

## Exercise in pregnancy!

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In this issue of the *American Journal of Obstetrics and Gynecology*, Wang et al<sup>1</sup> report results from a randomized controlled trial (RCT) on exercise in pregnancy. They found that cycling exercises initiated at <13 weeks gestation that are performed no <30 minutes 3 times per week until 37 weeks gestation significantly reduced the incidence of gestational diabetes mellitus (GDM) and gestational weight gain at <25 weeks gestation and lowered birthweight in a study that included 300 overweight or obese women carrying singleton gestations. Although these investigators found no significant differences between the exercise and control groups in the incidence of other outcomes such as preterm birth (PTB), gestational hypertension (GHTN), cesarean delivery, and macrosomia, all these outcomes were less frequent in the exercise group.<sup>1</sup>

This RCT is in agreement with previous data.<sup>2-7</sup> There are indeed >50 RCTs published on exercise in pregnancy. These have been summarized in several metaanalyses.<sup>2-7</sup> Often dietary counseling or other dietary interventions, which are beneficial by themselves, have been studied together with exercise,<sup>8,9</sup> so it is important, as done by Wang et al,<sup>1</sup> to focus on just exercise data when reviewing the previous literature. Two recent metaanalyses focused on just the effects of exercise on pregnancy outcomes.<sup>2,3</sup>

A metaanalysis of 9 RCTs that included 2059 women with an uncomplicated, singleton pregnancy with normal body mass index showed that women who were assigned randomly to aerobic exercise had similar incidence of PTB, 49% lower incidences of GDM, 79% lower incidence of GHTN disorders, 18% lower incidence of cesarean delivery, and a 9% higher rate of vaginal delivery.<sup>2</sup> A recent metaanalysis that focused, as in Wang et al,<sup>1</sup> on overweight or obese women included 9 RCTs and 1502 women and showed benefits of exercise in terms of a 38% lower rate of PTB and 39% lower rate of GDM (Table 1).<sup>3</sup>

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Our main aim in this editorial is to summarize this now extensive body of level-1 data, based on RCTs and meta-analyses of RCTs, so to provide easy-to-use advice for pregnant women and for us, their providers.

First, what are the benefits and harm of exercise in pregnancy? Table 1 lists the many statistically significant benefits of exercise in pregnancy that were reported in RCTs and metaanalyses of RCTs.<sup>1-3,8</sup> The list is quite noteworthy. To our knowledge, there is no intervention that we as providers can recommend to pregnant women as impressive in its significant impact on so many maternal and perinatal outcomes. Although nonpregnant data would perhaps predict that exercise decreases the incidence of GDM, the fact that exercise significantly decreases GHTN disorders, PTB, and cesarean delivery is remarkable and destroys the myth that exercise might be harmful in pregnancy, especially in terms of PTB. Moreover, there are good reasons why exercise would be associated with these many benefits. Exercise may decrease the incidence of GDM by attenuating the increase in insulin resistance that is associated with pregnancy.<sup>1</sup> It may decrease the risk of GHTN disorders by reducing oxidative stress and therefore improving endothelial function.<sup>10</sup> Exercise may decrease the incidence of cesarean delivery (and importantly increase the incidence of vaginal delivery) by improving maternal physical fitness and lowering birthweight.<sup>1-3</sup>

We could not identify any harm reported in level-1 data on exercise in pregnancy.<sup>2-9</sup> In fact, the contrary is true. There are lots of data that bed rest or decreased activity are harmful in pregnancy, with increased risks of venous thromboembolism, bone demineralization, and deconditioning.<sup>11</sup> Despite no evidence of benefit and known harms, bed rest continues to have wide use in obstetrics; approximately 15% of women each year are placed in bed rest during their pregnancies in the United States.<sup>12</sup> Seventy percent of Maternal Fetal Medicine physicians recommend bed rest for preterm labor (PTL), and 85% of them recommend bed rest in case of preterm premature rupture of membranes (PPROM),<sup>13</sup> with no evidence of benefit. In fact, decreased activity is associated with increased risk of PTB in women at high risk for PTB, such as those with a short transvaginal ultrasound cervical length.<sup>14</sup>

Second, which women should exercise in pregnancy? The short answer is just about every pregnant woman should exercise in pregnancy. The American College of Obstetricians and Gynecologists (ACOG) lists absolute and relative contraindications to aerobic exercise in pregnancy.<sup>11</sup> To our knowledge, and as even ACOG implies, these are based perhaps on common sense, but none have been substantiated by data. For example, of the ACOG absolute contraindications to exercise in pregnancy,

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TABLE 1

**Benefits of exercise in pregnancy**

Lower incidence of:	Higher incidence of:
Excessive gestational weight gain <sup>1,8</sup>	Vaginal delivery <sup>2</sup>
Gestational diabetes mellitus <sup>1-3</sup>	
Gestational hypertensive disorders <sup>2a</sup>	
Preterm birth <sup>3</sup>	
Cesarean delivery <sup>2</sup>	
Birthweight <sup>1b</sup>	

<sup>a</sup> Defined as gestational hypertension or preeclampsia; <sup>b</sup> Lower birthweight.

