Postpartum Healthcare After Gestational Diabetes and Hypertension

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Abstract

Background: Gestational diabetes and hypertensive disorders of pregnancy identify women with an elevated lifetime risk of diabetes and cardiovascular disease.

Methods: Prospective cohort of women recruited from the postpartum service of a large community-based academic obstetrical hospital after delivery of a pregnancy complicated by gestational diabetes (GDM) or a hypertensive disorder of pregnancy (HDP). Interviews were conducted, and validated surveys completed, before hospital discharge and again 3 months postpartum.

Results: The study sample included 249 women: 111 with GDM, 127 with HDP, and 11 with both. Most, 230 (92.4%) had a PCP prior to pregnancy and 97 (39.0%) reported an office visit with their PCP during the prenatal period. Of the 176 (70.7%) participants who attended the 3-month study visit, 169 (96.0%) women with either diagnosis reported they had attended their 6-week postpartum visit. By the 3-month study visit, 51 (57.9%) women with GDM had completed follow-up glucose testing; 93 (97.9%) with HDP had follow-up blood pressure testing; and 101 (57.4%) with either diagnosis recalled ever having completed lipid screening. Women least likely to complete screening tests were those who had no college education, less than a high school level of health literacy, and who were not privately insured.

Conclusion: There are important opportunities to improve postpartum testing for diabetes and CVD risk factor assessment. Most women were connected to primary care suggesting a “hand-off” to a primary care physician after pregnancy is feasible. More robust strategies may be needed to improve follow-up care for women with less education, lower health literacy, and those without private health insurance.

Introduction

GESTATIONAL DIABETES (GDM) and the hypertensive disorders of pregnancy (HDP) each represent abnormal responses to the physiologic and metabolic challenges of pregnancy and serve to identify women who have an elevated risk of cardiovascular disease (CVD) later in life.^{1,2} Whether the increased risk of CVD is due to shared underlying risk factors, lasting consequences of the pregnancy, or a combination of the two, is not yet understood.^{3,4} The risk of type 2 diabetes mellitus among women who had GDM is known to begin soon after delivery, and eventually 35%–60% of affected women develop diabetes over the subsequent 10 to 20 years.^{5,6} Similarly, after a HDP there is a 4-fold increase in the risk of hypertension and a doubling of the risk of CVD over the lifetime.^{7–12} Though less is known about the early

trajectory of CVD risk after HDP, results from small cohort studies suggest hypertension may be diagnosed within 1–2 years of delivery, providing a rationale for follow-up care during the early postpartum years.^{13,14}

The identification of women who have had pregnancy complications presents an opportunity for early prevention;^{15–18} a history of GDM, preeclampsia, and pregnancy-induced hypertension are now considered to be CVD risk factors according to the 2011 American Heart Association recommendations.¹⁹ Though follow-up glucose testing is recommended after GDM for risk stratification, ongoing surveillance, lifestyle counseling, and in some cases medical treatment,²⁰ observational studies consistently show low rates of screening after delivery.^{21–25} Less is known about follow-up care for women after HDP, though evidence suggests gaps in CVD risk screening by both the obstetrician/gynecologist

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(ObGyn) and the primary care provider (PCP).²⁶ The result may be missed opportunities, limiting the potential effectiveness of preventive healthcare for this group of women.²⁰

An understanding of the current system of healthcare for women in this age group could be helpful in guiding future prevention strategies. This study sought to identify the characteristics of women at delivery that predict a lower likelihood of follow-up screening after pregnancy complications, and explore the potential role of the PCP in their healthcare during the postpartum period.

Materials and Methods

We studied a prospective cohort of women recruited from the postpartum service of a community-based academic obstetrical hospital 1–2 days following delivery of a live birth and prior to their hospital discharge. The hospital provides obstetrical delivery care for 85% of births in the mid Atlantic region and has a level 3 Neonatal Intensive Care Unit. Prenatal care is provided by both hospital-based and private practice clinicians. All potentially eligible women delivering on a Sunday through Thursday were identified through a daily inpatient census of patients on the postpartum floor. Women were eligible for this study if they were 18 years or older when they delivered, English speaking, and had been told by their provider that their pregnancy had been complicated by GDM, or a HDP, or chronic hypertension. The overall consent rate at recruitment among eligible women was 87%. Participants were compensated for their time and travel costs if they attended the 3-month follow-up visit. The study was approved by the Christiana Care Health System Institutional Review Board.

Data were collected during two study visits by a trained research assistant using a standard interview form and through the use of self-administered survey instruments. A baseline interview was conducted after obstetrical delivery and prior to hospital discharge. The follow-up interview was conducted 3–4 months postpartum.

