Keywords: Antenatal Physiotherapy; Postnatal Rehabilitation; Pelvic Floor Muscle Training; Maternal Health; Exercise Therapy; Pregnancy; Postpartum Recovery; Diastasis Recti Abdominis; Evidence-Based Practice

Introduction

Pregnancy represents a unique physiological state characterized by profound systemic adaptations that fundamentally alter maternal biomechanics, neuromuscular function, and musculoskeletal integrity. The anatomical and physiological transformations occurring during gestation, labor, delivery, and the postpartum period create specific vulnerabilities to musculoskeletal disorders that warrant targeted clinical intervention [1-3].

Current epidemiological data indicates that musculoskeletal pain affects 50-70% of pregnant

women globally, with lower back pain representing the predominant complaint affecting approximately 50% of expectant mothers [1, 4]. Beyond lumbar pain, pregnant women commonly experience pelvic girdle pain (affecting 20% of pregnant populations), thoracic pain, rib pain, and upper extremity symptoms [5]. These conditions frequently persist into the postpartum period, with studies documenting that 30-50% of women continue experiencing pain-related dysfunction for months following delivery [6].

The etiology of pregnancy-related musculoskeletal disorders is multifactorial, involving hormonal factors (particularly relaxin-mediated ligamentous laxity), progressive abdominal distension with resulting postural changes, weight redistribution creating altered center of gravity mechanics, weakness of stabilizing musculature, and cardiovascular deconditioning [2, 3]. Additionally, labor-related trauma, perineal damage, and forceps delivery contribute to significant postpartum musculoskeletal and pelvic floor dysfunction [7].

Historically, many healthcare providers advised pregnant women to limit physical activity, perpetuating sedentary lifestyles during pregnancy. However, contemporary evidence from multiple systematic reviews and meta-analyses demonstrates that appropriately prescribed exercise during pregnancy conveys significant benefits with minimal risks [8-10]. Similarly, postpartum physiotherapy addressing specific dysfunctions has demonstrated substantial efficacy in accelerating functional recovery, preventing chronic pain syndromes, and improving psychological outcomes [11, 12].

The scientific evidence supporting physiotherapy integration into standard maternal care has accumulated substantially, particularly with the publication of high-quality RCTs and updated clinical guidelines from major organizations including ACOG, WHO, and the Royal College of Obstetricians and Gynaecologists. Despite this robust evidence base, physiotherapy remains underutilized in many maternal care settings, suggesting a gap between evidence and clinical implementation [13].

Pregnancy-Related Musculoskeletal Changes and Pathophysiology

Biomechanical Alterations During Pregnancy

Pregnancy induces progressive biomechanical changes beginning in early gestation and accelerating throughout the second and third trimesters. The progressive enlargement of the uterus shifts maternal center of gravity anteriorly, requiring compensatory postural adjustments throughout the kinetic chain. This anteriorward shift of the center of gravity, averaging 2-4 cm by term pregnancy, necessitates increased lumbar lordosis and posterior pelvic tilt to maintain balance [14].

The increased lumbar lordosis creates elevated intradiscal pressures within the lumbar spine, particularly at L5-S1, predisposing pregnant women to facet joint syndrome, segmental hypermobility, and discogenic pain [15]. Furthermore, the sustained anterior weight shift increases demand on the posterior vertebral ligaments and erector spinae musculature, contributing to the high prevalence of pregnancy-related low back pain [1].

Hormonal Contributions

Relaxin, a hormone secreted by the corpus luteum and placenta during pregnancy, reaches peak concentrations in the first and third trimesters [16]. This hormone functions to increase ligamentous

laxity, particularly affecting the sacroiliac joints, pubic symphysis, and spinal facet joints, facilitating pelvic adaptation for labor and delivery [17]. However, excessive relaxin-mediated laxity without concurrent muscular stabilization creates biomechanical instability and pain [18].

The widespread ligamentous laxity characteristic of pregnancy extends beyond the pelvis, affecting spinal segments, shoulder girdle, and peripheral joints. Interestingly, relaxin concentrations remain elevated during the postpartum period, particularly among breastfeeding women, perpetuating articular laxity for several months postpartum [16].

Abdominal Wall Changes

Progressive abdominal wall stretching during pregnancy frequently results in diastasis recti abdominis (DRA), characterized by increased inter-rectus distance exceeding 2 cm at or above the umbilicus [19]. WHO documentation reports DRA prevalence ranging from 30-68% in postpartum women, with functional consequences including reduced abdominal strength, increased intra-abdominal pressure transmission, low back pain, and cosmetic concerns [20, 21].

