Evaluation of an Education Intervention in Hispanic Women at Risk for Gestational Diabetes Mellitus

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Experts estimate that 1–14% of pregnant women in the United States will develop gestational diabetes mellitus (GDM) (1). Women with a history of GDM have a 60–70% chance of developing the metabolic disorder with a subsequent pregnancy (2). Among women with GDM, it is well established that risk of adverse pregnancy outcomes such as fetal macrosomia are associated with less than optimal blood glucose control during pregnancy (2). Health care providers must promote access to medical/obstetrical care, proper treatment, and optimal GDM diabetes self-management education (DSME). GDM occurs more frequently in women of certain ethnic groups (e.g., Hispanic/Latino American), who are also at higher risk for recurrent GDM (3). In fact, GDM is increasing among U.S. women with various racial/ethnic backgrounds, including Hispanic women (4,5).

Our aim was to develop, implement, and evaluate a culturally sensitive education intervention for Hispanic women at risk for GDM within our existing CenteringPregnancy (CP) model at a University of Kentucky prenatal clinic. The CP model provides prenatal care encompassing three components: health assessment, education, and support services (6). The program is composed of 10 prenatal care sessions offered in a small-group setting once monthly for 4 months and then twice monthly for the remainder of the pregnancy. Women who participate in CP group prenatal care have been reported to have improved birth outcomes compared to women who receive traditional prenatal care (7,8).

EMPOWR Study Analysis

Efforts to Maximize Perinatal Outcomes in Women at Risk (EMPOWR) is an ongoing research study that utilizes the evidence-based CP model. Before 20 weeks' gestation, specialized CP care is offered for Medicaid or Medicaid-eligible patients.

Evidence-based interventions throughout prenatal care for patients within the diabetes/obesity arm of the EMPOWR protocol include, but are not limited to: *1*) baseline intensive review of nutrition in pregnancy, with emphasis on individual-appropriate weight gain goals; *2*) discussion of dietary recommendations/restrictions; *3*) detailed educational materials presented in group or individual sessions with a certified diabetes educator (CDE); *4*) intensive review of glycemic control, with individualized recommendations for dietary/activity alterations to improve the glycemic profile; and *5*) discussion of potential complications associated with diabetes and obesity in the perinatal period and beyond (9,10).

A gap analysis identified the need for ongoing, cost-effective, culturally sensitive materials for GDM DSME that aligned with the CP program topics. Materials such as those from National Diabetes Information

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DOI: 10.2337/diaspect.29.2.115

Clearinghouse, which were in the public domain, reviewed by experts, available in both English and Spanish, and cost-effective, were identified for use by the registered nurse CDE. A team of internal stakeholders approved the DSME materials for use in the CP setting. The DSME component of CP was developed and implemented to educate Hispanic women diagnosed with GDM about the importance of attaining optimal glycemic control during pregnancy and to prevent macrosomia.

Methods

As part of the EMPOWR protocol, a pilot study was conducted to develop, implement, and evaluate an education intervention for Hispanic women at risk for GDM within the existing CP model. This study was approved by the University of Kentucky Institutional Review Board, and each patient signed an approved consent form to enter the program.

Setting

Participants receiving services at a university-affiliated, high-risk prenatal clinic directed by the university's Department of Maternal-Fetal Medicine were included in the pilot study. The prenatal clinic provides care for women who are pregnant with a condition that puts the mother, fetus, or both at a higher-than-normal risk for pregnancy-related complications. Women who are likely to have a high-risk pregnancy include those who have preexisting diabetes or GDM and those who have had any complications such as preeclampsia, GDM, preterm labor, or early delivery in previous pregnancies.

Four obstetricians/perinatologists who specialize in high-risk maternal-fetal medicine serve as providers for the clinic. An advanced-practice registered nurse who is also a certified nurse midwife provides prenatal care and is a trained facilitator for the CP program. The nurse is also certified as an oral interpreter and is fluent in English and Spanish.

Population

Inclusion criteria included participants in the EMPOWR study who *1*) were at <20 weeks' gestation upon entry to the group (required for entry to the CP program); *2*) gave informed consent to participate; *3*) were of Hispanic descent; and *4*) attended at least 5 of the 10 CP sessions. Forty-one women were eligible for inclusion in the pilot study. Because GDM is typically diagnosed at 24–28 weeks' gestation, the pilot study intervention targeted Hispanic women who were referred to the CP group as being high risk for GDM.

