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Physical Activity in Pregnancy: The Role of Exercise in Promoting Maternal and Fetal Health

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Abstract

Introduction and Objective: There is no doubt that engaging in regular physical activity is beneficial for individuals of all ages. Pregnancy is a special time of life for most women. This period presents a unique opportunity for them to improve their lifestyle choices and adopt healthier habits such as exercise. The aim of this article is to find out if regular physical activity during pregnancy has a positive impact for both the mother and the baby.

Review and Methods: Review and summary of available studies and meta-analyses found in open-access formats on Google Scholar and PubMed.

State of Knowledge: The WHO defines physical activity as any bodily movement requiring energy expenditure, including during leisure, transport, work, and domestic activities. Regular exercise reduces the risk of noncommunicable diseases (NCDs) and poor health outcomes, while sedentary behavior contributes to this and burdens healthcare systems. For pregnant and

postpartum women, physical movement decreases the risk of various complications, with no negative effects on birthweight or stillbirth risk.
Conclusions: Studies show that physical activity decreased risk of pre-eclampsia, gestational hypertension, gestational diabetes, excessive gestational weight gain, delivery complications, postpartum depression and newborn complications.

Keywords: exercise, physical activity, pregnancy

Introduction

Movement plays a crucial role in human life by stimulating physical, motor and psychosocial development. It helps in building strength and coordination, enhances mental well-being, and fosters social interaction and emotional growth. Many studies highlight the positive impact of exercise on health, and this knowledge continues to evolve and deepen. As scientific understanding advances, new insights into the specific benefits of different types and intensities of physical activity are uncovered. This ongoing research helps to refine guidelines and recommendations, ensuring that people of all ages and abilities can improve their health through movement [14].

Pregnancy involves significant hormonal, physiological, and biomechanical modifications, in al. weight gain, increased blood volume and heart rate. These changes are crucial to support the growing fetus and prepare the mother's body for childbirth. Although these modifications are natural, they can have a negative impact on a woman's physical capabilities and overall well-being. Many women reduce their level of physical activity compared to the pre-pregnancy period, or even stop it entirely. This behaviour increases the risk of complications for themselves and their baby during pregnancy and after delivery [15]. That's the reason why it is important to encourage them to adopt proper health practices and lifestyle adjustments.

Current recommendations

Engaging in regular physical activity during pregnancy offers significant health benefits and is generally safe for most women. The American College of Obstetricians and Gynecologists (ACOG) [16] currently instruct that pregnant women, after a thorough medical evaluation, should begin or continue aerobic and strengthening exercises. The principles of physical activity recommendations for expectant women largely align with those for the general population. [30]. However, due to physiological changes, some modifications may be necessary. For instance, contact activities that carry a high risk of abdominal injuries or balance disorders should be avoided. The goal is to achieve moderate-intensity exercise for 20–30 minutes daily on most days [16].

Due to variable heart-rate responses during pregnancy, perceived exertion and the "talk test" are recommended for monitoring intensity [31][32]. The test assumes that if a woman is able to hold a conversation while exercising, she is probably not overexerting herself [32]. Moreover women should stay hydrated, avoid prolonged supine positions, and be aware of warning signs to stop exercising. These signs include: vaginal bleeding, abdominal pain, dizziness, headache, calf pain or swelling and a few more.

Pregnant women who were not active before are advised to gradually increase their physical activity. Although there's no established upper limit for safe exercise intensity, those who were active prior to pregnancy and have uncomplicated pregnancies can safely engage in vigorous movement like jogging or aerobics. However, prolonged high-intensity exercise (over 45 minutes) may lead to hypoglycemia, so proper caloric intake is crucial [33]. Sport activity should also occur in thermoneutral environments to avoid overheating [34] or dehydration.

Despite slight increases in uterine contractions [36], a 2016 systematic review and meta-analysis found that for normal-weight pregnant women with uncomplicated, single-baby pregnancies, engaging in exercise for 35 to 90 minutes, 3 to 4 times per week, does not increase the risk of preterm birth or shorten the average gestational age at delivery [35]. ACOG emphasizes that activity restriction should not be routinely prescribed to prevent that [37-39]. Bed rest poses risks such as venous thromboembolism, bone loss, and deconditioning. Additionally, it does not reduce the risk of preeclampsia and should not be used for its

prevention [40]. However more research is needed to understand the effects of exercise on pregnancy-specific conditions and to optimize recommendations.

