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Review Article

The impact of exercise on pregnancy: a comprehensive examination of benefits, risks, and considerations

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ABSTRACT

Pregnancy represents a crucial developmental stage characterized by notable physiological transformations. The significance of maintaining an active lifestyle during this period is widely acknowledged as a crucial element of prenatal health, providing a multitude of advantages for the overall well-being of both the mother and the fetus. This article offers a comprehensive examination of the role of exercise during pregnancy, delving into the physiological adjustments, suggested recommendations, and the potential advantages and drawbacks. Physical activity during pregnancy has been shown to have positive effects on weight management, the prevention of gestational diabetes and hypertensive diseases, as well as the enhancement of mood, body image, and sleep quality. There is a positive impact on fetal health outcomes, including ideal birth weight and enhanced heart rate patterns. Nevertheless, some medical issues and complications during pregnancy may necessitate adjustments or contraindications to activity. Although the advantages of exercise are well recorded, numerous pregnant women encounter obstacles when it comes to engaging in physical activity. Healthcare practitioners assume a pivotal role in resolving these problems and facilitating the promotion of safe and effective exercise among expecting moms. Additional investigation is required to clarify the most beneficial exercise recommendations, ascertain efficacious intervention approaches, and advocate for exercise as an essential element of prenatal healthcare.

Keywords: Pregnancy, Exercise, Gestational diabetes, Hypertension, Maternal health, Fetal health

INTRODUCTION

Pregnancy is a notable physiological phenomenon characterized by the transformation of a fertilized egg into an embryo and fetus within the uterine cavity of a woman, occurring over a duration of around 40 weeks.[1] During this period, the female body experiences notable hormonal, structural, and functional transformations in order to facilitate the development of the developing fetus within her.[2] Pregnancy is a significant milestone in the lives of many women, signifying the shift to motherhood and the commencement of a new phase. It is commonly acknowledged that maintaining an active lifestyle throughout pregnancy is a crucial aspect of prenatal health.[3] Consistent engagement in physical exercise has been shown to assist pregnant women in effectively coping with the physical and psychological challenges associated with pregnancy, promoting a positive pregnancy outcome, and establishing a solid basis for postpartum recovery and long-term well-being.[4] Nevertheless, despite the extensively recognized advantages, numerous pregnant women encounter difficulties in adhering to the prescribed exercise requirements during this transforming phase.[5] Extensive and well-researched are the possible benefits of exercise during pregnancy. Engaging in physical activity can assist pregnant women in effectively managing

symptoms associated with pregnancy, including exhaustion, muscular aches, constipation, and mood fluctuations.[6] Additionally, there is evidence suggesting a correlation between it and a decreased likelihood of developing gestational diabetes, preeclampsia, and excessive weight gain. These conditions can significantly impact the well-being of both the mother and the baby.[7] Moreover, research has demonstrated that engaging in physical activity during pregnancy can enhance cardiovascular fitness, muscular strength and endurance, as well as general quality of life.[8] Notwithstanding these persuasive advantages, apprehensions regarding the safety and suitability of physical activity during pregnancy endure. Concerns regarding the potential hazards, such as harm to the growing fetus, premature labor, or even abortion, are legitimate.[9] Furthermore, pregnant women may face a range of obstacles when it comes to engaging in physical activity, such as insufficient energy levels, limited time availability, inadequate access to appropriate facilities, or apprehensions regarding the potential effects on the pregnancy.[10] In addressing these issues and promoting the safe and successful engagement of pregnant mothers in physical activity, healthcare providers assume a pivotal role.[11] Given the considerable potential advantages and the necessity to traverse the intricate array of considerations, it is imperative to cultivate a full comprehension of the role of physical activity during pregnancy. This study aims to present a comprehensive analysis of exercise during pregnancy, encompassing its advantages, potential dangers, measures for risk mitigation, and issues specific to particular groups. By consolidating the existing information in this field, healthcare practitioners can enhance their ability to assist expectant mothers in attaining maximum health results by strategically integrating physical activity into their prenatal care.

PHYSIOLOGICAL ADAPTATIONS TO PREGNANCY

The physiological state of pregnancy is distinct and triggers several changes in the maternal body to facilitate the growth and development of the fetus. The aforementioned adaptations encompass the circulatory and musculoskeletal systems, all of which are vital in promoting a wholesome pregnancy.

