Gestational Diabetes in Rhode Island

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Gestational diabetes mellitus (GDM) is a condition characterized by the onset or first recognition of glucose intolerance during pregnancy. In the United States there was a consistent increase in GDM prevalence of 46%-95% between the years 1990-2002.[1] Gestational diabetes occurs in approximately 7% of pregnancies, resulting in more than 200,000 cases each year, although the prevalence varies by population based on risk factors and diagnostic criteria. [2]

Gestational diabetes increases the chances of maternal and perinatal health complications during pregnancy. The unborn child or newborn is at risk for macrosomia, injuries at birth such as bone fractures and nerve palsies, hypoglycemia, shoulder dystocia, and respiratory distress syndrome. Maternal risks associated with GDM include hypertensive disorders, hyperbilirubinemia and preterm births. In order to reduce the complications of GDM, mothers are more likely to undergo cesarean section.[3]

In addition to the increased risk of adverse pregnancy outcomes, GDM may also lead to other serious long-term consequences. Among mothers with GDM, 5% to 10% develop type 2 diabetes immediately after the pregnancy. In the following 10 to 20 years after pregnancy, the risk of developing type 2 diabetes significantly increases to a range of 35% to 60%.[4] Children born to mothers affected by GDM are more likely to have impaired glucose tolerance, obesity and impairment in neurobehavioral development.[5-7]

The symptoms of GDM are often overlooked, and therefore undergoing screening is very important in determining whether an expectant mother has GDM. Early detection allows the expectant mother to take the necessary precautions to manage the condition. There is evidence that the management of GDM reduces birth-related complications and future health risks.[4]

Certain populations are more prone to developing GDM than others. Risk factors include having GDM with a previous pregnancy, having delivered a newborn over 9 pounds, being overweight or obese, being age 25 or older, being

Table 1. PRAMS Phase 6 (2009–2010) population characteristics of women by diagnosis of GDM

	Women with self-reported GDM 12.3%, n = 313	Women without self-reported GDM 87.7%, n = 2233	Adjusted OR (95% CI) of self-reported GDM
Age (%)			
<20 years	5.0 (13)	8.8 (192)	—
20-24 years	10.7 (28)	21.6 (445)	—
25-29	32.3 (95)	28.1 (609)	—
30-34	28.7 (102)	24.7 (568)	—
≥35	23.3 (83)	16.8 (411)	—
Level of education (%)			
< High school	15.7 (45)	14.3 (290)	1.76 (1.11-2.79)
High school graduate	28.7 (73)	29.0 (552)	1.35 (0.94-1.94)
>High school graduate	55.6 (179)	56.7 (1211)	1.00
Ethnicity (%)			
Hispanic	24.7 (83)	22.5 (493)	1.34 (0.96-1.88)
Not Hispanic	75.3 (232)	77.5 (1684)	1.00
Race (%)			
White	63.3 (186)	65.1 (1349)	1.00
Black	5.7 (18)	7.2 (171)	0.91 (0.50-1.66)
Asian	5.8 (23)	3.5 (90)	1.82 (0.97-3.40)
Others	25.2 (80)	24.2 (539)	1.30 (0.92-1.85)
Income level (%)			
<$50,000	64.0 (178)	57.8 (1174)	1.00
≥$50,000	36.0 (117)	42.2 (869)	0.54 (0.39-0.74)
Medicaid Status (%)			
No	52.6 (172)	51.7 (1165)	1.00
Yes	47.4 (149)	48.3 (1053)	1.33 (0.97-1.83)
Previous live birth (%)			
None	38.3 (128)	46.5 (1085)	1.00
≥ 1	61.7 (191)	53.5 (1123)	1.18 (0.88-1.59)
Weight gained during pregnancy (lbs)	28.1 ± 0.96	33.1 ± 0.34	-0.0032 (-0.0046-0.0018)
BMI (%)			
Underweight (<18.5)	3.4 (9)	3.6 (91)	1.91 (0.82-4.42)
Normal (19.5-24.9)	33.6 (102)	55.1 (1159)	1.00
Overweight (25.0-29.9)	30.5 (99)	25.1 (506)	2.00 (1.40-2.85)
Obese (≥30)	32.4 (99)	16.2 (365)	3.28 (2.28-4.72)

*Adjusted for age

treated for HIV, and having a family history of diabetes. There are also racial and ethnic disparities in gestational diabetes with African Americans, Hispanics, American Indian, Alaska Native, Native Hawaiian, or Pacific Islander having higher risks relative to white women.[8]

In this study, we examined the prevalence of gestational diabetes, risk factors and outcomes associated with gestational diabetes specific to Rhode Island using data from the Pregnancy Risk Assessment Monitoring System. Identifying risks, consequences and disparities specific to Rhode Island is important for tailoring interventions.

