Relationship Between 1-Hour Glucose Challenge Test Results and Perinatal Outcomes

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Abstract

Objective—To estimate the relationship between 1-hour 50 gm glucose challenge test (GCT) values and perinatal outcomes.

Methods—This was a secondary analysis of data from a multicenter treatment trial of mild gestational diabetes mellitus (GDM). Women with GCT 135199 mg/dL completed a 3-hour oral glucose tolerance test (OGTT). Mild GDM was defined as fasting glucose less than 95 mg/dL and two or more abnormal OGTT values: 1-hour 180 mg/dL or more; 2-hour 155 mg/dL or more; 3-hour 140 mg/dL or more. Our study included untreated women with GCT 135–139 mg/dL, GCT 140–199 mg/dL, and a comparison group with GCT less than 120 mg/dL. Primary outcomes included a perinatal composite (stillbirth, neonatal death, hypoglycemia, hyperbilirubinemia, neonatal hyperinsulinemia, and birth trauma), large for gestational age (LGA, birth weight above

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the 90th percentile based on gender and race specific norms) and macrosomia (greater than 4,000gm).

Results—There were 436 women with GCT less than120 mg/dL and 1,403 with GCT 135 mg/dL or more (GCT 135–139, n=135; 140–199, n=1,268). The composite perinatal outcome occurred in 25.6% of those with GCT less than 120 mg/dL compared with 21.1% for GCT 135–139 mg/dL, and 35.3% for GCT 140–199 mg/dL. Rates of LGA by group were 6.6%, 6.8% and 12.4%, respectively. Rates of macrosomia by group were 7.8%, 6.1% and 12.1%, respectively. Compared with GCT less than 120 mg/dL, the adjusted odds ratios (OR) (95% confidence intervals [CI]) for GCT values of 140–199 mg/dL were 1.48 (1.14–1.93) for the composite outcome, 1.97 (1.29–3.11) for LGA, and 1.61(1.07–2.49) for macrosomia. For GCT values 135–139 mg/dL, adjusted ORs and 95% CIs were 0.75 (0.45–1.21), 1.04 (0.44–2.24) and 0.75 (0.30–1.66), respectively. The subcategories with GCT values 140–144 mg/dL and 145–149 mg/dL were also associated with an increase in selected outcomes when compared with those with GCT less than 120 mg/dL.

Conclusions—Glucose challenge test values of 135–139 mg/dL were not associated with adverse outcomes compared with GCT less than 120 mg/dL; however, GCT values 140 mg/dL or more were associated with an increase in odds of the composite perinatal outcome, LGA and macrosomia.

INTRODUCTION

Gestational diabetes mellitus (GDM), defined as glucose intolerance with onset during pregnancy, affects between 2% and 14% of all gravid women.[1, 2] Pregnancies complicated by GDM are associated with increased perinatal and maternal morbidity. Fetal risks include macrosomia, shoulder dystocia, birth injuries, hypoglycemia, and potential long term sequelae such as obesity, and impaired intellectual achievement.[3, 4, 5] Maternal risks include preeclampsia, operative delivery and subsequent diabetes mellitus.[6, 7]

Despite an association with adverse outcomes, optimal screening and diagnostic criteria for GDM, including the use of a one-step or two-step strategy, remain controversial.[8, 9] In the two-step diagnostic strategy, a 1-hour 50 gm glucose challenge test (GCT) screen cutoff value of 140 mg/dL identifies 80% of women with GDM diagnosed after a 3-hour 100 gm oral glucose tolerance test (OGTT), whereas a value of 130 mg/dL identifies 90% of GDM.[10] However, the yield of each GCT cutoff varies with the criteria applied to the diagnostic OGTT. The Fourth International Workshop Conference on Gestational Diabetes Mellitus and the American College of Obstetricians and Gynecologists suggest that either 1-hour 50 gram screening threshold is acceptable.[1, 10] Relating screening GCT results to actual perinatal outcomes may help identify the optimal threshold for a positive screen result. We conducted this study to estimate the association between GCT results and perinatal outcomes.

