THE ROLE OF EXERCISE IN THE MANAGEMENT OF GESTATIONAL DIABETES

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Abstract

Gestational diabetes is defined as carbohydrate intolerance of any degree with onset or first recognition during pregnancy. Gestational diabetes requires treatment with dietary changes and exercise and/or insulin injections to keep maternal blood glucose levels as close to normal as possible and to prevent complications in both mother and baby. Women with gestational diabetes often need regular, moderate physical activity, such as walking, prenatal aerobics class, or swimming. Moderate physical activity is an important part of any healthy pregnancy. Regular moderately physical exercise is advised, although there is no consensus on the specific structure of exercise programs for gestational diabetes. Several epidemiological studies have suggested a robust link between physical activity and reduced risk of gestational diabetes; however, researchers have been unable to suggest a cost-effective, easily accessible, evidence-based program with guidelines for frequency, intensity, duration, and type of activity to prevent the incidence of gestational diabetes in sedentary, at-risk populations. The Finnish Diabetes Prevention Study Group and the Diabetes Prevention Program demonstrated that aggressive lifestyle management involving nutrition therapy and daily exercise can reduce the onset of type 2 diabetes by nearly 60% as compared with the rates in a nonintervention control group of patients with impaired glucose tolerance, including, but not limited to, patients with previous gestational diabetes.

Key words*: gestational diabetes, physical activity, diabetes prevention*

Introduction

Gestational diabetes is defined as carbohydrate intolerance of any degree with onset or first recognition during pregnancy (1). This definition does not preclude the possibility that diabetes antedated conception, but remained unrecognized until medical visits during pregnancy. Diagnosis of gestational diabetes is important to identify both infants at risk of adverse outcomes and women at risk of subsequent development of diabetes. The frequency of gestational diabetes depends on both the population studied and the diagnostic criteria used, resulting in a range of prevalence between 1% and 14% (2).

The procedures used to screen pregnant women and the diagnostic criteria are disputed. In 1964, O'Sullivan and Mahan (3) evaluated pregnant women with a 3-hour oral glucose tolerance test with 100 g of glucose.

In the years that followed, the "O'Sullivan and Mahan" criteria became widely accepted for the diagnosis of gestational diabetes. In 1982, Carpenter and Coustan (4) revised the diagnostic criteria. In much of the world, however, a 75 g 2-hour oral glucose tolerance test is administered, and gestational diabetes is diagnosed according to World Health Organization (WHO) criteria for the diagnosis of diabetes outside of pregnancy (5). Performance of either the 75 g 2-hour or the 100 g 3-hour oral glucose tolerance test evaluates the fasting glucose level and the value at 1 and 2 hours after the glucose load and the 100 g test includes an additional glucose assessment at 3 hours. Normal values based on Carpenter and Coustan criteria include a fasting plasma glucose level of 95 mg/dL or less, 1 hour, 180 mg/dl or less, 2 hour, 155 mg/dl or less, and for the 100 g load 3 hour, 140 mg/dl or less (6).

Risk assessment should occur at the first prenatal visit. Women with multiple risk factors, thus those at high risk, should undergo screening procedures as soon as feasible. If their glucose tolerance is normal early in pregnancy, testing should be repeated between 24 and 28 weeks of gestation, the interval recommended for women at moderate risk. Although universal screening of women for gestational diabetes was previously recommended, a series of identifying factors place a woman at lower risk for this complication of pregnancy. These factors include age younger than 25 years, normal body weight, absence of a first-degree relative with diabetes, no history of abnormal glucose metabolism or poor obstetric outcome, and not being of a racial or ethnic group with a high prevalence of diabetes. If a woman meets all of these criteria, testing for glucose intolerance during pregnancy may be discretionary.

Screening of women between 24 and 28 weeks of gestation with a plasma or serum glucose level obtained 1 hour following a 50 g glucose load (glucose load test), administered at any time of day without regard to the time since the last meal, has become a well validated and widely applied screening procedure. A value of 140 mg/dl or higher identifies 80% of women with gestational diabetes, and a value of 130 mg/dl or higher increases sensitivity to 90% (7).

Management of gestational diabetes

Glycemic targets: current American Diabetes Association (ADA) recommendations are to maintain fasting blood glucose levels lower than 95 mg/dl, 1-hour postprandial levels lower than 140 mg/dl, and/or 2-hour postprandial levels lower than 120 mg/dl (8).

Gestational diabetes requires treatment with dietary changes and exercise and/or insulin injections to keep maternal blood glucose levels as close to normal as possible and to prevent complications in both mother and baby. Women with gestational diabetes are also encouraged to self-test their blood glucose levels often.

Any diet needs to provide sufficient calories for pregnancy, typically 2000 - 2500 kcal with the exclusion of simple carbohydrates. A starting plan may provide about 30 kcal per kilogram of actual body weight for the woman who has ideal body weight, 40 kcal/kg for the woman who is less than 80% of ideal body weight, 25 kcal/kg for

the woman who is 120% to 150% of ideal body weight, and limited to as low as 12 kcal/kg for the patient who is over 150% ideal body weight (9).