This analysis included only women with a diagnosis of GDM, HDP, or both, as documented in the medical record for labor and delivery by trained nursing staff and medical providers. A diagnosis of GDM was assigned if that diagnosis was recorded in the record and there was no history of diabetes prior to pregnancy. A diagnosis of HDP was assigned if there was a clinical diagnosis of gestational hypertension, preeclampsia, or Hemolysis, Elevated Liver enzymes, Low Platelet count (HELLP) syndrome in the record. Providers in this community follow current American Congress of Obstetricians and Gynecologists guidelines for the diagnoses of these common pregnancy complications. Women with a history of chronic hypertension were excluded from this analysis because many had received this diagnosis prior to pregnancy and therefore were likely to have a PCP actively involved in their care.

Primary outcomes included self-reported attendance at the 6-week postpartum visit, completion of glucose tolerance testing if they had a pregnancy diagnosis of GDM, receipt of follow-up BP testing if they had HDP, and ever having had lipid screening for women with either diagnosis. Health-care related measures of interest included having a PCP who was not their ObGyn, receipt of medical care from their PCP during their pregnancy, and intrapartum and current treatment of diabetes or hypertension with medications.

Demographic characteristics collected included age at delivery, gravidity, parity, race, ethnicity, marital status, work status, completed education, and type of insurance coverage at the time of delivery. We included several validated survey instruments to explore psychosocial and educational dimensions potentially influencing follow-up care. Depressive symptoms were assessed using the Patient Health Questionnaire-2, a cut-off score of 2 or higher was used to indicate depressive symptoms.²⁷ Social support was measured using the Multi-Dimensional Scale of Perceived Social Support (MSPSS).²⁸ MSPSS scores are continuous measured in three areas: family, friends and significant others and range from 0 (no support) to 84 (most support). The Perceived Stress Scale was used to measure stress, with a continuous range of 0–40, with higher values indicating greater stress.^{29,30} The Rapid Estimate of Adult Literacy in Medicine, revised short form (REALM-SF) was used to assess health literacy. The REALM-SF uses a seven-word screening tool in which a score of four to six words correctly spoken indicates a reading level of seventh to eighth grade and a score of seven words correct indicates a high school reading level.³¹ Other covariates included gestational age at delivery, delivery method and prepregnancy body mass index indicating overweight (25–29.9 kg/m²) or obesity (≥ 30 kg/m²).

Summary statistics were used to describe the characteristics of the sample, social and behavioral measures, pregnancy outcomes, and receipt of healthcare. Independent samples *t*-tests and the Mann-Whitney U test were used for parametric and non-parametric data respectively. To identify potential bias created by drop-out for the 3-month follow-up visit, differences in the characteristics of the women who completed the 3-month follow-up interview were compared to those missing the visit using chi-squared test setting an alpha of $< .05$ to determine significance.

The standard error of sample proportion was calculated and used to provide the 95% confidence interval (CI). Bivariate logistic regression was used to identify independent predictors of completion of postpartum testing for diabetes and any cholesterol testing, using an alpha of < 0.05 to define significance. Those factors significantly associated with each outcome were entered into a multivariable logistic regression model using backward selection. Only those whose associations remained significant were included in the final models. Data were analyzed using STATA IC 13.0.

Results

We analyzed data for 249 women: 111 with GDM, 127 with HDP, and 11 with both GDM and HDP. A 3-month study visit was completed by 176 (70.7%) of the original cohort. Women with higher levels of education were more likely to return for the follow-up study visit ($p < 0.05$). Loss to follow-up did not result in significant differences in other demographic characteristics, obstetrical history, social or behavioral measures, pregnancy outcomes, or diagnosis group.

Because there were no significant differences in demographic or other characteristics of the women with GDM when compared to those with HDP, their combined results are presented in Table 1. On average women were 30.6 years of age, 172 (69.1%) were privately insured and 101 (40.6%) were first-time mothers; 107 (43%) reported theirs had been a planned pregnancy. Also shown in Table 1 are other