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although some (hemodynamically significant heart disease, restrictive heart disease, severe anemia) seem reasonable, the others (cervical insufficiency or cerclage, multiple gestation, vaginal bleeding, placenta previa, PTL, PPROM, preeclampsia, and GHTN) actually may be situations in which some exercise may prove beneficial. We are not aware of level 1, or even good level II, evidence of harm from exercise in these situations. No evidence of fetal harm from exercise has been reported, with a 10–15 beats per minute increase in fetal heart rate (HR) during moderate-to-intense exercise and minimal decrease in birthweight from regular exercise during pregnancy and no increase in intrauterine growth restriction or small for gestational age.<sup>1-7,11</sup>

Third, what types of exercises should pregnant women do? Table 2 shows the types of exercises that have been studied in pregnancy in RCTs and found to be safe and associated with benefits (Table 1). Many other types of exercises are safe and beneficial, such as swimming, jogging, running, yoga, pilates.<sup>11</sup> Examples of physical activities that have been listed as possibly unsafe include contact sports (eg, ice hockey, boxing), activities with high risk of falling

TABLE 2

**Examples of types of exercises that have been extensively studied in pregnancy and found to be safe and beneficial**

Walking
Stationary cycling
Aerobic exercises
Dancing
Resistance (eg, weights, elastic bands) exercises
Stretching exercises
Hydrotherapy, water aerobics

This is a partial list because the list of all safe and studied exercises in pregnancy would be too long to publish.

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(eg, skiing, horseback riding, sky diving), and scuba diving.<sup>11</sup> Some sports (eg, crew on an ergometer machine) may be deemed safe early in pregnancy but less feasible in the third trimester (personal communication, my rower son Andrea Berghella today while we were biking next to each other along the Schuylkill river in Philadelphia).

Fourth, how much should pregnant women exercise? Most of the RCTs<sup>2-7</sup> that showed that exercise in pregnancy is safe and effective in producing benefits recommended starting aerobic exercise in the first trimester, with sessions lasting approximately 30–60 minutes, at least 3–4 times (up to daily) per week, until delivery (Table 3).<sup>2,3</sup> Many RCTs monitor maternal HR and suggest not exceeding a 60–80% of maximum HR threshold, which approximately means, as used in other RCTs, a maximum maternal HR of approximately 140 beats per minute. The Borg scale is a category scale that has been used to measure the level of perceived exertion to assess the intensity of exercise.<sup>15</sup> RCTs and metaanalyses of RCTs on exercise in pregnancy have studied mainly “somewhat hard” or moderate-to-intense exercise regimens, which correspond to a Borg score of 13–14 (the scale is 6–20).<sup>1-7</sup> As recommended by ACOG and others,<sup>11,16</sup> women should be well hydrated before and during exercise, be able to carry a conversation during exercise (because this means they are likely not overexerting), and avoid lying flat on their backs for long periods.

Although the quality and extent of research on exercise in pregnancy is quite good, future research is needed. In particular, pregnant women who have been often excluded from RCTs in the past, such as those with previous PTB, multiple gestations, medical disorders (such as chronic hypertension, pregestational diabetes, cardiac disease, restrictive lung disease, renal disease, lupus, uncontrolled thyroid disease), those who experience complications such as short cervical length, PTL or PPROM, or GHTN or

TABLE 3

**Characteristics of a safe and effective exercise regimen in pregnancy<sup>1-7</sup>**

When to start	First trimester, <12 weeks gestation
Duration of a session	30-60 minutes
Times per week	At least 3–4 (up to daily)
Intensity of exercise	<60–80% of age-predicted maximum maternal heart rate <sup>a</sup>
Self-reported intensity of exercise (Borg scale) <sup>b</sup>	Moderate intensity (12–14 on Borg scale)
Supervision of exercise	Preferred, if available
When to end	Until delivery (as tolerated)

<sup>a</sup> Usually not exceeding 140 beats per minute; <sup>b</sup> Borg scale is a 15-category scale (from 6–20) to measure the level of perceived exertion: light exercise is approximately 6–11; 13 is somewhat hard; 15 is hard; 19 is extremely hard.<sup>15</sup>

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preeclampsia or those with ACOG absolute or relative contraindications to exercise<sup>11</sup> should be enrolled in future RCTs on exercise in pregnancy. Also, more level-1 evidence is needed on the effect of continuing strenuous exercise in elite athletes, which appears to be safe but has been insufficiently evaluated.<sup>17</sup>

In summary, exercise is good for all of us nonpregnant adults, because it improves cardiorespiratory fitness, reduces the risk of obesity, enhances psychological well-being, and results in greater longevity.<sup>11</sup> Level-1 evidence now from >50 RCTs (including this new one by Wang et al<sup>1</sup>) and several metaanalyses<sup>1-9</sup> show that almost all pregnant women should exercise. Aerobic exercise (Table 2) is associated with important benefits, including less gestational weight gain; lower incidences of GDM, GHTN, GHTN disorders, PTB, and cesarean delivery; lower birthweight, and higher incidence of vaginal delivery (Table 1). To seize these benefits, aerobic exercise should be started in the first trimester and continued 3-4 times per week for 30- to 60-minute sessions each until delivery (Table 3). To stay inactive is to die. ■

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