OBSTETRICS

Exercise during pregnancy protects against hypertension and macrosomia: randomized clinical trial

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BACKGROUND: The prevalence of all pregnancies with some form of hypertension can be up to 10%, with the rates of diagnosis varying according to the country and population studied and the criteria used to establish the diagnosis. Prepregnancy obesity and excessive gestational weight gain (GWG) of all body mass index (BMI) categories have been associated with maternal hypertensive disorders and linked to macrosomia (>4000 g) and low birthweight (<2500 g). No large randomized controlled trial with high adherence to an exercise program has examined pregnancy-induced hypertension and these associated issues. We investigated whether women adherent (≥80% attendance) to an exercise program initiated early showed a reduction in pregnancy-induced hypertension and excessive GWG in all prepregnancy BMI categories, and determined if maternal exercise protected against macrosomia and low birthweight.

OBJECTIVE: We sought to examine the impact of a program of supervised exercise throughout pregnancy on the incidence of pregnancy-induced hypertension.

STUDY DESIGN: A randomized controlled trial was used. Women were randomized into an exercise group (N = 382) or a control group (N = 383) receiving standard care. The exercise group trained 3 d/wk (50-55 min/session) from gestational weeks 9-11 until weeks 38-39. The 85 training sessions involved aerobic exercise, muscular strength, and flexibility.

RESULTS: High attendance to the exercise program regardless of BMI showed that pregnant women who did not exercise are 3 times more likely to develop hypertension (odds ratio [OR], 2.96; 95% confidence interval [CI], 1.29—6.81, $P = .01$) and are 1.5 times more likely to gain excessive weight if they do not exercise (OR, 1.47; 95% CI, 1.06—2.03, $P = .02$). Pregnant women who do not exercise are also 2.5 times more likely to give birth to a macrosomic infant (OR, 2.53; 95% CI, 1.03—6.20, $P = .04$).

CONCLUSION: Maternal exercise may be a preventative tool for hypertension and excessive GWG, and may control offspring size at birth while reducing comorbidities related to chronic disease risk.

Key words: exercise, gestational weight gain, hypertension, intervention, outcome, pregnancy

Introduction

The prevalence of all pregnancies with some form of hypertension can be up to 10%,[1] with the rates of diagnosis varying according to the country and population studied and the criteria used to establish the diagnosis.[2] Although these clinical issues may range in severity from trivial to life threatening,[1] elevated blood pressure (BP) remains the leading cause of maternal, fetal, and neonatal morbidity and mortality.[2,3] Gestational hypertension has been defined as elevated BP[4] that develops >20 weeks of gestation in a previously normotensive woman, without proteinuria.[1] These women are at high risk (15-45%) for developing preeclampsia[1] with high BP,[5] typically appearing >20 weeks of pregnancy in a normotensive woman, and most frequently including proteinuria.[2] Preeclampsia may or may not progress to eclampsia with the occurrence of seizures and extreme maternal and fetal complications.[5] Severity of symptoms can accelerate rapidly, leading to immediate delivery regardless of gestational age.[5] Although the origin of pregnancy hypertension is unknown,[6] many theories exist suggesting that the pathophysiological processes that lead to preeclampsia begin in early pregnancy, even though maternal symptoms do not appear until mid to late gestation.[7]

Although the causal link to pregnancy-induced hypertension is unknown, there are maternal factors, such as excessive gestational weight gain (GWG) regardless of prepregnancy body mass index (BMI), and maternal obesity[8] that increase the risk for hypertensive disorders.[9] In addition, there are downstream consequences of pregnancy-induced hypertension that have been linked to neonatal birthweight (macrosomia >4000 g; low birthweight <2500 g),[10] leading to childhood obesity and cardiovascular disease risk in the offspring.[10] It has been suggested that interventions focus on reducing modifiable risk factors (one of the most prominent being excessive GWG) should be incorporated into prenatal care to improve the health of the mother and reduce perinatal complications[11] and cardiovascular risk.

Epidemiological evidence suggests that women who participate in regular physical activity have a reduced risk of developing pregnancy-induced hypertension[12] and preeclampsia.[13-15] These studies are based on retrospective questionnaires in case-control cohorts and, as recent reviews concluded, there is a critical need for well-designed randomized controlled trials (RCT).[16-18] The aim of the present study was to examine the impact of a program of supervised exercise throughout pregnancy on the incidence of pregnancy-induced hypertension. We hypothesized that adherent women (≥80% attendance) to an exercise program initiated early in pregnancy (9-11 weeks' gestation) will have a decreased incidence of pregnancy-

