Physical exercise during pregnancy

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Abstract
It is commonly known that pregnancy is a unique process in which almost all the body's control systems (circulatory, respiratory, and locomotor) are modified. Pregnancy usually arise doubts about suitability of physical exercise. The purpose of the review of literature was to present the effects of physical exercise during pregnancy for mother and the fetus. Systematic literature search about effects of physical exercise during pregnancy with the help of electronic data base PubMed and PEDro. Physical exercise can help preventing pregnancy related disorders, such as gestational diabetes, gestational hypertension and pre-enclampsia. It is also effective in reducing gestational weight gain and improves the quality of sleep during pregnancy. Physical exercise during pregnancy is beneficial and has positive effects on maternal and perinatal outcomes. Pregnant women should be informed about the benefits by health professionals.
Keywords: Physical exercise, physical activity, pregnancy

Telesna dejavnost med nosečnostjo

Povzetek
Nosečnost je unikaten proces, pri katerem je splošno znano, da se skoraj vsi kontrolni sistemi v telesu (kardiovaskularni, respiratorni in lokomotorni) prilagodijo. Nosečnost navadno spodbudi dvome o primernosti telesne aktivnosti v tem obdobju. Namen pregleda literature je predstaviti učinke telesne aktivnosti med nosečnostjo, tako na mater, kot na plod. Sistematični pregled literature o učinkih telesne aktivnosti med nosečnostjo, s pomočjo elektronskih podatkovnih baz PubMed in PEDro. Telesna vadba lahko pripomore k zmanjšanju tveganja za zaplete v nosečnosti, kot so gestacijski diabetes, povišan krvni tlak, in preeklampsija. Učinkovito zmanjša pridobivanje telesne teže in ima ugoden učinek na kvaliteto spanja v obdobju nosečnosti. Telesna aktivnost med nosečnostjo ima pozitivne učinke na izhodne meritve. Zdravstveni delavci lahko nosečnicam svetujejo aktivnost in jih informirajo o ugodnih učinkih vadbe. *Ključne besede: Telesna vadba, telesna dejavnost, nosečnost*

1. INTRODUCTION

Physical exercise is planned, structured physical activity performed to improve one or more components of physical health status and is a cruical element of a healthy lifestyle. It is associated with numerous benefits for preventing, or being important part in treatement of several diseases (WHO, 2010). Pregnancy is a great period in women life to start exercising, since it is associated with an increased motivation to maintain or start a healthy lifestyle (Nawaz et al., 2000).
Regular physical exercise during pregnancy contributes to the preventions of numerous pregnancy disorders, such as gestational diabetes, gestational hypertension, excess weight gain, severe depression symptoms, weight retantion in the post-partum period, etc. (Davenport et al., 2018, 2019).
Pregnant women are generally not properly advised about physical activity in this period and despite all the benefits many women during pregnancy become more sedentary. The reason for this could be lack of knowledge about exercise and mistaken notion of potencial risks associated with exercise, for both mother and infant (Kramer and McDonald, 2006; Coll et al., 2017).
The aim of this article is to gather the scientific evidence about physical exercise's effects and benefits on maternal health status, considering the woman's individual characteristics, previous medical status and characteristics of the ongoing pregnancy.

2. METHODS

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses protocols (PRISMA) recommendations were used to guide this review.
This review aimed to include studies focusing on the practice of physical exercise during the gestational period and their respective maternal and fetal outcomes. Randomized Controlled Trials (RCTs), Meta-analyses, Prospective Studies and Systematic Reviews were considered. Case reports and narrative reviews were excluded.
A search on PubMed and PEDro was conducted using the following queries: "pregnancy AND (physical exercise OR physical activity) AND outcome". All studies identified were screened for followed inclusion criteria: (1) published in English, (2) between 2017 and 2022, (3) with full-text available, (4) maternal and fetal outcomes related to physical exercise during pregnancy. Studies focusing on pre-gestational period were excluded.

3. RESULTS

The search strategy resulted in 268 articles. Four duplicates were identified, remaining 264 articles. After examining title and abstract to determine those that met the inclusion criteria, 165 articles were excluded. The remaining 99 articles were accessed and analyzed for eligibility, and 86 articles were further excluded, for the following reasons: focus on pre-gestational period, not in english and no relevant outcomes recorded. Thirteen articles were finally included in this review. A PRISMA diagram of the search results is shown in Figure 1.

