Point: Yes, It Is Necessary to Rely Entirely on Glycemic Values for the Insulin Treatment of All Gestational Diabetic Women

The goal of therapy for gestational diabetic women is to have the outcome of pregnancy as perfect as possible. Therapeutic decisions should be designed to decrease the morbidity and mortality for the mother and the fetus. Until there is a proven test to identify the pregnancies at risk for untoward outcome, then all women with gestational diabetes mellitus (GDM) need to perform self—blood glucose monitoring to guide the treatment decisions about insulin therapy.

Maternal mortality is no longer an issue given the levels of control achieved in most healthcare settings; however, maternal morbidity is still at a higher rate if the pregnancy is terminated by cesarean section. Thus, our treatment goals also need to be directed toward decreasing the cesarean section rate. Unfortunately, the mere label of “gestational diabetes” has increased the cesarean section rate (2). However, when the criteria for performing a cesarean section have been based solely on fetal size and degree of maternal hyperglycemia (3), the cesarean section rate has been brought down to that seen in the general population.

The literature also supports the opinion that there is a need to rely on maternal glucose levels in order to achieve the best outcome for the infant. Langer et al. (4) tested the hypothesis that stringent glycemic control, verified glucose data, adherence to an established criterion for insulin initiation, and achievement of near normoglycemia resulted in the reduction of adverse outcomes. Their intensified management group had rates of macrosomia, cesarean section, metabolic complications, shoulder dystocia, stillbirth, neonatal intensive care unit days, and respiratory complications that were lower than the rates in a group of GDM women not intensely managed and that were comparable with the rates of their nondiabetic control subjects. The authors concluded that intensified management based on patient-monitored blood glucose levels and treatment based on these blood glucose determinations is associated with enhanced perinatal outcome. Thus, their management strategy clarifies the relation between glycemic control and neonatal outcome.

Subsequently, it has been shown that maternal postprandial glucose (1 h after beginning the meal) is positively related to neonatal birth weight (r = −0.72, P < 0.05) in pregnancies complicated by diabetes (5–7). Jovanovic et al. (5) first showed in 1991 that 1-h postprandial glucose levels are positively correlated with risk of macrosomia in pregnancies complicated by type 1 diabetes. In addition, they showed that the risk of macrosomia increased rapidly when the peak postprandial response was >120 mg/dl. Then a year later, Combs et al. (6) confirmed this finding, also in pregnancies complicated by type 1 diabetes, although they reported that the threshold for increased risk for macrosomia was a 1-h greater than 130 mg/dl. Subsequently, de Veciana et al. (7) performed the first randomized trial to observe the outcome when postprandial glucose levels were monitored and used for treatment in gestational diabetic women and compared with the outcome of pregnancies complicated by gestational diabetes when women only measured their premeal glucose level. They showed that treating the postprandial glucose level (targeting therapy to achieve a 1-h postmeal glucose level of <120 mg/dl) decreased the macrosomia rate to near that of a normal population (or ~12%), as opposed to the macrosomia rate of 43% (a rate similar to the reported rates in untreated diabetic women) in the offspring of the mothers who did not monitor their postprandial glucose level.

Others have argued that as long as the blood glucose level is measured after eating, then the issue of 1 versus 2 h may not be critical. Moses et al. (8) compared the outcome of 166 pregnancies complicated by GDM in women who tested 1-h postprandially with a target glucose level of <144 mg/dl (8.0 mmol/l) to the outcome of pregnancies of 101 GDM women who tested 2-h postprandially with a target glucose of <126 mg/dl (7.0 mmol/l). Therapy was adjusted to maintain the blood glucose below the targets, as defined by the group assignment. There were no significant demographic differences between these two groups. The neonatal birth weight, percentage of women requiring insulin, and total daily dose of insulin were similar in both groups. They concluded that for women with GDM, monitoring either 1-h or 2-h postprandially led to similar outcomes. This would suggest that women could choose the most convenient time for their postprandial monitoring.

An example of the need for glucose monitoring to guide therapeutic decisions for all pregnant women is found in the report by Bevier et al. (9). In their study, it was shown that even treating minor elevations of maternal glucose improves the outcome. They studied 103 women who had a positive glucose challenge test but a negative glucose tolerance test, and the women were randomly assigned to either experimental or control groups with the experimental women receiving dietary counseling and self—blood glucose monitoring. Glycosylated hemoglobin was significantly higher in the control women, and birth weight expressed in grams or as percentile specific for sex, ethnicity, and gestational age was significantly higher in the control infants. The cesarean section rate was also higher in the control women.

Measurement of maternal glucose to guide therapy is also cost effective. Based on the hypothesis that untreated elevated glucose levels result in an increasing prevalence of macrosomia, Jovanovic et al. (3) designed a study to observe the impact on birth weight and on cost of a treatment.
program for glucose-intolerant pregnant women in the Santa Barbara County Health Care Services. In 1985, 18% of 4,364 births were greater than the 90th percentile birth weight, and the cesarean section rate was 30% of the total births. In 1986, they began a program to treat all glucose-intolerant pregnant women who had a positive glucose challenge test (GCT >140 mg/dl after a 50-g oral glucose load), even if they had a negative glucose tolerance test (one or none of the results above the cutoffs after a 100-g glucose load). All glucose-intolerant pregnant women were placed on a 40% carbohydrate diet (1,800 kcal) and were taught to monitor their capillary whole-blood glucose. Insulin was begun if the fasting was >90 mg/dl and/or the 1-h was >120 mg/dl. By 1990, the macrosomia rate had dropped to 7% and the cesarean section rate dropped to 20%. The cost to Santa Barbara County to educate and treat the additional glucose-intolerant women was $233,650. Assuming that without this program there would have been an additional 398 macrosomic infants with some requiring cesarean delivery and intensive neonatal care, total potential savings could be estimated at $833,870 per year.

Kitzmiller et al. (10) also showed that intensive care, defined as self-blood glucose monitoring with insulin therapy decisions based on the glucose concentrations, results in a cost-savings with their analysis of care for GDM. Reimbursed average charges in the Northern California managed care market in 1996 were used to establish the direct costs, and the direct costs were then applied to the elements of care and pregnancy outcomes of three GDM management programs in Northern California, Southern California, and New England using prospectively collected data. Most striking was their report of the utility of postprandial glucose monitoring for the care of insulin-requiring gestational diabetic women. Incremental cost-effectiveness of postprandial monitoring in the Southern California controlled trial was $35 per patient in input costs per cesarean section averted and $25 per patient in input costs per neonatal intensive care unit day prevented. The benefit-to-cost ratio of the difference in input and outcome costs was 2.98 in favor of postprandial monitoring in the Southern California study.

Thus, intensive care as defined as pre- and postprandial glucose monitoring in all gestational diabetic women is cost effective. Decisions concerning the need for insulin therapy should be based on the success or lack of success in achieving blood glucose targets despite optimal dietary intervention. Thus, the answer to the question of whether it is necessary to rely entirely on glycemic values for the insulin treatment of all gestational diabetic women is definitely "Yes!"

LOIS JOVANOVIC, MD

From Sansum Medical Research Institute, Santa Barbara, California.

Address correspondence to Lois Jovanovic, MD, Sansum Medical Research Institute, 2219 Bath St., Santa Barbara, CA 93105. E-mail: ljovanovic@sansum.org.

References