CARDIOVASCULAR CHANGES

During gestation, the cardiovascular system experiences notable alterations in order to accommodate the heightened metabolic requirements of both the maternal body and the developing fetus. The amount of maternal blood increases by 30-50% to meet the increased demands, reaching its maximum at approximately 32-34 weeks of gestation.[2] The enlargement is concomitant with a rise in cardiac output, which has the potential to increase by as much as 50% in comparison to levels observed prior to pregnancy.[12] The cardiac muscle undergoes a modest expansion in order to support the augmented circulation of blood. Furthermore, it has been observed that the maternal heart rate exhibits an increase ranging from 10 to 20 beats per minute, hence augmenting the cardiovascular capacity.[13] Simultaneously with these alterations, the maternal blood pressure experiences an initial decrease during the early stages of pregnancy as a result of the expansion of peripheral blood arteries.[14,15] Nevertheless, this pattern undergoes a counterchange in the later phases, characterized by a steady rise in blood pressure, especially during the third trimester.[15] The circulatory changes described in the literature serve the purpose of ensuring sufficient transport of oxygen and nutrients to the fetus, while simultaneously maintaining maternal homeostasis.[16]

MUSCULOSKELETAL CHANGES

During pregnancy, significant musculoskeletal adaptations occur in order to support the developing fetus and facilitate the body's readiness for labor and delivery. One of the most prominent observable alterations is the enlargement of the abdominal region, which is helped by the elongation and elongation of the abdominal muscles.[17] Furthermore, it has been seen that the ligaments and joints inside the pelvic region undergo a process of laxity and increased flexibility, resulting in the expansion of the birth canal.[18] The aforementioned process is propelled by the heightened synthesis of the hormone relaxin, which aids in priming the body for the process of childbirth.[19] The expansion of the uterus also results in a displacement of the center of gravity, resulting in alterations in posture and an augmented lordotic curve in the lumbar region.[20] These modifications aid in preserving equilibrium and steadiness as the pregnancy advances. Moreover, the musculoskeletal system undergoes an elevation in joint laxity, so potentially contributing to the emergence of musculoskeletal distress associated with pregnancy, including lower back pain and pelvic girdle pain.[21]

RECOMMENDED EXERCISE GUIDELINES FOR PREGNANT WOMEN

Engaging in regular physical activity while pregnant provides a multitude of advantages for both the mother and the fetus.[22] Nevertheless, it is imperative to adhere to suitable protocols in order to guarantee a secure and efficient exercise routine. The 2018 revision of the physical activity guidelines for Americans by the U.S. department of health and human services serves to strengthen previous suggestions advocating for a minimum of 150 minutes of moderate intensity aerobic activity per week throughout pregnancy and the postpartum phase.[23] It is recommended to distribute this activity over the course of the week.[24] According to the guidelines, women who regularly participated in intense aerobic exercise or were physically active prior to pregnancy can continue these activities during pregnancy and the period after giving birth.[24] The concept of moderate intensity refers to a level of exertion that enables individuals to engage in conversation comfortably while engaging in physical activity. This level typically aligns

with a desired heart rate range of around 60-80% of the maximum heart rate anticipated for their age, typically not surpassing 140 beats per minute.[25] The recommendation for engaging in aerobic exercises includes walking, swimming, stationary cycling, and low-impact aerobics.[26] It is recommended to engage in muscle strengthening exercises at least twice a week.[25] The majority of exercise regimens can be either continued or began throughout the initial trimester, with necessary adjustments.[27] It is best to avoid engaging in any activity that puts you at danger of abdominal trauma or falls. Sufficient hydration and careful consideration of weariness and nausea are crucial factors.[28] The second trimester is commonly regarded as the most favorable period for engaging in physical activity, as the initial symptoms of pregnancy have generally diminished and the size of the abdomen remains within reasonable limits.[29-31] Nevertheless, it may be necessary to decrease intensity and duration of exercise during 3rd trimester, taking into account one's particular tolerance and condition.[29-31]

BENEFITS OF EXERCISE DURING PREGNANCY

Participating in consistent physical activity throughout pregnancy presents a multitude of benefits for the health outcomes of both the mother and the fetus, as well as for their psychological and emotional well-being.

MATERNAL HEALTH OUTCOMES

Weight management

Excessive gestational weight gain is a common occurrence during pregnancy, which has been associated with an elevated likelihood of problems including gestational diabetes, preeclampsia, and cesarean delivery.[32]

Gestational diabetes

Gestational diabetes mellitus (GDM) is a commonly occurring medical disorder that has the potential to cause difficulties for both the maternal and fetal health.[33] Multiple studies have shown that engaging in regular physical activity while pregnant can greatly decrease the likelihood of developing GDM.[34] Physical activity has been shown to enhance insulin sensitivity and glucose metabolism, leading to the regulation of blood glucose levels and a decreased risk of GDM.[35]

Hypertensive disorders

Preeclampsia and pregnant hypertension, which are hypertensive diseases, are major contributors to maternal and neonatal illness and death.[36] Research has demonstrated that engaging in physical activity during pregnancy can effectively decrease the likelihood of acquiring medical disorders by enhancing endothelial function, mitigating inflammation, and facilitating the maintenance of a healthy body weight.[37]