METHODS AND MATERIALS

This cohort study is a secondary analysis of data from a subgroup of women enrolled in a multicenter clinical trial of mild GDM. [11] In the primary study, women whose blood glucose

concentration was between 135 mg/dL and 199 mg/dL one hour after a 50 gm GCT (at 24 weeks to 30 weeks of gestation) were invited to participate. Eligible women completed a 3-hour OGTT. Mild GDM was defined as fasting glucose less than 95 mg/dL and two or more abnormal timed OGTT values: 1-hour 180 mg/dL or more; 2-hour 155 mg/dL or more; 3-hour 140 mg/dL or more. Women were then randomized to either treatment with nutritional counseling, diet modification, and insulin if required, or usual prenatal care. A cohort of women who had a positive GCT but a normal OGTT and matched one-to-one with the randomized cohort with respect to clinical center, race or ethnicity, and body mass index (BMI) was also followed as part of the usual prenatal care group to allow blinding. A third group of women with normal GCT (less than 120 mg/dL) and matched one-to-one to the untreated group with respect to clinical center, race or ethnicity, and BMI was also enrolled as an observational cohort. The current analysis consists of untreated women with GCT values of 135–139 mg/dL and 140–199 mg/dL (with untreated mild GDM or no GDM) and those with normal GCT less than 120 mg/dL. Women with mild GDM who received treatment were excluded from this analysis. The GCT category 140–199 mg/dL was further stratified into categories of 10-unit increments for comparisons. The lower GCT range was further subdivided by 5-unit increments (135–139 mg/dL, 140–144 mg/dL, 145–149 mg/dL) We separated out the 135–139 mg/dL category since 135 mg/dL and 140 mg/dL are used alternatively as screen-positive GCT cutoffs in different settings.

Study outcomes included 1) a perinatal composite adverse outcome comprising stillbirth, neonatal death, hypoglycemia, hyperbilirubinemia, neonatal hyperinsulinemia and birth trauma, 2) large for gestational age (LGA), defined as birth weight above the 90th percentile based on gender and race specific norms, and 3) macrosomia, defined as birthweight greater than 4000 gm.[12] Neonatal mortality was defined as death before hospital discharge or aged 30 days if still hospitalized. Hypoglycemia was defined as glucose less than 35 mg/dl by heel stick within 2 hours of birth and before the first nonbreastfed feeding. Hyperinsulinemia was defined as C-peptide from cord blood greater than 95th percentile, as determined from another unselected obstetric population of women in the Maternal-Fetal Medicine Units (MFMU) network. Birth trauma was defined as Erb's palsy, clavicular, humerus or skull fracture.

Categorical variables were analyzed using the chi-square test or Fisher exact test. Continuous variables were analyzed using the Wilcoxon rank sum test or the Kruskal-Wallis test. The incidence of the study outcomes was computed for each category of GCT: less than 120 mg/dL, 135–139 mg/dL, 140–199 mg/dL (and subcategories in additional analyses), and logistic regression was used in multivariable analysis to estimate the independent associations between the GCT categories of 135–139 mg/dL and 140–199 mg/dL to GCT less than 120 mg/dL. Potential confounders adjusted for included gestational age at delivery, self-reported race or ethnicity, smoking status, maternal age, baseline BMI, parity, and gestational age at enrollment. Potential confounders were chosen for their known association with gestational diabetes or are frequently adjusted for in other studies. Adjusted odds ratios (ORs) and 95% confidence intervals (CIs) were computed relative to the GCT less than 120 mg/dL category. The Cochran-Armitage test for trend was used to compare the incidence of study outcome by increasing GCT categories. The test for trend was based on a linear trend.

Where relevant, *P*<.05 was considered statistically significant; no adjustments were made for multiple comparisons. The primary study was approved by the Institutional Review Board at each participating center and the biostatistical coordinating center. Analyses were performed with SAS statistical software (SAS Institute Inc, Cary NC).

RESULTS

A total of 1,889 women were enrolled in the primary study and an additional 436 controls with GCT less than 120 mg/dL were enrolled for comparison; 485 women with mild GDM were assigned to the study treatment and were thus not included in this secondary analysis. Data were available for 436 in the comparison group (GCT less than 120 mg/dL) and 1,403 with GCT 135–199 mg/dL and either untreated mild GDM or no GDM (GCT of 135–139 mg/dL, n=135; 140–199 mg/dL, n=1,268). The baseline characteristics by GCT category are shown in Table 1. Women in different GCT categories differed significantly by age, race or ethnicity, smoking status, mean gestational age at randomization and, as expected, by mean glucose level.