All patients in the intervention group (n = 15) received basic education from a nurse educator about risk factors for GDM, general nutrition, and safe exercise based on current American College of Obstetricians and Gynecologists (ACOG) recommendations (11). Only the women in the group who were diagnosed with GDM received the full DSME curriculum with counseling provided by a registered dietitian (for medical nutrition therapy [MNT]) and by a nurse educator. For women diagnosed with GDM, topics including nutrition, exercise, breastfeeding, labor and delivery, and postpartum care were discussed in more detail relative to GDM. Self-monitoring of blood glucose records were downloaded at each session and discussed. The curriculum content for patients at risk for GDM and those diagnosed with GDM in the CP model aligned with the American Diabetes Association's National Standards for Diabetes Self-Management Education and Support (Table 1) (9).

The control group (n = 26) comprised Hispanic women at higher risk for GDM who entered the CP program during identical months of the previous calendar year. High-risk women in the control group did not receive the basic education from the nurse educator about risk factors for GDM, general nutrition, and safe exercise. Women diagnosed with GDM in the control group were referred for GDM-related services and did not return to their respective CP groups.

Hispanic women who were smokers were excluded from this evaluation because of the association between smoking and low birth weights (12). Smoking status was determined based on preset urine cotinine limits. A urine cotinine level of <99 ng/mL was used to classify women who did not smoke during pregnancy; women with cotinine levels ≥100 ng/mL were classified as smokers (13). One patient in the control group had a cotinine level >100 ng/mL and was excluded from this analysis; no women in the intervention group were confirmed as smokers. Hispanic women in the program spoke Spanish as a primary language; therefore, an interpreter certified in oral interpretation was present during all patient-provider interactions, including DSME.

Data Collection

Data were collected at three time points: maternal demographic characteristics and history of GDM were collected at baseline (first prenatal visit); birth outcomes data were collected via retrospective chart review after delivery; and patient satisfaction data were collected from women who had completed at least five sessions by session 7, 8, or 9. Demographic data reported were age, BMI, married/partnered status, and history of GDM/macrosomia at baseline (first prenatal visit).

Outcomes Measures

Birth outcomes, including neonatal birth weight, mode of delivery, and gestational age were collected for all study participants via retrospective chart review. Neonatal birth weight was reported in grams; mode of delivery was characterized as cesarean section versus spontaneous vaginal delivery; and gestational age was reported in weeks from estimated date of delivery. A macrosomic neonate was defined as >4,000 g (14,15).

Patient satisfaction rates were evaluated in the intervention group. A

TABLE 1. Curriculum Content Based on the American Diabetes Association's National Standards for Diabetes Self-Management Education and Support[a]: Patients at Risk for GDM or Diagnosed With GDM in the CP Model

Session Number (Gestational Week)	CP Curriculum[b]	At Risk for GDM/With GDM Curriculum[c]
1 (16)	Introduction to centering, nutrition, weight	*Disease Process* (GDM risk factors) *Nutrition/Lifestyle* (food diary, nutrition facts label, fast food/healthier choices) *Physical Activity/Lifestyle* (physical activity in pregnancy)
2 (20)	Body changes, common discomforts, HANDS	
3 (24)	Relaxation, dental issues, breastfeeding	*Monitoring/Interpreting Blood Glucose* (screening for GDM [1-hour, 50-g glucose load test])
4 (28)	Contraception, domestic violence, preterm labor	*Nutrition/Lifestyle* (MNT) *Physical Activity/Lifestyle* (effects on blood glucose) *Monitoring Blood Glucose* (SMBG)
5 (30)	Birth center tour	*Monitoring/Interpreting Blood Glucose* (upload/review of SMBG records)
6 (32)	Labor and delivery, when to go to hospital, pain relief options, preeclampsia	*Reducing Risks* (labor and delivery/GDM) *Monitoring/Interpreting Blood Glucose* (upload/review of SMBG records)
7 (34)	Infant care, car seat/crib safety	*Monitoring/Interpreting Blood Glucose* (upload/review of SMBG records) *Monitoring/Interpreting Other Parameters* (U/S and fetal weight)
8 (36)	Postpartum emotional adjustments, postpartum care, breastfeeding	*Personal Strategies to Promote Health* (breastfeeding after delivery, GDM) *Personal Strategies to Promote Health* (GDM with future pregnancies, type 2 diabetes risk) *Monitoring/Interpreting Blood Glucose* (upload/review of SMBG records)
9 (38)	Newborn safety, preparing for labor, stages of labor video	*Monitoring/Interpreting Blood Glucose* (upload/review of SMBG records)
10 (40)		*Disease Process/Psychosocial Issues* (GDM with future pregnancies, type 2 diabetes risk) *Monitoring/Interpreting Blood Glucose* (PP screening, upload/review of SMBG records) *Using Medications/Prevention of Acute Complications*[d] (prescribed drugs, hypoglycemia)

