Prevention of Gestational Diabetes

Feasibility issues for an exercise intervention in obese pregnant women

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OBJECTIVE — To examine the feasibility of an individualized exercise program to prevent gestational diabetes mellitus (GDM) in obese pregnant women.

RESEARCH DESIGN AND METHODS — The study was a pilot randomized controlled trial with obese pregnant women (intervention group, individualized exercise program [n = 25]; control group, usual care [n = 25]). Average weekly energy expenditure (MET hours per week and kilocalories per week) of exercise-specific activity was assessed during pregnancy using the Pregnancy Physical Activity Questionnaire. Fasting glucose and insulin and homeostasis model assessment of insulin resistance (HOMA-IR) were assessed at baseline and 20, 28, and 36 weeks' gestation.

RESULTS — Of the women in the intervention group, 16 of 22 (73%) achieved more than 900 kilocalories per week of exercise-specific activity at 28 weeks compared with 8 of 19 women in the control group (42%), P = 0.047. However, insulin resistance (HOMA-IR) did not differ between the groups.

CONCLUSION — This intervention was feasible and prompted a modest increase in physical activity. However, we are not confident that this intervention would be sufficient to prevent GDM.

Gestational diabetes mellitus (GDM) is increasing in parallel with overweight and obesity in the obstetric population (1), yet evidence on effective approaches to prevent GDM is lacking. A recent randomized controlled trial (RCT) aimed at modifying nutrition, weight gain, and physical activity in obese pregnant women was not effective in increasing physical activity (2). Based on successful trials in the nonpregnant population (3,4), we aimed to assess the feasibility of individualized, goal-directed exercise intervention in obese pregnant women. Feasibility issues that we address here include implementing the intervention and assessing the efficacy and acceptability of the intervention (5).

RESEARCH DESIGN AND METHODS — Obese pregnant women were recruited at 12 weeks' gestation and followed to delivery with data collection at 12, 20, 28, and 36 weeks' gestation.

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RESULTS — During the 7-month recruitment period, 50 obese women were randomized to either the intervention group (n = 25) or control group (n = 25), representing a recruitment rate of 12% of all eligible women presenting for maternity care at the Royal Brisbane and Women’s Hospital (supplemental Fig. 1, available in the online appendix). There were no statistically significant differences between the intervention and control groups in any baseline variable, although there was a trend toward more frequent early diagnosis of GDM in the intervention group (supplemental Table 1). Women in the intervention group were scheduled for six face-to-face visits during the trial and on average attended four. Further support was provided by email and telephone.

Efficacy

Exercise duration and intensity varied considerably, with a trend toward weekly EE (MET hours per week) being greater for women in the intervention group at 28 and 36 weeks' gestation (Table 1). In the

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**Exercise intervention in obese pregnant women**

**Table 1**—Physical activity and metabolic outcomes at various time points for women in the control group and exercise intervention group

| Time          | Control | Intervention | P   | Control | Intervention | P   |
|---------------|---------|--------------|-----|---------|--------------|-----|
| 12 weeks      | 25      | 25           | 0.23 | 9.9 (22.2) | 16.9 (22.2) | 0.07 |
| >900 kcal/week | 7 (28%) | 10 (40%)     | 0.12 | 8 (42%)  | 15 (71%)     | 0.37 |
| HOMA-IR [mean (SD)] | 2.49 (1.04) | 2.74 (1.04) | 0.7 | 2.21 (1.68) | 2.13 (1.68) | 0.4 |
| Fasting glucose [mean (SD)] | 12.42 (5.06) | 13.76 (8.94) | 0.07 | 11.42 (5.68) | 10.95 (4.52) | 0.32 |

**Acceptability**

Feedback was obtained from women in the intervention (n = 20) and control groups (n = 16). All women in the intervention group provided positive comments (e.g., useful nutritional advice, extra care during pregnancy). Women reported difficulty incorporating exercise into their daily routine due to pregnancy symptoms, child care, and work commitments (supplemental Table 2).

**CONCLUSIONS** — This individualized goal-directed exercise intervention in obese pregnant women met several criteria of feasibility. Recruitment rates were acceptable, implementation was achieved, and women found participation in the intervention acceptable.

There was some evidence of efficacy, with increased physical activity in the intervention group at some time points during pregnancy. Women in the intervention group were achieving sufficient activity at 20 weeks, falling within the exercise guidelines for weekly moderate-to-vigorous-intensity activities (9). At 28 weeks, women in the intervention group were significantly more likely to achieve greater than 900 kcal/week of exercise-based activity. However, while the intervention group showed some improvement in fasting glucose at 28 weeks, and fasting insulin at 36 weeks compared with the control group, there were no definitive between-group differences in HOMA-IR. The study was not powered to examine GDM prevalence as an outcome.

There are a number of potential explanations as to why there was no difference seen in insulin resistance, despite some improvement in physical activity. The difference in physical activity between the two groups might not have been sufficient to result in differences in insulin resistance. Randomization was not concealed from the women due to the need for informed consent. Women in the control group voluntarily undertook far more physical activity than predicted (or seen in clinical practice), which resulted in smaller differences between groups than expected. This issue needs careful consideration for future studies. Exercise alone might not be sufficient during pregnancy to affect insulin resistance. It is also possible that HOMA-IR is not the most sensitive way of assessing the impact of exercise on insulin resistance. Although HOMA-IR is regarded as a good measure of overall insulin resistance in pregnancy, it may provide a better reflection of liver rather than peripheral insulin resistance (7), whereas exercise is likely to preferentially reduce peripheral (muscle) insulin resistance.

Given our data, we believe a combined dietary and exercise intervention might have a stronger impact on insulin resistance, and subsequently on the prevention of GDM. This would be supported by a recent study showing the success of a dietary intervention in reducing the deterioration in glucose metabolism in obese pregnant women (10).

While pregnancy may represent an ideal opportunity to initiate lifestyle changes (11), most interventions in pregnancy have not been overly successful (12). Barriers to physical activity (i.e., pregnancy symptoms, child care responsibilities, work commitments) (13) are difficult to address. While this intervention was feasible and prompted a modest increase in physical activity, there is no evidence to suggest that it would be sufficient to prevent GDM.

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