Among five stillbirths in the study cohort, two were observed in the group with GCT less than 120 mg/dL, none in the 135–139 mg/dL group, and three in the 140–199 mg/dL group. All 13 infants with birth trauma were born to women in the GCT 140–199 mg/dL group. The study outcomes by main GCT categories are presented in Table 2. The composite perinatal outcome occurred in 25.6% of those with GCT less than 120 mg/dL compared to 21.1% for GCT 135–139 mg/dL, and 35.3% for GCT 140–199 mg/dL. Rates of LGA by group were 6.6%, 6.8% and 12.4%, respectively. Rates of macrosomia by group were 7.8%, 6.1% and 12.1%, respectively. The unadjusted and adjusted ORs (95% CI) relative to the GCT less than 120 mg/dL category are presented in Table 3. GCT category 140–199 mg/dL, but not GCT 135–139 mg/dL, was associated with an increase (approximately 50%) in the composite adverse outcome. Among the individual components of the composite, the strongest association was with hyperinsulinemia. Similar findings by GCT category were noted for LGA and macrosomia (nearly 2-fold and 1.6-fold association with GCT 140–199 mg/dL, respectively). The results were unchanged after adjusting for differences in baseline characteristics (Table 3).

Results from women with GCT in the range of 140–199 mg/dL further stratified by 10-unit increments are presented in Table 4. Rates of the perinatal composite outcome, LGA and macrosomia increased with increasing GCT category (*P* for trend test <.01for the primary composite outcome and LGA and *P*=.03 for macrosomia). The subgroup 160–169 mg/dL shows a nonsignificant adjusted OR for LGA and macrosomia. In general, the unadjusted and adjusted results for GCT subcategories within 140–199 mg/dL are consistent with an increase in the perinatal composite (up to 1.6-fold), LGA (up to 2.5-fold) and macrosomia (up to 2.9-fold). Results from the lower end of available GCT data stratified by 5-unit increments (135–139 mg/dL, 140–144 mg/dL and 145–149 mg/dL) compared to those with GCT <120mg/dL are presented in Table 5. The smaller categories at 140 mg/dL and above remained associated with perinatal outcomes.

Perinatal outcomes by presence or absence of GDM are presented in Table 6. The risk of the primary composite outcome, LGA and macrosomia among those with no GDM and GDM and GCT 135–139 mg/dL was 20.4% and 23.3% (*P*=.73), 4.9% and 13.3% (*P*=.12) and 3.9% and 13.3% (*P*= .08), respectively. The risk of the primary composite outcome, LGA and macrosomia among those with no GDM and GDM and GCT 140–199 mg/dL was 33.8% and 38.1% (*P*=.14), 11.2% and 14.7% (*P*=.08) and 11.0% and 14.4% (*P*= .08), respectively. However, when all women with GCT 135–199 mg/dL were considered without stratification by GCT category, the risk of LGA (14.6% compared with 10.5%, *P*=.03) and macrosomia (14.4% compared with 10.2%, *P*=.02), but not the composite outcome (37.1% compared with 32.9%, *P*=.08), differed significantly for women with GDM compared with those without GDM, respectively.

DISCUSSION

Overall, the risks of the primary perinatal composite outcome, LGA and macrosomia increased with increasing GCT values. Importantly, GCT values of 135–139 mg/dL were not associated with adverse outcomes compared with GCT less than 120 mg/dL; however, values of 140 mg/dL and above were associated with a 1.5-fold, 2.0-fold, and 1.6-fold increase in odds of the composite perinatal adverse outcome, LGA and macrosomia respectively. Specifically, selected outcomes remained higher in women with GCT values of 140–144 mg/dL and 145–149 mg/dL compared with GCT less than 120 mg/dL. As expected, selected outcomes for patients with GDM differed from those without GDM, albeit without statistical significance within GCT subcategories (likely due to the smaller numbers).