TABLE 1. CHARACTERISTICS OF THE COHORT AND PREGNANCY OUTCOMES AT DELIVERY, *N* = 249

<i>Demographic characteristics</i>	
Age, mean (SD)	30.6 (5.8)
Race, <i>n</i> (%)	
Caucasian	163 (65.5)
Black/African American	65 (26.1)
Asian	8 (3.2)
Mixed race	4 (1.6)
Ethnicity, <i>n</i> (%)	
Hispanic	24 (9.6)
Insurance, <i>n</i> (%)	
Private	172 (69.1)
Medicaid	75 (30.1)
Uninsured	2 (.8)
Work status, <i>n</i> (%)	
Currently working	21 (8.4)
On maternity leave, plans to return	149 (59.8)
Does not currently work	79 (31.7)
Education completed, <i>n</i> (%)	
High school diploma or less	114 (45.7)
2–4 year college degree or higher	127 (51.0)
Gravidity, mean (SD)	2.54 (1.36)
Parity, mean (SD)	1.90 (.99)
Primiparous, <i>n</i> (%)	101 (40.6)
Prepregnancy BMI, <i>n</i> (%)	
Underweight or normal weight	75 (30.5)
Overweight	61 (24.7)
Obese	110 (44.7)
<i>Social/behavioral measures</i>	
Stress score, mean, SD	13.0 (6.6)
Depressive symptoms, <i>n</i> (%)	42 (16.9)
Health literacy, <i>n</i> (%)	
7th–8th grade (score 4–6)	21 (8.9)
High school level (score 7)	215 (91.1)
Social support score, mean (SD)	74.2 (12.9)
<i>Pregnancy outcome</i>	
Pregnancy complication	
Hypertensive disorder of pregnancy	111 (44.6)
Gestational diabetes	127 (51.0)
Both	11 (4.4)
Gestational age, weeks, mean (SD)	38.4 (1.8)
Delivery method, <i>n</i> (%)	
Vaginal	121 (48.6)
Cesarean delivery	128 (51.4)

BMI, body mass index; SD, standard deviation.

demographic characteristics, obstetrical history, social and behavioral measures, and pregnancy outcomes.

Most women, 230 (92.4%), reported having a PCP prior to their pregnancy who was not their ObGyn, and 97 (38.9%) reported attending a visit with their PCP during their recent pregnancy.

During pregnancy, 15 (10.9%) of the women with GDM had been prescribed insulin, 33 (23.9%) an oral medication, and 5 (3.6%) both insulin and an oral medication. Among women with HDP, 19 (15.6%) had been prescribed an anti-

hypertensive medication during pregnancy. A recommendation to seek follow-up care after delivery from a PCP was reported by 92 (66.7%) of women with GDM, and 68 (55.7%) women after HDP prior to their hospital discharge; these differences were marginally significant ($p=0.07$).

Table 2 details elements of healthcare during the 3 months following delivery, indicating 168 (95.4%) reported attendance at a 6-week post-partum visit with their ObGyn and 37 (21.0%) an office visit with their PCP. Among women with GDM, 63 of 88 (71.5%) recalled having follow-up glucose testing ordered by their provider, with 2 (3.2%) reporting it had been ordered by their PCP. At the time of the follow-up study visit, 51 (57.9%) of women with GDM reported having completed their follow-up testing, 81% of those for whom testing was recommended. Of those with HDP, 93 (97.9%) reported follow-up BP testing postpartum. Among women with either complication, 143 (57.4%) reported having ever completed lipid testing: 127 (88.8%) prior to their pregnancy and 16 (11.2%) since their delivery. At 3 months, none of the women were being treated for diabetes, but 17 (17.9%) women were prescribed medication for hypertension.

Follow-up testing for diabetes was more likely to be completed by women who were privately insured ($p<0.01$), college educated ($p<0.05$), married ($p<0.01$), or had a REALM score consistent with at least a high school level of health literacy ($p<0.05$). There were no significant associations with other characteristics including age, race, employment, stress score, depressive symptoms, social support, having a PCP prior to pregnancy, or mode of delivery. Multivariable logistic regression suggested having private health insurance (aOR=5.0; 95% CI, 1.6–14.9) and least a high school level of health literacy (aOR=13.2; 95% CI, 1.5–120.2) were independently associated with improved odds of completing follow-up glucose testing.

Lipid screening was equally likely for women with GDM or HDP. Women were more likely to report ever having

TABLE 2. HEALTHCARE SINCE DELIVERY REPORTED BY THE 176 (70.7%) WOMEN WHO ATTENDED THE THREE-MONTH STUDY VISIT

	<i>n</i>	% (95% CI)
Attended 6-week postpartum visit	168	95.4 (92.4–98.5)
Additional healthcare received	88	50.0 (42.6–57.4)
3 months postpartum		
Obstetrician/gynecologist	29	16.5 (11.0–22.0)
Primary care provider	37	21.0 (15.0–27.0)
Emergency room visit	9	5.1 (1.9–8.4)
Hospital readmission	5	2.8 (.4–5.3)
Other	31	17.6 (12.0–23.2)
Ever had cholesterol testing	101	57.4 (50.1–64.7)
Gestational diabetes mellitus (<i>n</i> =88)		
Post-partum glucose testing	51	57.9 (47.6–68.3)
Medication for diabetes prescribed	0	—
Hypertensive disorder of pregnancy (<i>n</i> =95)		
Post-partum blood pressure testing	93	97.9 (95.0–100)
Medication for hypertension prescribed	17	17.9 (10.2–25.6)