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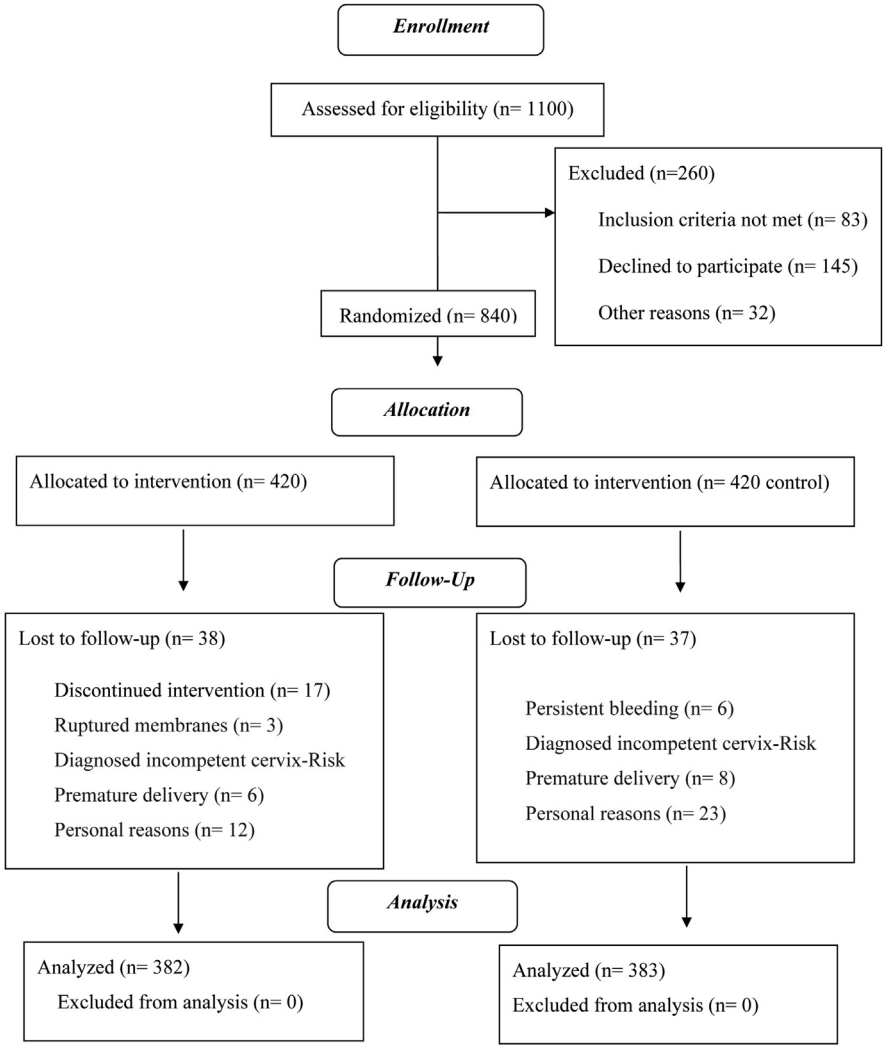
FIGURE
Consolidated Standards Of Reporting Trials (CONSORT) 2010 flow diagram of study participants



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induced hypertension and that exercise will protect against the initiation of this disease in women of all prepregnancy BMI categories, while also protecting against excessive GWG. In addition, we hypothesized that exercise protects against macrosomia (>4000 g) and low birthweight (<2500 g) and other pregnancy complications.

Materials and Methods

The present RCT (identifier: NCT01723098) was conducted from December 2011 through January 2015 following the ethical guidelines of the Declaration of Helsinki, last modified in 2000. The research protocol was reviewed and approved by the ethics review board of Hospital Severo Ochoa (Madrid, Spain). The onset of patient enrollment was November 2012.

Participants and randomization

A total of 1100 Spanish-speaking (Caucasian) pregnant women from primary care medical centers (Figure) were assessed for eligibility. Women with singleton and uncomplicated pregnancies (no type 1, type 2, or gestational diabetes mellitus [GDM] at baseline) with no history or risk of preterm delivery were included. Women not planning to give birth in the same obstetric hospital and not under medical follow-up throughout pregnancy were not included in the study, neither were women having any serious medical conditions (contraindications) that prevented them from exercising safely.[19]

After women provided written informed consent, 840 healthy gravidae were randomized (ratio 1:1) to either an exercise intervention (n = 420) or usual care (n = 420) group. The participant randomization assignment followed an allocation concealment process using a random numbers table. Assessment staff members were blinded to assignment. The randomization process (sequence generation, allocation concealment, and implementation) was conducted by 3 different individuals. To reduce participant drop out and to maintain adherence to the training program, all sessions were accompanied with music, and were performed in an air-conditioned well-lit exercise room at the hospital. A qualified fitness specialist carefully supervised every training session with the assistance of an obstetrician.

Exercise intervention

The randomization was performed in waves so that each wave had between 10-12 participants in the exercise group, and 10-12 women in the control group. The exercise group trained 3 d/wk (50-55 min/session), from weeks 9-11 of pregnancy, to the end of the third trimester (weeks 38-39). An average of 85 training sessions was originally planned for each participant in the event of no preterm delivery. The intervention involved aerobic exercise, aerobic dance, muscular strength, and flexibility, and met the standards of the American Congress of Obstetricians and Gynecologists.[19] Women used a heart rate monitor (Accurex Plus; Kempel, Finland) during the training sessions (heart rate was consistently <70% of age-predicted maximum) and the rating of perceived exertion scale ranged from 12-14 (somewhat hard).[20]

Each exercise session was preceded and followed by a gradual warm-up and cool-down period (both 10-12 minutes' duration) and consisted of walking and