Pelvic Floor Dysfunction

The pelvic floor musculature undergoes significant mechanical trauma during vaginal delivery [24]. Studies utilizing ultrasound and magnetic resonance imaging (MRI) demonstrate that 30-50% of women experience pelvic floor muscle dysfunction immediately following vaginal delivery, with partial recovery occurring over 6-12 months [25].

Pelvic floor dysfunction during and after pregnancy manifests as urinary incontinence (affecting 37% of postpartum women), fecal incontinence (affecting 8-10%), and pelvic organ prolapse (affecting 5-15%) [26].

Antenatal Physiotherapy: Evidence and Clinical Applications

Exercise Prescription and Recommendations

Contemporary clinical guidelines recommend that pregnant women without contraindications engage in moderate-intensity aerobic exercise for 150 minutes weekly, distributed across at least 3-4 days, combined with resistance training targeting major muscle groups 2-3 times weekly [8][28]. Exercise intensity should correspond to 60-80% of maximum heart rate or 12-14 on the Borg Rate of Perceived Exertion Scale [8].

Recent meta-analyses examining antenatal exercise demonstrate a relative risk (RR) of 1.14 (95% CI: 1.08-1.21) for normal vaginal delivery and RR 0.66 (95% CI: 0.55-0.80) for cesarean delivery in exercising compared to non-exercising pregnant women, with high certainty of evidence [29]. These findings represent substantial clinical significance, indicating exercise reduces cesarean delivery rates by approximately 34% [30].

Management of Pregnancy-Related Low Back Pain

Pregnancy-related low back pain affects approximately 50% of pregnant women, with evidence demonstrating that structured physiotherapy interventions significantly reduce pain intensity and improve function [1, 4]. The management approach emphasizes multimodal intervention incorporating core stabilization exercises, postural education, manual therapy techniques, and self-management

strategies [31].

Core stabilization exercises targeting the transversus abdominis and multifidus muscles demonstrate particular efficacy in managing pregnancy-related lumbar pain. Systematic reviews indicate that home-based exercise programs administered over 8-week periods reduce pain intensity significantly and improve functional capacity [31, 32].

Manual therapy techniques, including spinal mobilization, soft tissue techniques, and muscle energy methods, complement exercise interventions. Evidence suggests combined manual therapy and exercise demonstrates superior outcomes compared to either modality alone [33].

Pelvic Floor Muscle Training During Pregnancy

Pelvic floor muscle training (PFMT) during pregnancy aims to optimize muscular tone, promote awareness, facilitate recruitment patterns necessary for labor, and establish patterns supporting postpartum recovery [34]. Structured PFMT during pregnancy demonstrates evidence for prevention of urinary incontinence postpartum [35, 36].

The "knack technique," involving deliberate pelvic floor muscle contraction preceding increases in intra-abdominal pressure, proves particularly valuable during pregnancy. Research indicates that pregnant women educated in the knack technique during the second trimester demonstrate significantly lower postpartum incontinence rates [36].

Progressive pelvic floor muscle contraction training incorporates slow-twitch fiber recruitment through sustained contractions (5-10 seconds, 3 sets of 10 repetitions) combined with fast-twitch fiber training through rapid contractions [34, 38].

Gestational Diabetes and Hypertension Prevention

Emerging evidence demonstrates that structured antenatal exercise reduces incidence of gestational diabetes mellitus (GDM), a complication affecting 2-10% of pregnancies [40]. A recent clinical study comparing active and sedentary pregnant women demonstrated that physically active women experienced significantly lower rates of GDM compared to sedentary controls [3].

Mechanisms underlying GDM prevention through exercise involve improved insulin sensitivity, enhanced glucose disposal, reduced excessive gestational weight gain, and improved metabolic parameters [40]. Exercise also reduces pregnancy-induced hypertension incidence, with meta-analyses documenting 15-20% reductions in gestational hypertension among exercising populations [9, 41].

Neonatal Outcomes

Accumulating evidence demonstrates that maternal antenatal exercise exerts positive effects on neonatal outcomes. Meta-analyses confirm that infants born to mothers engaging in regular antenatal exercise demonstrate higher mean birth weights without increased macrosomia risk, suggesting enhanced placental function and nutrient transfer [3, 42].

Postnatal Physiotherapy: Evidence and Clinical Applications

Timeline and Progression of Postpartum Recovery

Postpartum recovery progresses through distinct phases: the

immediate postpartum period (0-2 weeks), the early postpartum period (2-6 weeks), and the late postpartum period (6-12 weeks) [44]. Early postnatal phases emphasize protected mobilization and gentle activation. Mid-postpartum phases (6-12 weeks) progress toward structured strengthening. Late postpartum phases (12+ weeks) facilitate return to pre-pregnancy activities [46].