Two retrospective analyses have examined the screening GCT results in relation to perinatal outcomes. In one cohort study, 176 women with GCT 135 mg/dL or more but normal OGTT by the Fourth International Workshop-Conference on Gestational Diabetes Mellitus criteria (fasting 95 mg/dL or more, 1-hour 180 mg/dL or more; 2-hour 155 mg/dL or more; 3-hour 140 mg/dL or more) had an incidence of macrosomia of 11.9% compared with an incidence of 6.4% among 1,854 women who had normal screening GCT values less than 135 mg/dL (relative risk =1.99, *P*=.009).[13] In the second retrospective cohort study, 164 patients with an GCT 135 mg/dL or more but normal OGTT by the National Diabetes Data Group Criteria (fasting 100 mg/dL or more, 1-hour 190 mg/dL or more, 2-hour 165 mg/dL or more, and 3-hour 145 mg/dL or more) had increased risk (OR 5.96, 95% CI 1.310.32) of adverse perinatal composite outcome including fetal macrosomia, antenatal death, shoulder dystocia, chorioamnionitis, preeclampsia, intensive care nursery admission, and postpartum endometritis when compared with 1,661 with a normal GCT less than 135 mg/dL.[14] These two studies however, did not define subcategories of GCT for comparison in order to assess alternative screen-positive cutoffs.[13,14] The results of our study involving women with milder GDM are consistent but further suggest that the increased risk associated with GCT may be limited to those with values 140 mg/dL and above. Importantly, this secondary analysis is a unique opportunity to observe the natural progression of perinatal outcomes in untreated women with and without mild GDM.

Our study is limited by the lack of pregnant women with GCT values between 121–134 mg/dL and 200 mg/dL or more. This does not allow for evaluation of the continuous GCT in the upper or lower ranges. This study also included a select group of pregnant women with mild GDM since those women with elevated fasting glucose (greater than 95 mg/dL) were excluded. These women likely have more severe GDM that may confer a greater risk for adverse perinatal outcomes. Additionally, these cases may also be more likely to occur among those with higher GCT values thereby strengthening the associations we report. Inclusion of such patients with the full spectrum of GDM in future studies may help validate and better quantify the strength of the association between perinatal outcomes and different subcategories of GCT. This study also lacks long-term data on the risk of GDM. Future research on long-term outcomes such as childhood obesity and impaired intellectual achievements with different GCT cutoffs may be useful. The adjusted OR for GCT categories greater than 160 mg/dL (Table 4) lacked statistical significance. This may be explained by the low number of patients in these groups and corresponding low power for statistical comparisons. However, the Cochran-Armitage test of trend revealed an overall increase in both the primary composite outcome and LGA with increasing GCT value. The results are also limited by the use of a composite outcome whose individual outcomes have varying clinical significance. This is a common critique of composite outcomes but this composite was also used in the primary study and we provide additional data on other outcomes. Finally, we may not have sufficient power to clearly delineate differences between the GCT 135–139 mg/dL category and the normal category (less than 120 mg/dL). The point estimates however, suggest that GCT 135–139 mg/dL is unlikely to be associated with increased adverse outcomes.

Screening and diagnostic criteria for GDM constitute a rapidly evolving topic. While the two-step process (1-hour 50 gm load and 3-hour 100 gm OGTT) is currently applied in the United States, the World Health Organization and several European countries have advocated the use of the single step 2-hour 75 gm OGTT for the diagnosis of GDM.[1,15,16,17] In January 2011, the American Diabetes Association in response to the proposal of the International Association of Diabetes and Pregnancy Study Groups, adopted new guidelines for the diagnosis of GDM.[18,19] These guidelines advocate use of the 2-hour 75g OGTT without a preceding screening test, but they have not been adopted by the American College of Obstetricians and Gynecologists. When the two-step strategy is used, the optimal screen positive cutoff remains controversial and values of 130 mg/dL, 135 mg/dL and 140 mg/dL have been variously advocated based solely on test characteristics for predicting a diagnosis of GDM using the 3-hour OGTT as the gold standard.[1,10] Therefore, our prospectively collected data from a well-characterized trial cohort, including untreated pregnant women with mild GDM, adds an important dimension: information about the ultimate effect of these cutoffs on pregnancy outcomes. These data suggest that GCT values less than 139 mg/dL may not be associated with immediate adverse pregnancy outcomes. A positive screen threshold of 140 mg/dL or more may be reasonable and perhaps more cost-effective than lower thresholds. A related analysis of our source cohort also suggests that GCT values 135142 mg/dL also carry an equivalent risk of GDM.[20] Therefore, in settings where the two-step diagnosis of GDM remains prevalent, larger studies involving the full range of GCT

categories are needed to validate our findings. Care must be taken to consider the attenuating effects of treatment for GDM in such studies.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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Table 1

Characteristics of the Study Population by Glucose Challenge Test Categories.

