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The Significance of Exercise in Pregnancy Course, Gestational Pathology and Labor Outcomes: A Literature Review

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Abstract

Introduction and Purpose: In the past, pregnancy was traditionally viewed as a period requiring substantial physical restriction. In contrast, contemporary evidence-based medicine recognizes routine exercise as a fundamental element in preventing and managing various health conditions. While current social media trends frequently encourage high-intensity

workouts, establishing safe boundaries and scientifically backed recommendations remains essential. This review aims to evaluate how physical activity influences pregnancy-specific pathologies and shapes the overall course of childbirth.

Materials and Methods: A comprehensive literature search was performed utilizing the PubMed medical database. The resulting analysis incorporated international clinical guidelines (such as those from ACOG and WHO) alongside recent meta-analyses centered on gestational complications and delivery outcomes.

Conclusions: Contemporary medical guidelines demonstrate that regular physical exercise yields significant benefits both during gestation and during preconception preparation. In an uncomplicated pregnancy, moderate-intensity training lowers the likelihood of gestational diabetes by 25–30%, reduces hypertensive disorders by roughly 40%, and mitigates perinatal depression. Furthermore, exercise relieves frequent discomforts like lumbopelvic pain and urinary incontinence. Physically active women generally benefit from shorter labor durations and a reduced rate of Cesarean deliveries, with no elevated risk of premature birth. Nevertheless, a prior medical consultation is indispensable to safely rule out any absolute contraindications.

Keywords: *physical activity; pregnancy; gestational diabetes; preeclampsia; depression; pain; urinary incontinence; labor*

Introduction

Physical activity has been a subject of scientific studies for decades, with its multi-faceted, health-promoting effects on the human body being indisputably proven. Modern evidence-based medicine (EBM) identifies regular physical exercise as a cornerstone of prophylaxis and adjunctive therapy for numerous conditions, including cardiovascular diseases, metabolic disorders, and mental illnesses. However, in recent years the focus has increasingly shifted toward the significance of physical activity during a unique period in a woman's life, which is pregnancy.

Historically, the clinical approach to pregnant women was characterized by extreme caution, often equating pregnancy with a state requiring a sedentary lifestyle and significant physical restriction. Currently, we are witnessing a definitive shift away from promoting continuous rest in uncomplicated, physiological pregnancies. Recommendations from international obstetric and gynecological societies, such as the American College of Obstetricians and Gynecologists (ACOG) and the World Health Organization (WHO), explicitly emphasize the maintenance or initiation of moderate-intensity physical activity. A

growing body of scientific evidence suggests that physical inactivity may pose greater risks to both maternal and fetal health than a properly structured exercise program [1].

This article aims to analyze the benefits of physical activity in the context of pregnancy-specific complications and its direct impact on the course of labor. The study seeks to systematize current knowledge on how regular exercise modifies the risk of gestational pathologies and how it prepares the female body for the childbirth.

1. Musculoskeletal and physiological adaptations to pregnancy

Pregnancy necessitates significant anatomical and physiological adaptations within the musculoskeletal system to accommodate the developing fetus and facilitate the childbirth process. These changes are driven by both hormonal shifts and mechanical pressures, leading to a marked transformation in maternal body statics and physical capacity.

A primary consequence of uterine growth and increased breast size is a shift in the body's center of gravity, which moves approximately 2 cm forward. To compensate for this shift, the maternal body develops an anterior pelvic tilt, hip joint flexion contractures, and lumbar hyperlordosis. These postural adjustments often result in increased tension in the lumbosacral musculature, manifesting as chronic back pain. Furthermore, the secretion of hormones such as relaxin induces the softening and loosening of cartilaginous tissues, ligaments, and intervertebral discs. This systemic ligamentous laxity particularly affects the pubic symphysis and sacroiliac joints, increasing joint instability and the risk of injury [2].