Pelvic Floor Rehabilitation

Pelvic floor rehabilitation represents a cornerstone of postnatal physiotherapy, addressing trauma-induced dysfunction and preventing long-term incontinence [24, 47]. Recent meta-analyses demonstrate that postpartum pelvic floor muscle training significantly reduces urinary incontinence incidence compared to standard care alone [25, 48].

High-quality evidence indicates that initiating PFMT within 6-8 weeks postpartum accelerates functional recovery and reduces incontinence prevalence [49]. Structured protocols incorporate progressive resistance training, addressing both slow-twitch fiber endurance and fast-twitch fiber power [38].

Diastasis Recti Abdominis Rehabilitation

Diastasis recti abdominis (DRA) affects 30-68% of postpartum women and frequently persists beyond 12 months postpartum if not specifically addressed [20, 52]. Recent scoping reviews and systematic meta-analyses examining DRA rehabilitation demonstrate that targeted exercise interventions, particularly those combining deep abdominal muscle retraining, superficial rectus abdominis strengthening, functional movement training, and pelvic floor integration, produce measurable improvements in inter-rectus distance [22, 23, 53].

Exercise protocols for DRA incorporate progressive phases. Initial phases emphasize transversus abdominis activation, initially through isolated contractions with tactile feedback, progressing toward integration with respiratory patterns and postural activities [54].

Research examining DRA rehabilitation demonstrates that inter-rectus distances decrease with progressive training, with some studies documenting reductions of 0.43-0.82 cm when comparing intervention to control groups [23].

Musculoskeletal Pain Management

Postpartum women frequently experience persistent musculoskeletal pain, including low back pain (affecting 30-50%), pelvic pain (affecting 5-15%), and shoulder/upper extremity pain (affecting 10-20%) [6, 57]. These pain syndromes often relate to postural deconditioning, muscular weakness, ongoing relaxin-mediated laxity, and altered movement patterns [57].

Postpartum physiotherapy addressing these conditions combines cardiovascular reconditioning, progressive strengthening, flexibility training, postural re-education, and functional retraining [58]. Evidence supports that structured postpartum exercise programs incorporating moderate-intensity aerobic exercise combined with resistance training significantly reduce musculoskeletal pain and improve functional capacity [59, 60].

Mental Health and Postpartum Depression Prevention

Emerging evidence demonstrates that postpartum exercise programs contribute to prevention and management of postpartum depression, a condition affecting 10-15% of postpartum women [61],

62]. Mechanisms involve multiple pathways including enhanced endorphin secretion, improved sleep quality, increased social engagement during group programs, enhanced self-efficacy through achievement of fitness goals, and neurobiological effects [61].

Meta-analyses examining exercise effects on postpartum depression demonstrate that women engaging in structured postpartum exercise programs experience significantly reduced depression symptom severity compared to sedentary controls [62].

Comparative Analysis of Antenatal and Postnatal Physiotherapy

Preventive vs. Rehabilitative Approaches

Antenatal physiotherapy primarily functions as a preventive intervention, aimed at optimizing maternal fitness, preventing common pregnancy complications, and establishing movement patterns supporting safe labor mechanics [8, 28]. In contrast, postnatal physiotherapy primarily functions as a rehabilitative intervention, addressing actual tissue trauma, functional deficits, and dysfunction resulting from pregnancy, labor, and delivery [45, 46].

The preventive nature of antenatal physiotherapy allows for broader population benefit, as the majority of pregnant women benefit regardless of whether complications develop [8]. Conversely, postnatal physiotherapy benefits are more population-specific, with targeted programs addressing specific dysfunctions [47].

Intervention Timing and Intensity

Antenatal interventions typically commence in early pregnancy and progress throughout gestation, adapting to changing maternal physiology and capacity [8]. Exercise intensity generally remains moderate throughout pregnancy [8].

Postnatal interventions follow a precisely prescribed timeline dependent on delivery mode, tissue trauma severity, and presence of complications [45]. Early postnatal phases emphasize protected mobilization and gentle activation. Mid-postpartum phases progress toward structured strengthening [46].

Specific Outcome Parameters

Antenatal physiotherapy outcome parameters emphasize prevention of complications (reduced GDM incidence, reduced hypertension prevalence), improved labor outcomes (increased vaginal delivery rates), and prevention of early postpartum dysfunction [8, 29]. Postnatal physiotherapy outcome parameters emphasize functional restoration (walking, stair climbing), symptom reduction (pain relief, continence improvement), and prevention of chronic dysfunction [45, 46].