Characteristic	Glucose Challenge Test Categories			
	Less than 120 mg/dL (n=436)	135–139 mg/dL (n=135)	140–199 mg/dL (n=1,268)	P
Age, y	24 [21–29]	28 [24–32]	28 [24–32]	<0.001
Primiparous	162(37.2%)	39(28.9%)	425(33.5%)	0.162
Race or ethnic group				<0.001
Black	56(12.8%)	27(20.0%)	142(11.2%)	
White	118(27.1%)	46(34.1%)	319(25.2%)	
Hispanic	255(58.5%)	58(43.0%)	750(59.2%)	
Other	7(1.6%)	4(3.0%)	57(4.5%)	
Smoking	34(7.8%)	20(14.8%)	95(7.5%)	0.012
Alcohol use	13(3.0%)	6(4.4%)	43(3.4%)	0.711
Body mass index at entry, kg/m^2	29.1 [26.1–32.5]	29.5 [26.3–33.3]	29.7 [26.7–32.8]	0.215
Glucose level after 50-g glucose challenge test, mg/dL	100 [86–109]	137 [136–138]	154 [145–165]	<0.001
Duration of gestation at enrollment, wk	29.6 [28.3–30.4]	29 [28–29.7]	28.7 [27.6–30.0]	<0.001

Data are n (%) or median [interquartile range] unless otherwise specified.

Table 2

Incidence of the Study Outcomes by Main Glucose Challenge Test Categories.

Outcome Variable	Glucose Challenge Test Categories		
	Less than 120 mg/dL (n=436)	135–139 mg/dL (n=135)	140–199 mg/dL (n=1,268)
Composite	104/406 (25.6%)	27/128 (21.1%)	415/1175 (35.3%)
Hypoglycemia	44/337 (13.1%)	11/109 (10.1%)	164/963 (17.0%)
Hyperbilirubinemia	39/396 (9.9%)	7/127 (5.5%)	131/1125 (11.6%)
Hyperinsulinemia	44/364 (12.1%)	10/116 (8.6%)	201/1046 (19.2%)
Large for gestational age	28/422 (6.6%)	9/132 (6.8%)	152/1227 (12.4%)
Macrosomia	33/422 (7.8%)	8/132 (6.1%)	149/1227 (12.1%)

Data are no./total (%).

Table 3

Main 1-Hour Glucose Challenge Test Categories and Perinatal Outcomes

Outcome Variable	Glucose Challenge Test Categories			
	135–139 mg/dL		140–199 mg/dL	
	Unadjusted Odds Ratio (95%CI)	Adjusted Odds Ratio (95%CI)	Unadjusted Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)
Composite	0.78 (0.48–1.25)	0.75 (0.45–1.21)	1.59 (1.23–2.04)	1.48 (1.14,1.93)
Hypoglycemia	0.75 (0.37–1.50)	0.75 (0.35–1.49)	1.37 (0.96–1.96)	1.38 (0.95–2.02)
Hyperbilirubinemia	0.53 (0.23–1.23)	0.51 (0.20–1.11)	1.21 (0.83–1.76)	1.12 (0.76–1.67)
Hyperinsulinemia	0.69 (0.33–1.41)	0.64 (0.29–1.29)	1.73 (1.22–2.46)	1.57 (1.09–2.28)
Large for gestational age	1.03 (0.47–2.24)	1.04 (0.44–2.24)	1.99 (1.31–3.03)	1.97 (1.29–3.11)
Macrosomia	0.76 (0.34–1.69)	0.75 (0.30–1.66)	1.63 (1.10–2.42)	1.61 (1.07–2.49)

CI, confidence interval.

Glucose challenge test less than 120 mg/dL as the referent. Adjusted for gestational age at delivery, race, sex, smoking status, maternal age, maternal body mass index at enrollment, parity, and gestational age at enrollment.

Table 4

Perinatal Outcomes by Increasing 1-Hour Glucose Challenge Test Categories Relative to Glucose Challenge Test Less Than 120 mg/dL Group.