[a]*Ref. 9, Standard #6.*

[b]*All patients enter the program before 20 weeks' gestation.*

[c]*Italicized topics are aligned with ADA curriculum.*

[d]Using Medications/Prevention of Acute Complications *may be used at any time point if medication therapy is a necessary part of treatment.*

ADA, American Diabetes Association; HANDS, Health Access Nurturing Development Services; PP, postpartum; SMBG, self-monitoring of blood glucose; U/S, ultrasonography.

TABLE 2. Select Demographic and Clinical Variables for Hispanic Women With and Without GDM in the Intervention and Control Groups of the CP Model

Demographic and Clinical Variables[a]	Control Group (*n* = 25)			Intervention Group (*n* = 15)		
	With GDM[b] (*n* = 5)	Without GDM (*n* = 20)	Total Group	With GDM[b] (*n* = 1)	Without GDM (*n* = 14)	Total Group
Baseline[c]						
Age (years)	28.2 ± 6.7	28.2 ± 6.0	28.2 ± 6.0	27.0	26.6 ± 5.8	26.6 ± 5.6
BMI (kg/m^2)	30.0 ± 6.4	26.1 ± 3.2	26.8 ± 4.2	32.8	26.0 ± 3.3	25.6 ± 3.3
Married/partnered (%)	25	78	68	100	57	64
History GDM/ macrosomia (%)	20	0	4	0	7	47
Delivery						
Gestation (weeks)	38.3 ± 1.0	39.1 ± 1.2	39.0 ± 1.2	40.1	37.60 ± 4.6	38.0 ± 4.4
Infant birth weight (g)	3,280.0 ± 934.7	3,236.4 ± 527.3	3,244.2 ± 591.8	3,540.0	3,062.0 ± 819.7	3,105.4 ± 790.9
Cesarean section (%)	25	11	14	0	3	20

[a]*Numbers may vary due to missing data; data are expressed in mean ± SD unless otherwise specified.*
[b]*Diagnosed per ACOG two-step method for screening and diagnosis.*
[c]*Baseline data were determined at first prenatal visit.*

satisfaction survey in which participants rated 12 discussion topics as either "not helpful," "somewhat helpful," "very helpful," or "not discussed" was administered. Four questions regarding the group setting dynamics and preparation for labor and delivery were assessed with possible ratings of "disagree," "not sure," and "agree." Finally, a measurement of overall experience with the CP group care setting was assessed using a 1–5 scale rating, with 1 being the worst and 5 being the best. Qualitative feedback was also solicited. Comments written in Spanish were translated by an interpreter certified in written interpretation.

For the EMPOWR protocol, study data were collected and managed using REDCap (Research Electronic Data Capture) tools hosted at the University of Kentucky (16). REDCap is a secure, web-based application designed to support data capture for research studies, providing *1*) an intuitive interface for validated data entry; *2*) audit trails for tracking data manipulation and export procedures; *3*) automated export procedures for seamless data downloads to common statistical packages; and *4*) procedures for importing data from external sources.