Additionally, the enlarging uterus elevates the diaphragm, reducing total lung capacity by approximately 5%. This is partially compensated for by an increase in thoracic circumference and the intercostal angle [3]. In the second and third trimesters, the rectus abdominis muscles lengthen by approximately 15 cm, significantly increasing the risk of diastasis recti abdominis (DRA). Although the descent of the fetus in the final weeks of pregnancy partially restores respiratory capacity, the cumulative effect of these musculoskeletal changes remains a primary factor in reduced physical endurance and movement efficiency in pregnant women [4].

2. Exercises during pregnancy — recommendations

Prior to commencing any physical exercise regimen during pregnancy, a formal medical consultation with the supervising obstetrician is imperative. This initial assessment serves to evaluate the patient's overall health status and identify potential contraindications. High-risk complications, such as: gestational hypertension, pre-existing or gestational diabetes, and the

risk of preterm labor — constitute absolute contraindications to strenuous physical exertion. In the presence of acute clinical signs such as cervical shortening, uterine contractions, or vaginal bleeding, the immediate cessation of activity and the implementation of restricted physical activity (bed rest) are mandatory.

In contrast, an uncomplicated pregnancy serves as a positive indication for the initiation of moderate exercise, yielding health benefits for both the mother and the fetus. It is generally recommended that new exercise routines begin after the 12th week of gestation, a period marked by a significant reduction in the risk of spontaneous abortion. However, because pregnancy is a dynamic physiological state, continuous medical surveillance is necessary to ensure that exercise remains safe. Regular follow-up appointments allow for the monitoring of maternal-fetal well-being and the titration of exercise intensity based on the patient's evolving physical capacity.

For women who maintained an active lifestyle prior to conception, the first trimester requires specific modifications to intensity and activity types to mitigate the risk of miscarriage. High-intensity training should be replaced with lower-impact alternatives that minimize systemic strain. Beyond the 12th week, many pre-pregnancy activities may be resumed with caution, provided they are adapted to the physiological changes of the advancing pregnancy and the shifting center of gravity associated with abdominal growth.

For previously sedentary women, it is advisable to introduce physical activity between the 12th and 35th weeks of gestation. Initial activities should focus on low-impact modalities such as walking, swimming, prenatal yoga, or pilates, as these can be easily tailored to individual fitness levels. Furthermore, participation in specialized prenatal fitness classes led by certified instructors is recommended. These professionals possess the expertise to adapt movements to the specific biomechanical needs of the pregnant participant [5,6,7].

Clinical evidence suggests that regular physical activity during pregnancy provides extensive health benefits, including enhanced cardiovascular fitness, a reduced incidence of complications, and improved psychological well-being. Furthermore, research indicates that active women may experience shorter labor durations, a decreased requirement for medical interventions, and accelerated postpartum recovery. Nevertheless, patients must remain vigilant of somatic signals: the occurrence of pain, vertigo, dyspnea, or bleeding necessitates the immediate termination of activity and urgent medical consultation. Through collaborative management involving medical professionals and fitness experts, a tailored exercise program

can serve as a cornerstone of a healthy pregnancy, facilitating long-term health outcomes for both mother and child [8].

Recommended activities	Warning signs to discontinue exercise
Walking	Vaginal bleeding
Stationary cycling	Abdominal pain
Aerobic exercises	Regular painful contractions
Dancing	Amniotic fluid leakage
Resistance exercises	Dyspnea before exertion
Stretching exercises	Dizziness or syncope
Hydrotherapy and water aerobics	Chest pain

Table 1. *Clinical guidelines for safe exercise and warning signs during pregnancy.*

The American College of Obstetricians and Gynecologists (ACOG) has also established guidelines regarding physical activity during pregnancy; these recommendations are summarized in the table below [9].