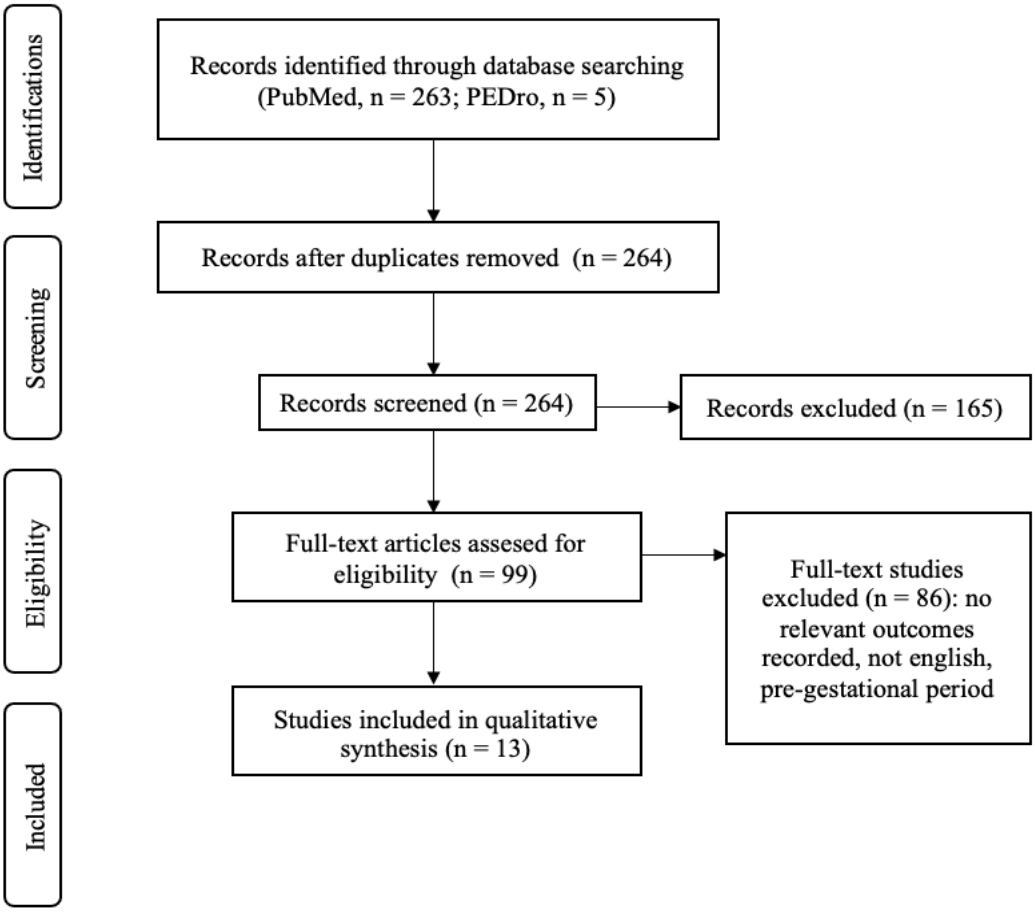

Figure 1: Flow - chart of the literature research (PRISMA)

Tabel 1: Characteristics of studies included

Author, Year	*Sample characteristics*	*Results*
Bacchi et al., 2017 (10)	*n = 109, D: 3 sessions/week (from weeks 10-12 until weeks 38-39)*	*Three sessions of water activities per week prevents excessive maternal weight gain and preserves birth weight.*
Rodriguez-Blanque et al., 2017 (11)	*n = 140, D: 17 weeks*	*Water Exercise during pregnancy improves the quality of sleep.*
Brik et al., 2019 (12)	*n = 120, D: 3 days/week (60 min sessions)*	*Moderate physical exercise during pregnancy increases weight loss at 6 weeks postpartum and may have beneficial effects on fetal cardiovascular function*
Davenport et al., 2018 (6)	*N = 106, n = 273 182*	*Exercise is effective at lowering risk of developing gestational diabetes mellitus, gestational hypertension and pre-eclampsia.*
Davenport et al., 2018 (13)	*N = 52, n = 131 406*	*Exercise reduced the odds of prenatal depression and the severity of depressive symptoms, but effects are not seen in the postpartum period or prenatal/postnatal anxiety*

Ribeiro et al., 2021 (18)	N = 57	Exercise during pregnancy is safe for mother and the fetus and can reduce the odds of pregnancy related disorders.
De Castro et al., 2022 (19)	N = 32	Group exercise programs have significant effects on health status of pregnant woman (lower maternal weight gain, faster heart rate recovery, lower blood pressure, decreased risk of depression,...)
Xie et al., 2022 (20)	N = 12, n = 1649	Physical exercise has positive effect on reducing the risk for gestational hypertension in obese and overweight pregnant women.
Davenport et al., 2018 (7)	*N = 135, n = 166 094*	*Prenatal exercise is safe and has beneficial effects for the fetus. It is associated with reduced risk for macrosomia and is not associated with neonatal complications.*
Chan et al., 2019 (14)	*N = 29*	*Physical exercise during pregnancy is beneficial to the health of mother and the fetus.*
Wang et al., 2019 (15)	*N = 23, n = 4462*	*Exercise intervations can reduce gestational weight gain, especially if performed 3 times/week (30-45 min sessions).*
Rodriguez-Blanque et al., 2020 (16)	*n = 129, D: from week 20 of pregnancy until week 37*	*Water exercise has positive effects on health-related quality of life of pregnant women.*
Makaruk et al., 2021 (17)	*n = 66, D: 81 sessions 3 times/week (50-60 min)*	*Regular and supervised exercise program has positive effects on maternal physical fitness and cardiac efficiency and is safe for the fetus.*

