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THE IMPACT OF SPORTS AND PHYSICAL ACTIVITY ON THE DEVELOPMENT OF PREGNANCY AND THE POSTPARTUM PERIOD CONSIDERING THE IMPACT OF PHYSICAL AND MENTAL HEALTH IN TERMS OF POSTPARTUM DEPRESSION

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ABSTRACT

Background: Regular physical activity and exercise during pregnancy, in the absence of contraindications, is recommended and recognized as safe and beneficial for both the mother and the developing fetus. However, contact sports, where the risk of injury is significantly higher, should be avoided. The peripartum period is considered a significant risk factor for the development of mental health issues, particularly postpartum depression (PPD).
Aim: This review first presents aspects of the changes in physiology in the mother and fetus. Then the risks and contraindications are discussed, and the various forms of activity are briefly described about their safety, including pelvic-floor muscle exercises and their impact on the course of labor as well as recovery afterwards.
Material and methods: Studies, clinical trials, meta-analyses and systematic reviews with quantifiable or qualitative sports and physical activity during pregnancy data.
Results: There is now plenty of evidence for the beneficial effects of moderate exercise during pregnancy, even in previously inactive women.
Conclusions: Exercise can help reduce the risk of gestational diabetes, pre-eclampsia and cesarean section, while preventing excessive weight gain especially in obese patients. A reduced incidence of postpartum depression has been associated with returning to physical exercise and sports after pregnancy.

KEYWORDS

Pregnancy, Sport, Physical Activity, Mental Health, Obesity, Postpartum Depression, Pelvic Floor Muscle, Gestational Diabetes Mellitus

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1. Introduction

There are anatomical and physiological changes that occur during pregnancy [1]. This aspect must be considered in terms of selecting the appropriate physical activity. Exercises can be started at any time preferably even before pregnancy. This will strengthen muscles, increase joint mobility and reduce low back pain, which affects most patients. Trainings should be adjusted to current capabilities [2]. This publication is intended to help establish and systematize the necessary and key information in the aspect of sports during pregnancy. It important to consider the patient's previous physical activity and chronic diseases that were identified before the pregnancy [3]. Exercise also plays an important role in preparing the patient for labor as well as in the postpartum period [4]. Most of the research shows that pelvic-floor muscle training during the prepartum and postpartum phases helps avoid pelvic-floor dysfunction, especially when it comes to the symptoms of urine incontinence [5]. The review also discusses the beneficial effects of exercise on mental health and how this can lower the risk of postpartum depression [6], [7].

2. Research materials and methods

This review systematically analyzed on the impact of sports and physical activity on the development of pregnancy and the postpartum period considering the impact of physical and mental health in terms of postpartum depression.

The methodology included: Database Search: PubMed, Scopus, Update, and Web of Science were searched using keywords such as "pregnancy", "sport", "physical activity", "obesity", "postpartum depression", "pelvic-floor muscle" and "gestational diabetes mellitus".

Inclusion Criteria: Studies, clinical trials, meta-analyses and systematic reviews with quantifiable or qualitative sports and physical activity during pregnancy data.

Exclusion Criteria: Studies with weak methodologies and animal studies unrelated to human pregnancy.

3. Physiological changes that occur in women during pregnancy:

In preparation for childbirth, a woman's body undergoes a variety of anatomical, physiological, and hormonal changes during pregnancy [8]. Changes are observed in the circulatory system in the form of an increase in circulating blood volume (plasma volume increases) as well as an intensification of prothrombotic activity. There are hemodynamic changes such as an elevation in heart rate and heart mass. The minute volume increases, which contributes to higher blood flow through most organs [9]. Changes in the cardiovascular system start in the fifth week of pregnancy [10]. Renal plasma flow and glomerular filtration rate (GFR) both rise by 40–65 and 50–85%, respectively, in comparison to non-pregnant values because of renal vasodilatation [11].The main hormonal causes of increased ligamentous laxity, especially during pregnancy, are relaxin and estrogen. These pregnancy-related hormones help to relax and soften the ligaments, particularly those surrounding the pelvis [12]. This situation should be highlighted because it may predispose the joint to injury during sports activities [13]. This hormonal change is frequently linked to pelvic and lower back discomfort. Despite increased laxity, pool and low-impact exercises have been shown to have positive effects on low back pain and are less likely to cause ligamentous injuries [14]. The inferior vena cava may be compressed by the expanding uterus during the last trimester of pregnancy. Ten percent of women experience decreased blood pressure while they are in the supine posture [1].

4.1. Recommendations for physical activity in pregnant women:

Frequent exercise throughout pregnancy has significant positive effects on the mother's and the newborn's health. According to WHO guidelines activity decreased risk of preeclampsia, gestational hypertension and diabetes. In addition, the risk of delivery complications and postpartum depression is reduced, about which more information is provided later in the review. It is recommended that all pregnant and postpartum women without contraindication should do at least 150 minutes of moderate intensity aerobic physical activity throughout the week [15]. Sports recommended and listed as low risk for a developing pregnancy include for example, swimming, walking, aerobics, dance, yoga or pilates [3]. The different sports are briefly described below, with an emphasis on how they affect pregnant women's health.