95% CI, 95% confidence interval.

completed cholesterol testing if they were 30 years or older ($p < 0.01$), college educated ($p < 0.001$), employed at the time of the 3 month visit ($p < 0.05$) or had private health insurance ($p < 0.001$). There were no significant associations with other characteristics including race, marital status, REALM score, stress score, depressive symptoms, social support, having a PCP prior to pregnancy, or mode of delivery. The small ($n = 37$) group of women who reported a visit with their PCP since their delivery had a greater odds of ever having had their cholesterol measured (OR = 2.8; 95% CI, 1.2–6.4) than women who did not. Multivariable logistic regression estimates again suggested being college educated (aOR = 2.0; 95% CI, 1.04–4.1) or having private health insurance (aOR = 2.6; 95% CI, 1.1–5.7) were significantly associated with the self-report of ever having completed lipid testing.

Discussion

We found 92.4% of women with pregnancies complicated by GDM or HDP had an established PCP prior to their pregnancy and 39.0% reported attending an office visit with their PCP during pregnancy. While attendance at the 6-week postpartum visit with their ObGyn was completed by 96%, only 21.0% saw their PCP during the first 3 months following their delivery. At 3 months postpartum, 41.1% of women with GDM had not yet completed recommending screening for diabetes, and a similar percentage (42.6%) of all subjects reported never having had their lipids measured. Having more than a high school education and private health insurance independently predicted completion of these evidence-based screening measures recommended by current guidelines.

The epidemiologic evidence is clear that women with adverse pregnancy complications, including GDM and HDP, have an elevated risk of future diabetes and CVD when compared with women who have had a healthy pregnancy. However, approaches to ensuring follow-up have not yet been established.^{21,24,32} In contrast to earlier work suggesting that women of reproductive age are more likely to receive preventive care from their ObGyn and less likely to identify a PCP,³³ we found a majority of women who experienced pregnancy complications reported having a PCP prior to their pregnancy. This observation suggests that incorporating PCPs into follow-up care may be a successful strategy.

The rate of completion of follow-up glucose testing we observed among women with GDM fell well within the range previously been reported in other settings.²⁵ The requirement that women attend a follow-up study visit led to a somewhat selected population, however completion of cholesterol screening for CVD risk factor stratification was lower than the 63.2% overall rate in the United States among 18–44 year olds as measured by Behavioral Risk Factor Surveillance System.³⁴ Like earlier studies, we identified characteristics of the women associated with completion of postpartum surveillance and screening tests after GDM which reflect with social determinants of health, specifically having private health insurance and greater education.³⁵ These findings provide a mechanism through which social determinants of health may be related to receipt of evidence-based CVD preventive care, and support a tailoring of interventions to meet the needs of less educated populations to improve health equity.³⁶ In contrast, we found no evidence to suggest an influence of psychosocial factors including depression, stress, or social support.

This study has several important limitations. The small sample size may have limited our ability to detect associations of important contributing factors. In addition, we studied women living in a single region and therefore the findings may not be generalizable. The short duration of follow-up may have underestimated the extent to which screening occurs in the obstetrics or primary care settings, however a recent systematic review suggested that most women who do complete postpartum testing after GDM do so within the first 3 months of delivery.²⁵ Though there were few differences in the characteristics of those for whom we had follow-up information at a 3-month study visit, our findings may reflect the patterns of a population more adherent to medical care. Finally, our reliance on documentation in the medical record and subject confirmation of the diagnosis of GDM or HDP could have led to a more adherent group of providers and patients.

This study extends prior work in two areas. First, our study of a diverse population of women at a large community-based hospital confirmed that receipt of evidence-based screening was more likely for those who were college educated or privately insured. In addition, we found a majority of women were connected to primary care prior to their pregnancy, suggesting a hand-off from the ObGyn to the PCP may be an effective strategy to ensuring attention to CVD prevention postpartum.

In summary, women who have had GDM or HDP are now recognized to be a high-risk group for CVD, yet the challenges of ensuring both short-term and long-term follow-up care and risk factor management remain. Pregnancy and the post-partum period present important opportunities for healthcare providers to address risk factors for future heart disease for all women, but it is of particular importance to women who have had an adverse pregnancy outcome. Our finding that affected women were connected to primary care suggests a coordinated “handoff” to a PCP after pregnancy is feasible and might facilitate an earlier focus on prevention. In addition, more robust strategies may be needed to improve follow-up care for women with less education, lower health literacy, and who are not privately insured. Future healthcare models should work to incorporate reproductive health and obstetrical outcomes into comprehensive preventive healthcare for women.³⁷

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Disclosure Statement

No competing financial interests exist.

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