N = number of studies; n = number of participants; D = duration of interventions

4. DISCUSSION

Different types of physical exercise can be beneficial for pregnant women and the fetus. Bacchi et al. (2018) and Rodriguez-Blanque et al. (2018) evaluated sleep quality, maternal weight gain and birth weight changes with water exercise. The exercise program in the first study consisted a total of 85 sessions in the swimming pool, 3 times per week and each sessions lasted 55-60 minutes. Women performed aerobic exercises or dance, strenght exercises and aquatic activities and swimming using all styles except butterfly for 8 to 10 minutes. The results showed that percentage of women in control group with excessive maternal weight gain was higher than in the exercise group, but no diffrences between groups were showed in other pregnancy outcomes (Bacchi et al., 2018). In the second study exercise program was similar to the first one, as the intervention group took part in three one-hour exercise sessions per week. Moderate physical exercise in water showed positive effects on sleep quality, considerating the duration, latency and regular efficiency of sleep (Rodriguez-Blanque et al., 2018). Rodriguez-Blanque et al. (2020) performed another study evaluating effects of physical exercise on maintaining a healthy lifestyle and confirmed their findings as the results showed benefical effects such as higher percentage of intact pelvic floor after delivery and lower percentage of tears and

episiotomies. Also the newborns of women who did physical exercise had significantly lower weight, and both groups newborns weight was maintained within the margin of normal weight (Rodriguez-Blanque et al., 2020).

Brik et al. (2019) were evaluating the association between physical exercise in pregnant women and maternal gestational weight gain and fetal cardiac function. Study reported no differences were found between the groups in maternal weight from weeks 20 until weeks 38, but performing exercise during pregnancy resulted in increased weight loss at 6 weeks postpartum. Exercise may have a beneficial effects on fetal cardiovascular development as study showed increased ductus arteriosus pulsatility index at 20 weeks and the ejection fraction at 36 weeks. Future studies are needed to investigate the relationship between physical exercise during pregnancy and fetal cardiovascular function (Brik et al., 2019). Contrarily Wang et al. (Wang et al., 2019) found indications that physical exercise during pregnancy can reduce maternal gestational weight gain (GWG). GWG was significantly decreased when exercise was performed from 30 to 45 minutes each time with frequency of 3 times per week (Wang et al., 2019).

Gestational diabetes mellitius (GDM), gestational hypertension (GH) and pre-eclampsia (PE) are relatively common pathologies in the prenatal period. Davenport et al. (2018) reported that exercise is associated with a 38% decrease of risk of developing GDM, 41% for developing PE and 39% for developing GH. At least 25% decrease in the odds for all three pathologies was achieved if pregnant women performed at least 140 minutes of moderate-intensity such as brisk walking, water activities, resistance training or indoor cycling (Davenport et al., 2018). Likewise, Ribeiro et al. (2021) concluded that exercise can be successful in preventing pregnancy related disorders as 11 studies (very low to high quality studies) in their review showed lower risk for developing GDM in women who exercised and four studies showed a significant reduction of GH and PE among women that were physical active and did not have previously increased odds for these disorders (Ribeiro et al., 2021). Similarly, Xie et al. (20) reported that physical exercise reduced risk of GH in obese and overweight women, but more well-designed and larger studies are needed to further elaborate these results.

Another research from Davenport et al. (2018) examined the association between physical exercise during pregnancy and prenatal depression and the severity of depressive symptoms. Researchers reported a 67% reduction of the risk of prenatal depression and reduction of severity of prenatal depression, but effects were not extended beyond pregnancy period. Moderate effects in the reduction in severity of symptoms were seen if pregnant women accumulated at least 150 minutes of moderate intensity exercise (Davenport et al., 2018).

Five other studies (7, 14, 17, 18, 19) reported that physical exercise is beneficial for maternal health status and is also safe for the fetus. De Castro et al. (2022) reported significant effects of the group exercise on pregnant women (lower maternal weight gain, improved glucose tolerance, lower blood pressure, decreased risk of depression, faster heart rate recovery, less complications during labor etc.) Exercise program encluded aerobic, resistance, pelvic floor training, stretching and relaxation methods (De Castro et al., 2022). Furthermore, Makaruk et al. (2021) reported similar results as regular and supervised exercise program during pregnancy improved maternal health status and cardiac efficiency. The exercise took place three times per week, with moderate intensity and with heart rate between 100-145 beats per minute. The results also confirmed that moderate exercise during pregnancy does not affect fetal health status and is considered safe for the fetus (Makaruk et al., 2021). Studies from Davenport et al. (2018) and Chan et al. (2019) both confirmed beneficial effects on mother and fetus health status.

5. CONCLUSION

The current study demonstrates several beneficial health outcomes of physical activity during pregnancy. Pregnant women should focus on performing at least 140-150 minutes per week physical activity, exercise can be moderate intensity and may include different types of activity, such as water exercise, brisk walking, aerobic, resistence and pelvic floor training, stretching and relaxation methods. Health care professionals should inform women of the benefits of physical activity during pregnancy,

with consideration that exercise intensity should be adapted to women's previous activity level. Exercise also needs more extensive research to determine specific types of exercise and their effect in each outcome and in women with different comorbidities.

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