Mood and anxiety

During pregnancy, individuals may experience notable hormonal and physiological alterations that have the potential to influence their mood and mental state.[38] Research has demonstrated that engaging in regular physical activity might enhance mood and alleviate symptoms of melancholy and anxiety in pregnant women.[39]

Body image and self-esteem

Pregnancy has the potential to induce notable alterations in body composition and body mass, thereby exerting an influence on a woman's perception of her own body and self-worth. Engaging in regular physical activity while pregnant has been linked to increased satisfaction with one's body image and higher self-esteem.[4,40]

Sleep quality

Sleep disruptions are frequently observed throughout pregnancy, frequently intensified by bodily unease, hormonal fluctuations, and psychological strain.[41] Research conducted in Taiwan has demonstrated that engaging in regular exercise can enhance both the quality and duration of sleep in pregnant women. A study found that pregnant women who engaged in aerobic exercises for a period of 4 weeks experienced improvements in sleep quality and maternal-fetal attachment. These positive effects on sleep quality persisted for a duration of 12 weeks.[42]

FETAL HEALTH OUTCOMES

Birth weight

A multitude of studies have been conducted to examine the correlation between maternal physical activity during pregnancy and the birth weight of infants. There is a prevailing belief that engaging in regular physical activity during pregnancy is linked to a decreased likelihood of giving birth to infants with low birth weight (less than 2,500 grams) or macrosomia (birth weight over 4,000 grams).[43] The release of apelin by the placenta is stimulated by maternal activity, resulting in improved vascularization and enhanced efficiency of food supply to the placenta.[44] Nevertheless, there is still a need to investigate the specific function of apelin in facilitating the impact of maternal exercise on placental function.[44]

Fetal heart rate and fetal well-being

Multiple studies have investigated the impact of maternal physical activity on the heart rate patterns of the fetus and the general health of the fetus. Multiple studies have demonstrated that consistent maternal physical activity during pregnancy leads to a notable reduction in fetal heart rate and an increase in heart rate variability. These findings

indicate a potential positive impact on fetal autonomic function.[45,46]

Preterm birth

Preterm birth, which refers to the delivery of a baby before 37 weeks of gestation, is a significant factor in the occurrence of illness and death in newborns.[47] Research has shown that engaging in moderate levels of physical exercise during pregnancy is linked to a reduced risk of preterm birth.[48]

Table 1: A list of several medical conditions which may need exercise considerations.

Condition	Considerations
Hypertension	Current findings recommend that individuals with respiratory conditions or diabetes engage in low-intensity exercise, rather than moderate/ high-intensity workouts.
Asthma	Exercises that may trigger/ exacerbate asthma symptoms should be avoided. These may include activities that induce broncho-constriction, such as prolonged cardio or high-intensity interval training. Patients should be aware of their personal asthma triggers and modify their exercise regimen accordingly.
COPD	Exercises that may worsen COPD symptoms should be discontinued. Individuals with COPD may experience increased breathlessness, fatigue/ exacerbations with certain physical activities. Monitoring one's tolerance and avoiding triggering exercises is essential.
Diabetes mellitus	Patients with diabetes must also be mindful of their blood glucose levels during and after exercise. Hypoglycemic or hyperglycemic conditions can arise, putting individual at risk. Careful monitoring, appropriate medication adjustments, and having fast-acting carbohydrates on hand are crucial safety precautions.

POTENTIAL RISKS AND CONTRAINDICATIONS OF EXERCISE IN PREGNANCY

Participating in consistent physical activity throughout pregnancy provides a multitude of advantages for both the maternal figure and the growing fetus. It is important to acknowledge that specific previous medical issues, complications related to pregnancy, and safety concerns may require adjustments or restrictions to exercise routines. Comprehending these possible hazards and following suitable measures is crucial for guaranteeing a good pregnancy and reducing unfavorable results. Several prior medical issues can present difficulties or heighten the potential hazards associated with engaging in physical activity while pregnant. Table 1 summarizes several medical conditions which need considerations.

Cardiovascular disorders

Medical conditions such as hypertension, heart disease, or arrhythmias may necessitate adjustments or restrictions in exercise regimens in order to mitigate the worsening of symptoms or the occurrence of problems.[49]

Respiratory conditions

Certain types of exercise, especially those involving high-intensity or sustained effort, may pose challenges for women who have asthma, COPD, or other respiratory illnesses.[50,51] Nevertheless, there is a prevailing belief that individuals with COPD and additional medical conditions can achieve substantial and meaningful enhancements in their functional exercise capacity and overall health condition with the implementation of an exercise-based pulmonary rehabilitation program.[51]

Diabetes

To prevent hypoglycemia or hyperglycemia, it is important to closely monitor blood glucose levels before, during, and after exercise for both preexisting and gestational diabetes.[52]

SAFETY CONSIDERATIONS AND PRECAUTIONS

In conjunction with preexisting medical issues and complications associated with pregnancy, it is imperative to exercise caution and adhere to certain safety concerns and precautions when engaging in physical activity during pregnancy.