Statistical Analysis

Descriptive statistics, including means and standard deviations (SDs) or frequency distributions, as appropriate, were used to summarize study variables. For between-group comparisons (intervention vs. control), a two-sample *t* test analysis evaluated differences in maternal age, maternal BMI, maternal weeks of gestation at birth, and neonatal birth weight. Because of the small sample sizes, a Fisher's exact test was used to determine associations between group (intervention or control) and partnered status, history of GDM/macrosomia, and mode of delivery. Data were also analyzed for women with GDM and women without GDM within the intervention and control groups. Frequency distributions were used to summarize patient satisfaction. Significance was set at $P<0.05$ for all results. SPSS version 22.0 (SPSS Corp., Chicago, Ill.) was used for analysis.

Results

Forty patients were included in this pilot study (control group, *n* = 25; intervention group, *n* = 15). Overall mean values for age, BMI, weeks of gestation, and infant birth weight were slightly higher for the control group; however, there were no significant differences between groups. There was no significant difference with respect to history of GDM with a previous pregnancy ($P<0.99$), married/partner status ($P = 0.27$), or mode of delivery (vaginal versus cesarean) ($P = 0.34$) between the control and intervention groups (Table 2). Because there was only one woman diagnosed with GDM in the intervention group, we were unable to assess the effect of the DSME component on outcomes such as birth weight and mode of delivery.

Patient satisfaction was assessed in the intervention group among women who completed at least five CP sessions (*n* = 11). Eight of the 11 (73%) completed the voluntary CP evaluation tool, with 86% of responses rating the discussion topics as "very helpful." Ninety-three percent of surveyed participants agreed that they liked the prenatal group format, were comfortable with their prenatal assessments in the group setting, and felt prepared for labor, birth, and parenting. On a scale of 1–5 for overall

CP group care, 87.5% (7/8) of women selected a 5 (best rating) and 12.5% (1/8) selected a 4.

Discussion

The interdisciplinary team was focused on providing care for women in the CP program who were at high risk for GDM. All patients in the intervention group received education from a nurse educator regarding the risk factors for GDM and general nutrition and exercise in pregnancy, including carbohydrate awareness and the metabolic benefits of exercise (e.g., improvement of glucose utilization and decrease in hepatic glucose output) (17). A question to consider in future research might be whether education focused on the risks for GDM, nutrition, and exercise before GDM screening lowers the rate of GDM diagnosis in Hispanic women at higher risk. However, in a multicenter, randomized, control trial, Poston et al. (18) found that behavioral intervention strategies of nutrition and physical activity in women who were obese during pregnancy was not adequate to prevent GDM or to lower the incidence of large-for-gestational-age infants.

An additional area for a future study would be an evaluation in a larger study population of gains in knowledge and changes in self-care behaviors resulting from patient education in women at risk for or diagnosed with GDM.

This study's interdisciplinary partnership with a faculty member in the Department of Dietetics and Human Nutrition provided expertise in clinical dietetics, outpatient nutrition services, and DSME. A potential for ongoing MNT support services exists using this model for all women at risk for or diagnosed with GDM.

We have experienced an increase in the number of Hispanic women who are primarily Spanish speakers within our prenatal clinic. Because of the higher risk for GDM in this population, employing a diabetes educator who is fluent in Spanish is an important consideration.

Study Limitations

This analysis was a pilot study conducted to develop, implement, and evaluate an education intervention for Hispanic women at risk for GDM within the existing CP model. The education intervention was limited to enrollees in three CP groups. All patients were screened for GDM; however, only one patient was diagnosed in the intervention group compared to five in the control group. Because of the small number of patients diagnosed with GDM in the education intervention group, more data are needed to evaluate the effect of the DSME component within the CP setting on clinical outcomes.

Conclusion

An education intervention for Hispanic women at risk for GDM that is aligned with the CP model was attained. The pilot study provided process data for development and limited implementation of a culturally sensitive GDM DSME component within the CP model setting. Generally, participants were pleased with the CP experience and indicated that they would recommend this method of prenatal care to other women. However, a larger evaluation to determine the effects of the education intervention, justify additional resources, and evaluate the impact of the program on clinical outcomes is warranted.

Acknowledgments

This project was supported by Funding Opportunity Number CMS-1D1-12-001 from the Centers for Medicare & Medicaid Services Center for Medicare & Medicaid Innovation.

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This project was managed using the REDCap database, made possible through the University of Kentucky Center for Clinical and Translational Science National Institutes of Health grant CTSA UL1TR000117.

Duality of Interest

No potential conflicts of interest relevant to this article were reported.

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