Women with gestational diabetes often need regular, moderate physical activity, such as walking, prenatal aerobics class, or swimming. Moderate physical activity is an important part of any healthy pregnancy. Regular moderately physical exercise is advised, although there is no consensus on the specific structure of exercise programs for gestational diabetes. Several epidemiological studies have suggested a robust link between physical activity and reduced risk of gestational diabetes; however, researchers have been unable to suggest a cost-effective, easily accessible, evidence-based program with guidelines for frequency, intensity, duration, and type of activity to prevent the incidence of gestational diabetes in sedentary, at-risk populations (10). The American College of Obstetricians and Gynecologists recommends that women with low-risk pregnancies participate in moderate-intensity exercise during their pregnancy. Currently, only 15.1% of pregnant women exercise at the recommended levels, which is significantly lower than the general population's 45%. The American College of Obstetricians and Gynecologists currently recommends 30 minutes or more of moderate exercise per day on most days of the week during pregnancy in the absence of medical or obstetric complications. The evidence indicates that exercise during pregnancy is safe and perhaps even reduces the risk of preeclampsia and gestational diabetes (11).

Three observational studies (12, 13, 14) and several small studies (15, 16, 17) support the thesis that recreational physical activity performed before and/or during pregnancy modifies the risk of gestational diabetes. . Using a population-based birth registry, Dye et al. (12) reported that maternal exercise during pregnancy was associated with a 47 percent reduction in risk of gestational diabetes among obese women. Solomon et al. (13) noted that participants in the Nurses' Health Study II who engaged in vigorous activity or brisk walking prior to pregnancy were less likely to develop gestational diabetes mellitus, although these associations were not statistically significant. In OMEGA study (14) the authors examined the relation between recreational physical activity before and during pregnancy and risk of gestational diabetes, the metabolic and dietary predictors of preeclampsia and other pregnancy outcomes in a prospective cohort study. 909 normotensive, nondiabetic women were questioned during early gestation about physical activity performed during the year before and 7 days prior to the interview during pregnancy. Compared with inactive women, women who participated in any physical activity during the year before experienced a 56% risk reduction. Women spending ≥4.2 hours/week engaged in physical activity experienced a 76% reduction in gestational diabetes mellitus risk and those expending ≥21.1 metabolic equivalent-hours/week experienced a 74% reduction compared with inactive women. Physical activity during pregnancy was also associated with reductions in gestational diabetes risk. Women who engaged in physical activity during both time periods experienced a 69% reduced risk. Reductions in mean total cholesterol were also observed for women with the highest levels of time performing

physical activity, energy expenditure, and peak intensity. Linear relations were observed across levels of physical activity measures for triglyceride and total cholesterol. No association was found between physical activity and high density lipoprotein cholesterol. Findings suggest that efforts to increase maternal physical activity may contribute to substantial reductions in gestational diabetes risk and may attenuate pregnancy-associated dyslipidemia.

About 50% of women initially treated with diet alone will require additional therapy, and insulin therapy usually is recommended. Insulin management must be individualized, but most pregnant women require about 0.7 units/kg daily, divided into three doses. As in nonpregnant women, about two thirds of the insulin is administered in the morning and one third is administered in the evening, with a 1:2 ratio of short- to intermediate- (or long-) acting insulin. Insulin requirements increase by about 50% from 20 to 24 weeks to around 30 to 32 weeks of gestation, at which time insulin needs often stabilize.

Postpartum

In most cases, the glucose intolerance that first arises during pregnancy resolves immediately post partum, and insulin, if required during pregnancy, is no longer required. Women with elevated values should present for early postpartum glucose tolerance testing. Otherwise, a 75-g glucose tolerance test performed about 2 months post partum will identify women with persistent diabetes or impaired glucose tolerance. If glucose levels are elevated, insulin therapy is indicated in the lactating woman, as oral agents may be excreted in the breast milk. Because about 50% of women who have had gestational diabetes will go on to develop diabetes over the next 20 years, an evaluation of glycemia should occur annually.

Given the high risk of future type 2 diabetes in these patients, they would be well served with interventions that delay or prevent diabetes. In 2007 International Federation of Diabetes (IDF) has published a consensus of type 2 diabetes prevention. IDF strategy focuses on risk factors control in general population and in persons at risk of diabetes. IDF prevention program comprises of 3 stages: identifying persons at risk for developing diabetes, risk assessment and preventive measures. The strategy of identifying the persons at risk for diabetes made use of a questionnaire including family history of diabetes, age, diagnosis of gestational diabetes or cardiovascular disease, long standing smoking, chronic glcucorticoid use, thyroid hormones, beta-adrenergic antagonists, antipsychotic medication, alpha interferon. Preventive means reccommended are lifestyle improvement by caloric intake decrease, intensify of physical effort and medical therapy. If lifestyle changes do not lead to weight loss or improvement of glycemia, metformin is associated in patients with BMI > 30 kg/m2 and glycemia > 110 mg/dl in the absence of contraindications (18).

The Finnish Diabetes Prevention Study Group (19) and the Diabetes Prevention Program (20) demonstrated that aggressive lifestyle management involving nutrition therapy and daily exercise can reduce the onset of type 2 diabetes by nearly 60% as compared with the rates in a nonintervention control group of patients with impaired

glucose tolerance, including, but not limited to, patients with previous gestational diabetes.

Use of medications has also been demonstrated to reduce the risk of future diabetes in high-risk populations. However, lifestyle management of diet and exercise offers the most favorable reduction in progression to diabetes and has no risk of adverse effects that can be associated with medical therapies. These data support the importance of insurance coverage for postpartum nutrition and exercise counseling and monitoring of metabolic status in women who have had gestational diabetes.

Conclusions

Moderate physical activity is an important part of any healthy pregnancy. The evidence indicates that exercise during pregnancy is safe and perhaps even reduces the risk of preeclampsia and gestational diabetes.

Women with gestational diabetes often need regular, moderate physical activity, such as walking, prenatal aerobics class, or swimming, to help control blood sugar levels (in the absence of medical or obstetric complications).

Researchers are uncertain about the amount of physical activity that best helps a woman with gestational diabetes to control her blood sugar.

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