Component	Guideline details
Onset of activity	From the first trimester (after 12 weeks of gestation)
Frequency	Minimum of 3–4 days per week, up to daily activity
Session length	Between 30 and 60 minutes per session
Intensity level	Moderate (Borg scale[1] 12–14); heart rate should remain within 60–80% of age-predicted maximum[2]
Environment	Avoiding heat stress; exercising in climate-controlled or thermoneutral settings
Supervision of exercise	Preferred (if available)
Cessation	Continuous until delivery, based on individual tolerance

Table 2. *Recommendations for a safe exercise program during pregnancy (adapted from ACOG guidelines); [1] The Borg scale serves as a subjective tool for evaluating the level of fatigue experienced during exercise; [2] generally not exceeding 140 bpm.*

3. The influence of physical activity on selected health aspects during pregnancy

3.1. Gestational Diabetes Mellitus (GDM)

Gestational Diabetes Mellitus is one of the most prevalent metabolic complications during pregnancy, a disease characterized by glucose intolerance with onset or first recognition during gestation. The physiological basis of GDM involves an exacerbation of insulin resistance, which, if left unmanaged, poses significant risks including macrosomia, neonatal

hypoglycemia, and an increased long-term risk of type 2 diabetes for both mother and child. Physical activity is increasingly recognized as a cornerstone of non-pharmacological intervention in the prevention and management of GDM [10].

As highlighted in the literature (e.g., Sanda et al., 2020), the therapeutic effect of exercise on GDM is primarily driven by improved insulin sensitivity and glucose uptake in skeletal muscles. During physical exertion, the translocation of GLUT4 glucose transporters to the cell membrane occurs independently of insulin signaling. This mechanism allows for better regulation of postprandial glycemic levels, which is crucial for maintaining euglycemia in pregnant women. Furthermore, regular aerobic and resistance training helps modulate systemic inflammation and oxidative stress, both of which are implicated in the pathogenesis of GDM [11].

Recent meta-analyses and randomized controlled trials (e.g., Ming et al., 2020) demonstrate a clear inverse relationship between physical activity levels and GDM risk. Physical activity during early pregnancy or even pre-conception can reduce the risk of developing GDM by approximately 25–30%. For women already diagnosed with GDM, structured exercise programs significantly reduce the need for insulin therapy. Studies show that combining aerobic exercise with resistance training is more effective than either modality alone in stabilizing blood glucose levels [12].

3.2. Hypertensive disorders and preeclampsia (PE)

Hypertensive disorders of pregnancy (HDP), which encompass gestational hypertension (GH) and preeclampsia (PE), represent a significant global health burden. PE alone complicates approximately 2–8% of pregnancies worldwide and is a leading cause of maternal and perinatal morbidity. These conditions are responsible for nearly 16% of maternal deaths and are strongly associated with adverse outcomes such as intrauterine growth restriction (IUGR), preterm delivery, and perinatal mortality.

Accumulating evidence from systematic reviews and meta-analyses suggests that physical activity is a potent primary prevention strategy for HDP. According to Davenport et al. (2018), prenatal exercise is associated with a 39% reduced risk of GH (RR = 0.61) and a 41% reduction in the risk of PE (RR = 0.59). Beyond preventing the onset of disease, randomized controlled trials have demonstrated that even among previously inactive women, structured exercise significantly reduces systolic blood pressure (mean difference of 7.5 mmHg), highlighting its role in cardiovascular modulation during gestation [13].

The literature presents some nuance regarding the efficacy of exercise in high-risk populations. While the benefits are robust for previously healthy, normotensive women, some meta-analyses (e.g., Meher et al., 2017; Magro-Malosso et al., 2017) have reported non-significant differences in PE and GH risk among women who were already overweight, obese, or at high baseline risk for preeclampsia. However, these "null" findings must be interpreted with caution. Many of these studies suffered from small sample sizes or lower adherence rates. More recent evidence (e.g., Aune et al., 2020) suggests that when physical activity is measured as a continuous variable, there is a linear dose-response relationship: for every 1 hour/week increase in exercise, the risk of PE may drop by approximately 5%.

The protective effect of exercise against HDP is likely multifactorial, involving:

- placental development: early-pregnancy exercise promotes healthy placental vascularization and reduces oxidative stress;
- endothelial function: aerobic activity stimulates the release of nitric oxide, improving systemic vascular resistance;
- inflammatory modulation: physical activity helps attenuate the systemic inflammatory response characteristic of preeclampsia [14,15,16].