The influence of exercise on the fetus

Studies on fetal responses to maternal exercise primarily focus on fetal heart rate and birth weight. Research shows that fetal heart rate increases modestly by 10–30 beats per minute during or after maternal exercise [17-20]. Three meta-analyses found minimal differences in birth weight between exercising and non-exercising pregnant women [20-23]. However, these studies show that vigorous sport activity in the third trimester may result in slightly lower birth weights (200–400 g less than controls), though without increased risk of fetal growth restriction [20-23]. A cohort research that evaluated fetal heart rate, biophysical profiles, and umbilical artery blood flow before and after intense physical movement found that 30 minutes of such exercise was well tolerated by both active and inactive women in the second trimester, as well as by their fetuses [20]. Further studies are needed to explore the effects of high-intensity physical activity, especially in pregnant athletes. There might be a critical intensity or duration that, if exceeded, could pose risks to fetal well-being. In such cases, it may be necessary to develop personalized exercise guidelines to ensure both maternal and fetal safety [29]. This highlights the importance of understanding individual limits during pregnancy to balance the benefits of physical activity with potential risks.

Gestational Diabetes Mellitus

Gestational diabetes mellitus (GDM) is characterized by elevated glucose level that begins or is first identified during pregnancy. It is the most common metabolic disorder associated with pregnancy [41], with prevalence rates varying based on the population. Current estimates suggest that GDM affects between 6% and 14% of pregnancies [25]. GDM poses increased risks for both mother and child, including the likelihood of macrosomia, neonatal hypoglycemia, and a higher probability of cesarean delivery [41][25]. In the long term, women with a history of GDM face a 15% to 70% risk of progressing to type 2 diabetes (T2DM), and their children also have an elevated risk of developing obesity and T2DM [25].

Multiple studies, including meta-analyses, systematic reviews, and a randomized controlled trial, have demonstrated that exercise during pregnancy can significantly lower the risk of gestational diabetes mellitus [2]. Reported risk reductions ranged from 28% to 59% [2].

Davenport et al. identified a relationship between exercise and GDM prevention, finding that 140 minutes per week of moderate-intensity exercise was necessary to achieve a 25% reduction [42].

Additionally, physical exercise can contribute to disease management. For instance, Harrison et al. [43] discovered that exercise interventions significantly reduced both after-meal and fasting blood glucose levels in women previously diagnosed with GDM. This suggests that regular physical activity could be a valuable strategy in controlling blood sugar levels in these women. However, it's important to note that not all research aligns with these findings. A systematic review by Perales et al. [44] found only limited evidence supporting the link between exercise interventions and a reduced incidence of GDM.

Physical movement appears to be a promising strategy for preventing gestational diabetes mellitus. However, the evidence supporting the role of exercise in the treatment of GDM remains limited. Moreover, questions remain about the ideal type, frequency, intensity, and duration of physical activity needed for optimal blood glucose control. To better understand the impact of exercise on GDM treatment, larger and more comprehensive studies are needed.

Preeclampsia and Gestational Hypertension

Hypertensive disorders are fairly prevalent during pregnancy, affecting approximately 10% of pregnancies [1]. These conditions are a significant source of complications and contribute to around 16% of maternal mortality, among other adverse outcomes [2]. There are two primary types of hypertensive disorders: Gestational Hypertension (GH), which involves high blood pressure after 20 weeks of pregnancy, and Preeclampsia (PE), characterized by elevated blood pressure and proteinuria.

Emerging evidence suggests that exercise may have a beneficial role in mitigating the risk of developing pre-eclampsia and gestational hypertension during pregnancy. Three meta-analyses have shown a lower incidence of these conditions among women who were physically active while pregnant [2]. One of them, a study by Davenport et al. reported a significant 41% reduction in the risk of PE and a 39% decrease in the likelihood of GH [3]. The analysis indicated that the exercise sessions needed to be at least 25 minutes long and occur at least three times per week to achieve these benefits [3]. Further support for the

protective effect of physical activity comes from another meta-analysis of six case-control studies by Kasawara et al., which revealed that exercise undertaken before pregnancy was associated with decreased risk of PE [4]. Additionally, a different research, a randomized controlled trial involving pregnant women, demonstrated that incorporating physical movement in previously inactive women led to a notable reduction in their systolic blood pressure [6]. A separate randomized controlled trial found that women assigned to perform 30-60 minutes of aerobic exercise 2 to 7 times per week were less likely to develop gestational hypertension [5].