Warm-up/cool-down

Sufficient warm-up and cool-down intervals are crucial for gradually elevating/reducing heart rate and priming muscles for physical exertion.[53]

Hydration

It is recommended that pregnant women ensure adequate hydration prior to, during, and following physical activity in order to mitigate the risk of dehydration and hyperthermia.[54]

Overheating

To prevent potential injury to the fetus due to maternal hyperthermia, it is advisable to avoid exercising in excessively hot or humid conditions.[55] It is advisable to

wear loose and breathable clothing and create cool and well-ventilated spaces.

Supine position

It is advisable to refrain from engaging in prolonged supine exercise following the first trimester, as it may lead to the compression of the vena cava and compromised venous return.[56]

Joint precautions

In order to mitigate risk of joint injuries, it is advisable to restrict activities that include rapid twists, jerks, or heavy impact, as these activities are associated with elevated levels of relaxin and ligamentous laxity.[57]

Abdominal trauma

It is advisable to refrain from engaging in activities that have a heightened risk of abdominal damage, such as contact sports, horseback riding, and those with a high possibility for falls.[58]

CONSIDERATIONS FOR SPECIAL POPULATIONS

While regular exercise during pregnancy offers numerous benefits for most women, certain special populations may require additional considerations and modifications to their exercise regimens.

Pregnant women with obesity

It is imperative to implement certain measures while formulating an exercise regimen for this particular demographic. There is an increased likelihood of musculoskeletal injuries, joint pain, and discomfort during weight-bearing activities in pregnant women who are obese.[59] Activities with low impact, such as strolling, stationary cycling, or aquatic workouts, may be seen more suitable and more well-tolerated. Moreover, pregnant women who are obese may face an elevated susceptibility to overheating and dehydration while engaging in physical activity, mostly due to the heightened metabolic requirements and insulating characteristics of surplus adipose tissue. It may be required to ensure adequate hydration, watch for indications of overheating, and engage in physical activity in cooler locations.

Pregnant women with gestational diabetes mellitus

Monitoring blood glucose levels before, during, and after exercise sessions is crucial for pregnant women diagnosed with gestational diabetes mellitus.[60] Modifications to insulin dosages or carbohydrate consumption may be required in order to mitigate occurrence of hypoglycemia or hyperglycemia during and following physical activity.[60]

Sedentary women and those with low physical activity levels

The initiation of an exercise program during pregnancy may present distinct problems for pregnant women who were sedentary or had low levels of physical activity before to conception.[10] Pregnant women who have been sedentary or previously inactive are advised to initiate their exercise routine with low-intensity activities, such as walking or prenatal yoga, and subsequently augment the time and intensity of these activities as they are able to endure.[24] In order to facilitate appropriate adaptation and mitigate the likelihood of musculoskeletal injuries, it may be imperative to implement a more gradual progression and extend duration of warm-up and cool-down periods.

CONCLUSION

The comprehensive body of evidence included in this review underscores the crucial significance of physical activity in promoting the well-being of both mothers and fetuses throughout the course of pregnancy. Engaging in consistent physical activity can assist pregnant women in effectively coping with the physical and psychological challenges associated with this significant phase of life, while also establishing the groundwork for optimal recuperation after childbirth and long-term well-being. The advantages of exercise are numerous and well-documented, ranging from regulating weight growth and reducing the risk of pregnancy-related problems to enhancing mood, body image, and sleep quality. Nevertheless, the realm of physical activity while pregnancy is not devoid of intricacies. Many pregnant women continue to have concerns regarding safety, potential hazards, and numerous obstacles to participating. Achieving this intricate equilibrium necessitates a thorough and personalized strategy that considers the distinct circumstances of each woman, her degree of physical fitness before to pregnancy, and any difficulties that may arise during pregnancy. Healthcare practitioners assume a pivotal role in this undertaking, functioning as reliable collaborators and mentors for pregnant women. Clinicians have the ability to empower women to participate in physical activity in a safe and effective manner by offering explicit and evidence-based recommendations regarding the suitable exercise methods, frequency, and intensity. Another crucial aspect to consider is the imperative for healthcare systems and governments to effectively tackle the structural obstacles that impede individuals' ability to obtain prenatal exercise resources and support. In order to advance the incorporation of exercise into normal prenatal care, it is crucial to conduct ongoing research and create novel, multifaceted interventions. By implementing this approach, we can enhance the overall health outcomes for both mothers and fetuses, alleviate impact of pregnancy-related complications, and enable women to enjoy a more dynamic, satisfying, and empowered pregnant experience.

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