3.3. Depression

Perinatal depression, encompassing both prenatal (during pregnancy) and postpartum (after delivery) depressive episodes, is a significant public health concern, affecting approximately 10–20% of women. These disorders are characterized by persistent low mood, anxiety, and sleep disturbances, which can adversely affect maternal-fetal bonding and neonatal developmental outcomes. While pharmacological interventions are available, many pregnant women prefer non-pharmacological alternatives due to concerns regarding fetal exposure to psychotropic medications. A robust body of evidence from systematic reviews (e.g., Netsere et al., 2023) confirms that physical activity is an effective tool for both the prevention and reduction of depressive symptoms during pregnancy. Meta-analyses indicate that pregnant women who engage in regular exercise have a significantly lower risk of developing prenatal depression compared to sedentary peers. Research suggests that even low-to-moderate intensity exercise, such as walking for 30 minutes three times a week, can provide a protective buffer against mood disturbances [17,18].

The antidepressant effect of physical activity during pregnancy is mediated through several pathways:

- neurotransmitter regulation: exercise increases the bioavailability of serotonin, dopamine, and norepinephrine, which play key roles in mood regulation;
- endocrine modulation: PA helps regulate the Hypothalamic-Pituitary-Adrenal (HPA) axis, reducing systemic cortisol levels (the "stress hormone") which are often elevated in depressive states;
- neuroplasticity: aerobic exercise stimulates the release of Brain-Derived Neurotrophic Factor (BDNF), supporting neuronal health and emotional resilience;
- psychosocial factors: group-based exercise provides social support and improves maternal self-efficacy and body image, which are critical protective factors against perinatal distress [19].

3.4. Lumbopelvic pain

Pregnancy-related lumbopelvic pain (LBPP), which includes lower back pain and pelvic girdle pain, affects up to 50–80% of pregnant women. These symptoms typically intensify as pregnancy progresses, often peaking in the third trimester. LBPP can significantly impair daily functioning, reduce sleep quality, and is a leading cause of sick leave during pregnancy.

Clinical evidence from systematic reviews (e.g., Davenport et al., 2019) confirms that exercise is a primary non-pharmacological strategy for managing and preventing LBPP. Structured exercise programs, particularly those focusing on core stability and strengthening, have been shown to reduce the intensity of back pain and the associated functional disability. Women who engage in regular physical activity report better mobility and a higher quality of life compared to sedentary controls [20].

The protective effect of exercise on the musculoskeletal system during pregnancy is achieved through core and pelvic floor strengthening: improving the stability of the "muscular corset" helps compensate for the shift in the body's center of gravity and increased joint laxity caused by the hormone relaxin. Especially recommended physical activities are:

- water-based exercise: swimming and aqua-aerobics are highly effective for LBPP as buoyancy reduces the mechanical load on the spine while providing resistance for muscle strengthening;
- yoga and stretching: these modalities improve flexibility and help alleviate muscular tension in the lumbar region [21,22].

3.5. Urinary incontinence

Urinary incontinence (UI), particularly stress urinary incontinence (SUI), is a frequent concern during pregnancy and the postpartum period, affecting approximately 33–50% of

women. The etiology is multifaceted, involving the mechanical pressure of the growing fetus on the bladder, hormonal changes (increased relaxin and progesterone) that lead to ligamentous laxity, and the progressive weakening of the pelvic floor muscles (PFM). If unaddressed during pregnancy, UI often persists or worsens following vaginal delivery.

The most effective form of "physical activity" for this condition is structured Pelvic Floor Muscle Training (PFMT). Systematic reviews (e.g., Woodley et al., 2020) provide high-quality evidence that prenatal PFMT significantly reduces the risk of UI in late pregnancy and the early postpartum period. Pregnant women without prior UI who perform regular PFMT have an approximately 62% lower risk of experiencing incontinence in late pregnancy. For women already symptomatic, targeted exercises can significantly reduce the frequency and severity of leakage episodes by improving the structural support of the pelvic organs and the closure pressure of the urethra [23,24].