A sedentary lifestyle during pregnancy is associated with the significant health risk of deep venous thrombosis. Obesity is also a factor that increases the chance of developing venous thromboembolism (VTE) by increasing blood viscosity, facilitating activation of the coagulation cascade and intensifying venous stasis. The Royal College of Obstetricians and Gynaecologists and The American College of Chest Physicians recommend assessing its risk and implementing appropriate prophylaxis, which involves administering low-molecular-weight heparin to pregnant women with at least grade II obesity throughout pregnancy and until the 7th day after delivery [16]. It is advised to begin a routine of exercise early in pregnancy, even for patients who have previously been sedentary. Additionally, it is regarded to be secure for certain high-risk pregnancies, including those with gestational diabetes and persistent hypertension.

Gestational diabetes mellitus (GDM) is a form of hyperglycemia that develops during pregnancy and poses risks to both mother and fetus [17]. Human placental lactogen is the main hormone associated with insulin resistance that develops during pregnancy. This hormone not only increases insulin secretion but also contributes to β-cell proliferation to regulate maternal hyperglycemia in normal pregnancies. On the other hand, maternal pancreatic β-cell dysfunction or delayed β-cell response occurs in patients with GDM due to certain conditions or factors, which lowers insulin secretion and ultimately leads to maternal hyperglycemia [17], [18]. Maternal obesity in the early stages of pregnancy is another factor that contributes to abnormally elevated insulin resistance because it raises free fatty acid levels, which prevent the mother from absorbing glucose and increase hepatic gluconeogenesis [17]. Regular aerobic exercise with proper warm-up and cool-down has been shown to lower fasting and postprandial glucose concentrations in studies of previously sedentary individuals with gestational diabetes mellitus (GDM) [19].

In the situation of patients who were already struggling with obesity before pregnancy, appropriate guidelines should also be applied during pregnancy management. Patient carries an increased risk of complications of pregnancy, labor and delivery. Maternal obesity has both short- and long-term consequences for both mother and child. It has been demonstrated that body mass index (BMI) has a strong correlation with several metabolic risk variables and illness outcomes, and it has a modest correlation with direct measurements of body fat [20]. Obese pregnant women should limit their intake of high-calorie foods, such as sweets, and introduce whole-food meals instead. The Polish Gynecological Society recommends a diet whose energy value does not exceed 2000 kcal. It is also recommended to consume fruits and vegetables, but with a low glycemic index [21]. The targeted weight gain should decrease as the BMI increases. To achieve the minimum necessary

level of physical activity, it is recommended for obese pregnant patients to begin exercising with 15-minute sessions and progressively increase their duration to 30 minutes [1]. For example, swimming is a safe and beneficial exercise option for pregnant women, including those who are obese. In addition, it is worth noting that swimming, as an aerobic exercise, can effectively improve blood glucose levels in gestational diabetes mellitus (GDM) [22].

Blood pressure above or equal to 140/90 that starts in the second half of pregnancy (usually after 20 weeks) is known as gestational hypertension. Pregnancy-related hypertension's pathogenesis is not completely understood [23]. The disorder is a spectrum of hypertensive disease in pregnancy, beginning with gestational hypertension and developing into increasingly severe features before it reaches its most serious symptoms, including HELLP syndrome and eclampsia [24]. Worldwide, pre-eclampsia complicates 2–8% of pregnancies. However, a Zhu Zhu suggests that exercise interventions in pregnant women might reduce systolic and diastolic blood pressure during pregnancy. As a result, it is important to promote exercise as a means of improving pregnant women's cardiovascular health [25].

Women should receive advice about warning indicators of when they should stop training. Situations that require control and certainly a visit to a specialist gynecologist-obstetrician are for example vaginal bleeding, decreased fetal movements or amniotic fluid leakage. In addition, symptoms such as chest pain, dizziness or a feeling of muscle weakness should be mentioned [1]. Individual adjustments should be considered to the recommended intensity of physical exercise for women who experience difficulties during pregnancy.

