**Background and Objective**

In women with pregestational diabetes (type 1 or 2), hyperglycemia during labor and delivery is an important factor in the development of neonatal hypoglycemia. Previous studies show that strict intrapartum glycemic control reduces the rate of neonatal hypoglycemia and use of insulin infusions is therefore recommended. However, no generally accepted recommendations exist for women with gestational diabetes mellitus (GDM), given a lack of clinical studies on this topic.

A study was designed and conducted to evaluate: (1) metabolic control achieved during labor using a new protocol; (2) the effect on intrapartum glycemic control of treatment during gestation and other maternal factors; and (3) the relationship between maternal factors during pregnancy and labor and the risk for neonatal hypoglycemia.

**Materials and Methods**

A prospective observational study was conducted at Hospital del Mar, Barcelona, Spain, from October 2006 through March 2009. All women admitted to our institution for delivery who were diagnosed with GDM were invited to participate.

Patients who made <3 follow-up visits were classified as having no endocrinologic follow-up (NEF-GDM). NEF-GDM women were those who did not complete their scheduled visits or were included at >36 weeks of gestational age.

A new protocol designed for GDM patients was applied upon arrival at the obstetric ward. We established 7.22 mmol/L as the upper limit for target maternal capillary blood glucose (CBG). CBG and capillary blood ketonemia were measured every 2 hours. A CBG >7.22 mmol/L insulin drip was started and CBG was checked hourly. Management of the newborn included early feeding and CBG measurements at birth and at 1, 2, 4, 8, 12, 18, and 24 hours thereafter.

Parameters analyzed were: (1) metabolic control during labor, characterized by mean maternal CBG, maternal delivery CBG, number of women with any CBG >7.22 mmol/L, need for insulin treatment (and dosage), hypoglycemic episodes, and presence of ketosis, including mean ketonemia and time to normalization; (2) treatment received during pregnancy: dietary alone, diet plus insulin, or NEF-GDM; (3) intrapartum glycemic control: any maternal CBG >7.22 mmol/L vs no reading >7.22 mmol/L; and (4) neonatal hypoglycemia, defined as any CBG <2.22 mmol/L during the first 24 hours of life.

**Results**

The analysis included 129 mothers and 127 newborns. No differences in maternal and delivery characteristics were observed between study groups.

Itrapartum maternal CBG was kept within the desired range (3.3–7.2 mmol/L) in 86% of the women (Table). A CBG ≥7.22 mmol/L was detected in 18 women (14%); only 5 had a CBG >10 mmol/L, without any associated ketosis. Insulin was initiated in 12 of the 18 women, but rapid progression of delivery in the remaining 6 cases precluded insulin treatment. Patients who received insulin required an average of 1.7 ± 1.0 IU/h. Ketosis development was independent of labor duration and occurred in 15.8% of patients with mean ketonemia of 1.25 ± 0.28 mmol/L. It resolved in an average of 2.6 ± 0.7 hours. The mean glucose dosage was 6.7 ± 1.2 g/h.

No differences were observed between dietary and insulin treatment of GDM.
patients in the degree of intrapartum metabolic control achieved. Nevertheless, NEF-GDM women were more likely to have CBG >7.22 mmol/L (P = .04). In a bivariate analysis including other maternal variables, only glycated hemoglobin level was related to higher intrapartum maternal CBG (P = .02).

During the first 24 hours of life, 15 newborns presented at least 1 CBG reading <2.22 mmol/L. Only 2 newborns presented 2 hypoglycemic episodes and required admission to the neonatal intensive care unit. All hypoglycemic events occurred in the first 4 hours of life. In a bivariate analysis, development of neonatal hypoglycemia was not related to mean intrapartum CBG or to maternal CBG ≥7.22 mmol/L. Of the other maternal variables studied, only insulin therapy during pregnancy was related to the development of neonatal hypoglycemia (35% vs 10%; P = .02).

**COMMENT**

Intrapartum metabolic control in patients with GDM does not require insulin infusions in the majority of cases and is not correlated with the treatment established during pregnancy but rather with third-trimester glycated hemoglobin levels and with lack of endocrinologic follow-up. Development of neonatal hypoglycemia is not influenced by intrapartum glycemic control but is associated with insulin use in pregnancy.

This study offers a number of significant findings. GDM patients do not require intensive monitoring and treatment of intrapartum glycemia, as in the case of patients with pregestational diabetes. The results confirm the lack of relationship between treatment received during pregnancy and degree of intrapartum glycemic control. Common practice, as summarized by the Fifth International Workshop Conference on Gestational Diabetes Mellitus, has been to monitor and treat only GDM patients who received insulin treatment during pregnancy. In light of our findings, this practice does not seem appropriate.

While the type of treatment followed during gestation does not affect intrapartum glycemic control, we found that noncompliance with endocrinologic follow-up is related to higher glycemia levels during labor. This lack of follow-up compliance could reflect worse glycemic control during pregnancy as well, not reflected in glycated hemoglobin levels, which could in turn result in higher glycemia levels during labor.

A further important finding is the lack of correlation between intrapartum glycemia and the development of neonatal hypoglycemia, an especially frequent problem in babies born to mothers with diabetes. Our results indicate that neonatal hypoglycemia in babies born to women with GDM is associated with the need for insulin treatment during pregnancy and therefore seems to be correlated better with hyperglycemia during gestation than with hyperglycemia in labor.

Further studies will be required to establish the optimal glycemic target during labor that is associated with the best perinatal outcome.

**CLINICAL IMPLICATION**

- The results of the present study contribute to better understanding of the labor process in women with gestational diabetes mellitus and therefore to the development of clinical guidelines for intrapartum metabolic management of these women.