A common clinical question is whether general high-impact exercise (e.g., running or jumping) exacerbates UI. While excessive intra-abdominal pressure can challenge the pelvic floor, moderate-intensity general exercise combined with specific PFMT is considered safe and beneficial. General core stability exercises (e.g., prenatal pilates) can enhance the functional coordination between the diaphragm, transversus abdominis, and pelvic floor. Importantly, since high Body Mass Index (BMI) is a major risk factor for UI, general aerobic activity indirectly supports bladder control by preventing excessive gestational weight gain [25].

4. Impact of physical activity on labor and delivery outcomes

4.1. Influence on labor duration and perineal integrity

Physical activity during pregnancy is associated with several physiological adaptations that may facilitate a more efficient labor process. Systematic reviews suggest that women who engage in regular aerobic and strength exercises tend to experience a shorter first stage of labor (the cervical dilation phase). This is likely due to improved maternal cardiovascular fitness and better muscular endurance, which are critical during the high physical demand of contractions.

Regarding perineal integrity, the evidence indicates that while general exercise does not negatively impact the perineum, specific Pelvic Floor Muscle Training (PFMT) can reduce the risk of severe perineal tears (3rd and 4th degree). Strong yet flexible pelvic floor muscles may decrease the necessity for episiotomies.

4.2. Addressing misconceptions: cesarean section and preterm birth

A common clinical misconception suggests that high levels of physical activity — particularly abdominal exercises or high-impact movement — might increase the risk of preterm birth (PTB) or lead to "overly toned" muscles that hinder vaginal delivery, thus necessitating a Cesarean Section (CS).

Risk of cesarean section: contrary to the belief that exercise complicates delivery, meta-analyses of randomized controlled trials show that supervised exercise programs are actually associated with a significant reduction in the risk of instrumental delivery and Cesarean Section. According to Poyatos-León et al. (2017), women who exercised had a lower likelihood of undergoing an emergency CS, partly due to better weight management and reduced incidence of macrosomia (large birth weight), which is a common indication for surgical intervention [26].

Risk of preterm birth: concern that exercise triggers premature labor is not supported by current high-quality data. Large-scale studies (e.g., Di Mascio et al., 2016) focusing on healthy pregnant women have found no significant difference in the rates of preterm birth (before 37 weeks) between active and sedentary groups. In fact, exercise may have a protective effect by reducing systemic inflammation and improving placental function, which are key factors in preventing spontaneous PTB [27,28].

5. Summary

The integration of regular physical activity into the prenatal period represents a fundamental shift in modern obstetric care, moving away from historical models of physical restriction toward evidence-based promotion of maternal health. Current scientific evidence, supported by major organizations such as ACOG and WHO, demonstrates that sedentary behavior in an uncomplicated pregnancy often carries higher risks than a structured exercise program.

This review confirms that moderate-intensity exercise serves as a potent non-pharmacological intervention against major pregnancy complications. Key findings include:

- metabolic and vascular health: physical activity reduces the risk of Gestational Diabetes Mellitus by 25–30% by enhancing insulin sensitivity. It also acts as a primary prevention strategy for hypertensive disorders, reducing the risk of preeclampsia by approximately 41%;
- psychological well-being: exercise significantly mitigates symptoms of perinatal depression through neurotransmitter regulation and improved psychosocial factors;

• musculoskeletal support: targeted training, including Pelvic Floor Muscle Training (PFMT) and core strengthening, effectively manages lumbopelvic pain and reduces the incidence of urinary incontinence by up to 62%;

• labor outcomes: active women benefit from shorter labor durations and a significantly reduced risk of Cesarean sections. Contrary to common misconceptions, exercise does not increase the risk of preterm birth.

In conclusion, a tailored exercise program, initiated ideally after the 12th week of gestation and conducted under medical supervision, is essential for optimizing maternal-fetal outcomes. By addressing both physiological and psychological challenges, physical activity prepares the female body for the demands of childbirth and facilitates a faster postpartum recovery, establishing a foundation for long-term health.

Disclosure

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