During the second half of pregnancy, water gymnastics greatly decreased the severity of low back and back discomfort. Pilates exercises have similar qualities and effects on low and back pain. They are mainly caused by the anterior tilt of the pelvis and the change in lumbar curvature, which is exacerbated by fetal growth and increased abdominal girth. Pilates not only improves core physical strength but also stabilizes the hip joint by strengthening deep muscles [26]. An additional advantage is that no specialized sports equipment is needed to practice, and simple exercises can be done by oneself at home. The pelvic floor muscles are one of the most important deep muscle groups to focus on before delivery. Specifically recommended exercises adjusted by a urogynecological physiotherapist can prevent and treat incontinence. One study confirmed a reduction in the duration of the second stage of labor, in women practicing pelvic floor muscle physiotherapy [27]. The most well-known pelvic floor exercise is most likely the Kegel exercise. Women should elevate and squeeze the muscles that slow or stop urine when doing Kegel exercises. It is best to strengthen the pelvic floor muscles rather than the muscles in the abdomen, buttocks, or inner thighs [28]. Every exercise must be done correctly, with the appropriate frequency and strength. Furthermore, regularity is necessary. Yoga, as a practice that allows a combination of stretching exercises, relaxation and breathing techniques, has reached positive recommendations from many scientific communities as a safe and more beneficial form of activity for pregnant women than walking [29]. Evidence supports the positive effects of yoga in pregnancy on anxiety disorders and depression. Regular practice leads to a shorter duration of labor. However, it is worth noting that the exercises in the supine position after 16 weeks of pregnancy should be evaluated for compression of the inferior vena cava, as this position may cause the patient to feel weak or uncomfortable. On the other hand, however, contact sports and those involving a high risk of falling or injury such as horse riding, alpine skiing or hockey are inadvisable and should be avoided. A reasonable choice seems to be a stationary bicycle and a moderate-intensity exercise workout. Patients should be advised against scuba diving. Additionally, it is reported that the chance of spontaneous miscarriage, intrauterine growth restriction (IUGR), and fetal deformity is three to six times higher for people who dive regularly and professionally [3]. Animal data suggest possible adverse fetal effects due to fetal decompression illness and hyperbaric oxygen exposure [30].

4.2. Physical activity in reducing the risk of postpartum depression:

The peripartum period is believed to be one of greatest risk factors for the development of mental health difficulties, including depression. Additionally, the behavioral, emotional, and cognitive development of infants is negatively impacted by maternal depression [31]. Although the prevalence of postpartum depression (PPD) varies greatly among cultures, it is estimated to be between 10% and 20% [32]. Environmental factors such as previous mental crises, anxiety disorders, sociocultural roles, history of depression as well as its occurrence in the family and ability to deal with problems and changing circumstances (coping skills) all have an impact on the development of disorders. Female gender also predisposes to the development of anxiety disorders and depression. A mood disorders known as perinatal depression affects people during pregnancy or within a year after giving birth. Postpartum depression is now referred to as perinatal depression in the

Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision (DSM-5-TR) [33]. Postpartum depression may initially be confused with baby blues; however, its symptoms are more severe and persist for a longer duration. In fact, it appeared that more than 50% of women remain undiagnosed [34]. Women who were sexually abused as children were more probable to suffer from postpartum depression [35]. The perinatal period is a time of rapid changes in the balance of the hormonal system. There is enough data to conclude that sensitive women experience affective dysregulation because of changes in reproductive hormones. Lower oxytocin levels have been shown to be a predictor of postpartum depression, in patients with a history of major depressive disorder [31], [36]. Another study found a correlation between prolactin and breastfeeding; women with postpartum depression were less likely to breastfeed and had lower serum prolactin levels [37]. Therefore, it is suggested that unsuccessful lactation and postpartum depression may share a common pathophysiological mechanism [38]. It should be highlighted that a lower incidence of postpartum depression has been linked to returning to physical exercise and sport following pregnancy. However, a Koltyn suggests that exercise was associated with significant decreases ($p < 0.05$) in total mood disturbance [39]. Engaging in regular physical activity improves mental as well as physical health. Physically active people report higher levels of well-being, little trouble going asleep, and lower anxiety. These statements also apply to pregnant women. Recent research demonstrated that yoga was an effective complementary treatment to manage prenatal depression and improve mode of birth out- comes [29]. So, it is worth highlighting that physical activity, family support and the ability to cope with new situations and challenges are factors that reduce the risk of depression in women during the perinatal period.

4.3. Sport in the postpartum period:

The six weeks following delivery is known as the postpartum. Significant new situations and challenges, including breastfeeding, pelvic floor dysfunction, sleep deprivation, and changes in mood, develop during the puerperium. Exercise is supposed to help women cope with such changes. It is advisable to perform simple exercises while still in the hospital, such as hand or foot circles [1]. The choice of exercises, as well as the intensity and range of motion, should consider the course of labor (natural childbirth, cesarean section) and the condition of the patient (episiotomy or perineal tear). As soon as possible, the patient should begin working out her pelvic floor muscle [40]. It is recommended to perform resistance exercise sessions of at least 5 to 10 minutes 3 to 5 times a week [1].

5. Conclusions

Regular physical activity during pregnancy has many beneficial effects for pregnant women and the fetus. Awareness of physical activity during pregnancy should be discussed during pregnancy follow-up visits, especially among women who are overweight or obese. Postpartum depression risk is decreased by physical exercise throughout the perinatal period. Exercises for preparation for delivery and pelvic floor training should be included for pregnant women. It is important to consult gynecologist-obstetrician if there are any doubts, modifying activity as needed and avoiding high-risk activities.

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