Category	Composite Outcome Unadjusted OR (95% CI)	Composite Outcome Adjusted OR (95% CI)	LGA Unadjusted OR (95% CI)	LGA Adjusted OR (95% CI)	Macrosomia Unadjusted OR (95% CI)	Macrosomia Adjusted OR (95% CI)
135–139 mg/dL (n=126)	0.78 (0.48, 1.25)	0.75 (0.45, 1.21)	1.03 (0.47, 2.24)	1.04 (0.44, 2.24)	0.76 (0.34, 1.69)	0.75 (0.30, 1.66)
140–149 mg/dL (n=447)	1.51 (1.12, 2.03)	1.38 (1.01, 1.90)	2.11 (1.32, 3.38)	2.07 (1.26, 3.46)	1.77 (1.13, 2.77)	1.74 (1.07, 2.87)
150–159 mg/dL (n=310)	1.57 (1.14, 2.17)	1.47 (1.04, 2.07)	2.05 (1.24, 3.40)	2.23 (1.31, 3.87)	1.53 (0.93, 2.51)	1.61 (0.94, 2.77)
160–169 mg/dL (n=185)	1.54 (1.05, 2.24)	1.36 (0.91, 2.03)	1.49 (0.81, 2.73)	1.55 (0.80, 2.99)	1.39 (0.78, 2.47)	1.39 (0.73, 2.62)
170–179 mg/dL (n=137)	2.07 (1.38, 3.11)	1.75 (1.12, 2.71)	2.17 (1.17, 4.03)	2.00 (0.99, 3.98)	1.60 (0.86, 2.98)	1.58 (0.77, 3.15)
180–189 mg/dL (n=65)	1.20 (0.67, 2.14)	1.03 (0.54, 1.88)	1.67 (0.70, 3.99)	1.94 (0.71, 4.84)	1.40 (0.59, 3.31)	1.72 (0.63, 4.22)
190–199 mg/dL (n=31)	2.10 (0.99, 4.43)	1.66 (0.75, 3.59)	2.71 (0.97, 7.59)	2.54 (0.76, 7.32)	2.83 (1.08, 7.38)	2.99 (0.97, 8.34)

OR, odds ratio; CI, confidence interval; LGA, large for gestational age.

Adjusted for gestational age at delivery, race, sex, smoking status, maternal age, maternal body mass index at enrollment, parity, and gestational age at enrollment.

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Table 5

Perinatal Outcomes by Increasing (5 mg/dL Increments) 1-Hour Glucose Challenge Test Categories Relative to Glucose Challenge Test Less Than 120 mg/dL Group.

Category	Composite Outcome Unadjusted OR (95% CI)	Composite Outcome Adjusted OR (95% CI)	LGA Unadjusted OR (95% CI)	LGA Adjusted OR (95% CI)	Macrosomia Unadjusted OR (95% CI)	Macrosomia Adjusted OR (95% CI)
135–139 mg/dL (n=126)	0.78 (0.48, 1.25)	0.75 (0.45, 1.21)	1.03 (0.47, 2.24)	1.04 (0.44, 2.24)	0.76 (0.34, 1.69)	0.75 (0.30, 1.66)
140–144 mg/dL (n=256)	1.37 (0.97, 1.93)	1.24 (0.86, 1.79)	1.76 (1.03, 3.02)	1.81 (1.01, 3.27)	1.42 (0.84, 2.40)	1.44 (0.80, 2.58)
145–149 mg/dL (n=191)	1.72 (1.19, 2.48)	1.58 (1.07, 2.33)	2.63 (1.53, 4.52)	2.54 (1.42, 4.59)	2.29 (1.36, 3.84)	2.25 (1.26, 4.02)

OR, odds ratio; CI, confidence interval; LGA, large for gestational age.

Adjusted for gestational age at delivery, race, sex, smoking status, maternal age, maternal body mass index at enrollment, parity, and gestational age at enrollment.

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Table 6

Perinatal Outcomes by Presence or Absence of Gestational Diabetes Mellitus.

Glucose Challenge Test Range and Outcomes	GDM	No GDM	P
135–139 mg/dL			
Primary outcome	30 (23.3%)	98 (20.4%)	0.73
LGA	30 (13.3%)	102 (4.9%)	0.12
Macrosomia	30 (13.3%)	102 (3.9%)	0.08
140–199 mg/dL			
Primary outcome	409 (38.1%)	766 (33.8%)	0.14
LGA	423 (14.7%)	804 (11.2%)	0.08
Macrosomia	423 (14.4%)	804 (11.0%)	0.08
135–199 mg/dL			
Primary outcome	439 (37.1%)	864 (32.3%)	0.08
LGA	453 (14.6%)	906 (10.5%)	0.03
Macrosomia	453 (14.4%)	906 (10.2%)	0.02

GDM, gestational diabetes mellitus; LGA, large for gestational age.

Data are n (%) unless otherwise specified.