However, not all studies have found a clear association between physical activity and risk of developing GH and PE. A meta-analysis of ten cohort studies by Kasawara et al. showed no significant link between exercise and those disorders [4]. This discrepancy highlights the need for further investigation.

Overall, existing evidence indicates a potential protective effect of regular physical activity in preventing conditions like pre-eclampsia and gestational hypertension. However, while these findings are promising, additional research is necessary to fully confirm and understand the extent of these benefits.

The impact of physical activity on mental health during pregnancy and postpartum

There are few studies that have specifically examined the relationship between physical activity (PA) affect during pregnancy. Limited evidence suggests that yoga during this time can significantly reduce anxiety symptoms. In relation to antenatal anxiety and depressive symptoms, a systematic review by Sheffield et al. [47] examined 13 studies, including seven RCTs, of the effects of yoga over the gestation period. Among the research evaluating anxiety, all reported improvements in anxiety scores, and six of seven studies observed significant reductions in depression scores. Another review by Shivakumar et al. [48] found that physically active pregnant women had reduced anxiety in one of three studies and reduced depression symptoms in pregnant adolescent girls in two studies.

Postpartum depression (PPD) is a common condition that affects approximately 10–15% of women within the first year after childbirth [45]. About half of the cases manifest within the

first 12 weeks postpartum. The severity and duration vary from case to case, and may be exacerbated by the additional demands placed on new mothers after delivery [45].

Research on physical activity (PA) and exercise interventions for preventing or treating PPD is limited, with only a few high-quality randomized controlled trials (RCTs) that typically involve small sample sizes and varying timelines postpartum. A meta-analysis of 6 studies of exercise interventions within 12 months of delivery confirmed a moderate effect of physical activity on the treatment of PPD [46]. The research included either structured exercise classes or personalized exercise advice. Walking groups have also shown promise in diminishing PPD symptoms. Two small RCTs with 20–24 participants each reported a 59–65% reduction in depression scores following a 12-week program of 2–3 walking sessions per week [53][54]. These findings align with cohort studies that report similar benefits from low to moderate and vigorous exercise interventions initiated during pregnancy or the postpartum period [54][55].

More research is needed to establish a causal link between increased physical activity and reductions in PPD symptoms. However PA appears to have potential benefits such as mood elevation, improved self-efficacy, better sleep patterns, stress relief, and enhanced coping strategies. Women who engage in postpartum exercise often report an increased sense of well-being and improved health-related quality of life [46][49][50]. Regular physical movement before and during pregnancy is associated with a reduced risk of PPD so they should be encouraged to maintain an active lifestyle to potentially improve their psychological well-being after childbirth [51][52].

Risks of exercising during pregnancy

In light of the evidence supporting the benefits of exercise during pregnancy, one important question emerges: Are there any associated risks? Several conditions are thought to be linked to sport activity during this period. These include miscarriage, preterm birth, low birthweight or maternal hyperthermia.

One of the potential concerns with exercise during pregnancy is the risk of preterm birth, which is a major contributor to perinatal mortality and morbidity, occurring in approximately 10% of births [7]. However, evidence suggests that physical activity may actually lower this

risk [2]. For instance, a study by Da Silva et al. demonstrated a 20% reduction in the likelihood of preterm birth among women who exercised during pregnancy [8]

Miscarriage, which occurs in approximately 15% of pregnancies [9], is influenced by various risk factors, including hypertension, diabetes, and stress. The potential effect of physical activity during pregnancy on miscarriage risk has been examined in both a meta-analysis [3] and a systematic review [10], neither of which found a significant link between exercise and an increased likelihood of miscarriage. Current evidence suggests that low to medium intensity physical activity is safe and does not elevate the risk [11]. However, the effects of vigorous exercise during pregnancy remain under-researched. To better understand the implications of high intensity physical activity, more extensive studies are needed to fully assess the risk of miscarriage in women who exceed current exercise guidelines during pregnancy.