Clinical Guidelines and Implementation Frameworks

International Guideline Recommendations

Major international organizations endorse physiotherapy as a component of comprehensive maternal care:

World Health Organization (WHO): Recommends integration of physical activity and exercise into routine antenatal care, recognizing benefits for maternal and fetal outcomes [41].

American College of Obstetricians and Gynecologists (ACOG): Endorses that exercise during pregnancy and postpartum conveys numerous benefits, recommending 150 minutes of moderate-intensity aerobic exercise weekly for pregnant women without

contraindications [8].

Royal College of Obstetricians and Gynaecologists: Recommends structured antenatal exercise and postnatal physiotherapy, particularly pelvic floor rehabilitation, as standard components of maternal care [34].

Cochrane Collaboration: Systematic reviews conclude that exercise during pregnancy reduces cesarean delivery risk (RR 0.66, 95% CI: 0.55-0.80) and increases normal vaginal delivery likelihood (RR 1.14, 95% CI: 1.08-1.21) [29].

Implementation in Clinical Practice

Successful physiotherapy integration into maternal care requires multidisciplinary coordination involving obstetricians, midwives, physiotherapists, and general practitioners [63]. Implementation frameworks should address education, accessibility, standardization, and professional training [63-66].

Safety Considerations and Contraindications

Antenatal Exercise Safety

Exercise during uncomplicated pregnancy is safe when following evidence-based guidelines [8, 28]. Contraindications to antenatal exercise include severe cardiac disease, restrictive lung disease, placental abnormalities, incompetent cervix, persistent vaginal bleeding, preeclampsia, uncontrolled diabetes, and risk for premature labor [8, 28].

Women should discontinue exercise and consult healthcare providers if experiencing warning signs including vaginal bleeding, dyspnea, dizziness, headache, chest pain, muscle weakness, calf pain, or decreased fetal movement [8].

Postpartum Rehabilitation Precautions

Postpartum physiotherapy precautions address wound healing requirements following cesarean delivery (typically allowing gentle mobilization at 4-6 weeks), tissue trauma from vaginal delivery (restricting high-impact activities for 6-8 weeks), and complications [45, 46].

Future Directions and Research Gaps

Despite substantial progress, important research gaps persist requiring future investigation:

Optimal Exercise Prescription Specificity: While moderate-intensity exercise recommendations are established, optimal exercise types, progression strategies, and modification factors specific to pre-existing conditions require further clarification [8].

Postpartum Rehabilitation Standardization: Greater standardization in postpartum exercise protocols, timing of introduction, and progression criteria would enhance clinical implementation [46].

Implementation Science: Research examining barriers to physiotherapy implementation, optimal delivery methods, and strategies to improve population access remains limited [67].

Long-term Follow-up: While significant literature addresses immediate postpartum outcomes, longer-term follow-up (2-5 years postpartum) examining prevention of chronic musculoskeletal dysfunction remains limited [69].

Conclusion

Comprehensive analysis of contemporary scientific literature demonstrates that antenatal and postnatal physiotherapy represent evidence-based, safe, and highly effective interventions for managing pregnancy-related musculoskeletal disorders and preventing postpartum complications. Antenatal physiotherapy, incorporating moderate-intensity exercise, targeted pelvic floor training, and postural education, reduces pregnancy-related musculoskeletal pain, prevents obstetric complications, reduces cesarean delivery rates by 34%, and optimizes maternal fitness for labor and delivery.

Postnatal physiotherapy addresses actual tissue trauma through pelvic floor rehabilitation, diastasis recti management, and progressive functional restoration, with documented benefits including improved continence, reduced musculoskeletal pain, and prevention of postpartum depression. The evidence supporting these interventions demonstrates moderate-to-high certainty and consistency across multiple high-quality randomized controlled trials, systematic reviews, and international clinical guidelines.

Contemporary barriers to physiotherapy implementation appear to relate more to healthcare system factors, provider knowledge gaps, and resource limitations rather than questions regarding safety or efficacy. Integration of structured physiotherapy into routine maternal care represents an achievable, cost-effective strategy to enhance maternal health outcomes, reduce healthcare burden associated with preventable complications, and promote long-term maternal well-being.

Healthcare systems, policymakers, and educational institutions should prioritize implementation initiatives emphasizing physiotherapy as standard care rather than supplementary care in maternal health settings. Through systematic integration of evidence-based physiotherapy into comprehensive maternal care, healthcare systems can substantially enhance outcomes for pregnant and postpartum women while reducing the burden of preventable musculoskeletal dysfunction and psychological morbidity.

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