Across various studies, the risk of low birth weight remained consistently unaffected by exercise interventions [2]. Additionally, two studies examined the risk associated with maternal hyperthermia. They specifically assessed changes in core temperature as a result of physical activity. Their findings indicated that exercise did not lead to increases in core temperature that would reach harmful or dangerous levels [12][13].

Evidence did not relate sport activity to an increased risk of preterm birth, miscarriage, low birth weight and maternal hyperthermia. This reinforces the safety of moderate physical movement in maintaining maternal health during pregnancy. It appears that engaging in low to medium intensity exercise during pregnancy is generally safe. However, further research is required to fully understand the safety and implications of vigorous physical activity during this period.

Postpartum

The postpartum period is the time following childbirth, generally lasting around six weeks. During this phase, a mother's body experiences substantial physical and emotional changes as it heals from pregnancy and delivery. This period also marks the start of lactation, where the

body begins producing milk. Additionally, many women face challenges with weight gain after childbirth as their bodies transition back to their pre-pregnancy state.

Postpartum weight retention is a common concern, with the average retention ranging from 0.5 kg to 4 kg one year after giving birth [26]. Notably, up to 20% of new mothers retain 5 kg or more, which can lead to long-term health complications [25]. Holding onto excess weight after pregnancy is associated with a higher risk of obesity, cardiovascular disease, and type 2 diabetes. Therefore, engaging in physical activity after childbirth is crucial not only for weight maintenance but also for overall health. A meta-analysis investigated the impact of exercise interventions (with or without accompanying dietary changes) on postpartum weight loss compared with standard care [27]. The subgroup analysis revealed that the most successful strategies for reducing weight in postpartum women involved combining exercise with intensive dietary interventions and exercise programs with clearly defined objectives, such as using pedometers or heart rate monitors [27]. Another research - review of six studies demonstrated a notable weight loss of 1.63kg [28]. The findings also indicated that interventions incorporating a dietary component led to greater results.

Research has also explored the potential impact of exercise on milk production during the postpartum period. Evidence suggests that engaging in moderate to vigorous physical activity does not adversely influence the composition or volume of breast milk [25]. Studies indicate that the nutritional quality and overall volume of breast milk remain stable, even when mothers participate in higher levels of exercise [25]. However, lactic acid levels have been observed to rise in the breast milk of women engaging in high intensity exercise, but not in those participating in moderate intensity activities [24]. There is ongoing debate about whether this temporary increase in lactic acid affects the taste of breast milk and makes it less palatable to infants. Mothers who notice that their baby has difficulty feeding immediately after exercise might consider breastfeeding before engaging in physical activity [24]. Additionally, it may be beneficial for them to wait for at least one hour after completing exercise before resuming breastfeeding [24].

Research suggests that engaging in exercise during the postpartum period offers significant benefits, especially for assisting new mothers with weight management. Studies have also disproven the claim that exercise negatively impacts milk production. Overall, this evidence

highlights the importance of promoting physical activity during the postpartum period to support long-term health and well-being.

Conclusion

Exercise is crucial for maintaining overall health. During pregnancy, this becomes even more important as it contributes to the well-being of both the mother and the fetus. Obstetricians and other healthcare professionals should strongly advocate for continuing or initiating safe exercise during pregnancy as it has numerous benefits. For instance, regular physical activity can significantly lower the risk of gestational diabetes, hypertension, cesarean sections, and operative vaginal deliveries. Moreover, it can accelerate recovery after childbirth and play an important role in preventing depressive disorders that may occur in the postpartum period. It has also been shown to be effective in managing weight retention after delivery.

Although exercise during pregnancy is generally safe and beneficial, it is important to adapt them to the anatomical and physiological changes. In cases where there are no medical complications, pregnant women should be encouraged to engage in regular, moderate-intensity physical activity, which may include activities they were accustomed to before pregnancy or new, safe exercises. Recent evidence supports the idea that the benefits of physical activity during pregnancy far outweigh the risks. This reinforces the importance of exercise as an integral component of prenatal care. Healthcare providers should be vigilant in assessing the individual needs of each patient and providing guidance on safe physical movement.

Disclosure

Author's contribution

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