METHODS

The Pregnancy Risk Assessment Monitoring System (PRAMS) is a collaborative surveillance project of the Centers for Disease Control and Prevention (CDC) and 37 state health departments.[9] Data from 2009 and 2010 were collected from the ongoing, mixed-mode, cross sectional Rhode Island PRAMS survey. The survey was administered to mothers who recently gave birth to live-born infants, identified through the state's birth file. Information was collected on the attitudes and behaviors before the pregnancy, during the pregnancy and shortly after the pregnancy. Between 2009 and 2010, PRAMS collected data from a total of 2,576 mothers, yielding a 68.8% response rate. After removing observations with invalid information for GDM the final analytic sample consisted of 2,546 participants.

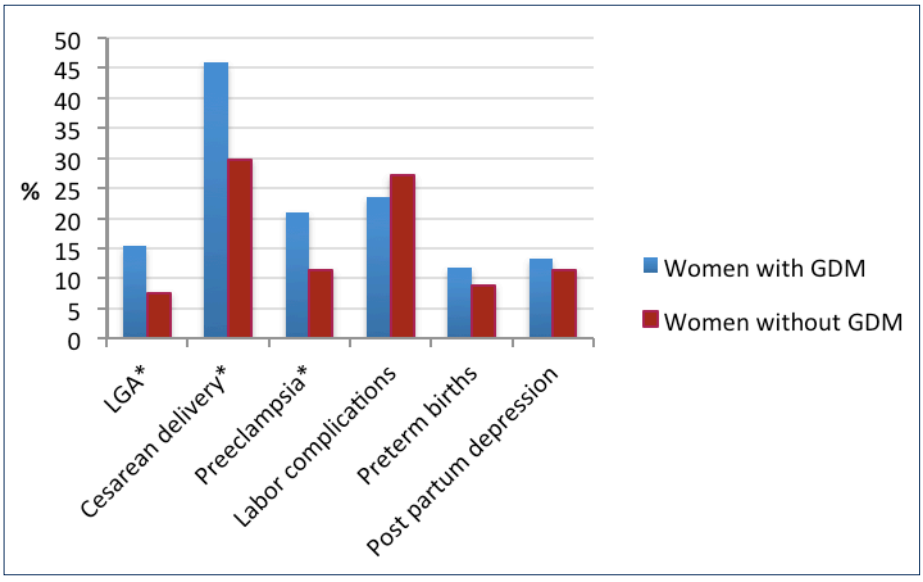
Gestational diabetes was assessed using the self-reported question "During your most recent pregnancy, were you told by a doctor, nurse, or other health care worker that you had gestational diabetes (diabetes that started during *this* pregnancy)?" To determine the demographic and socioeconomic profile of women with GDM, we compared women with GDM to women without GDM adjusted for age (Table 1). Additionally, we used chi-square tests to examine potential adverse outcomes, including large for gestational age, cesarean delivery, preeclampsia, labor complications,* preterm births and postpartum depression. To determine if the association between GDM and adverse outcomes differed by baseline body mass index (BMI) we used logistic regression to determine the odds of selected adverse pregnancy outcomes for women with GDM compared to women without GDM adjusted for age and stratified by BMI category. All analyses were performed using StataSE, version 11.1 to apply the appropriate weights and account for complex survey design. The percents and population estimates reported are adjusted to represent live births in Rhode Island.

RESULTS

In this study, 321 women [12.3%, 95% confidence interval (CI) 10.8–13.8] who had a live birth in 2009 or 2010 had self-reported GDM with their most recent pregnancy. Women with GDM were older (23.3% with GDM were ≥35 years old compared to 16.8% without GDM), more likely to have had at least one previous live birth (61.7% with GDM compared to 53.5% without GDM) and more likely to be overweight or obese prior to pregnancy (62.9% with GDM compared to 41.3% without GDM). When adjusting for age in independent logistic regression models, women with less than a high school education had higher odds of GDM compared to women who had at least some college (AOR 1.76; 95% CI 1.11–2.79). Women with high-income levels had about half the odds of GDM compared to their low-income counterparts (AOR 0.54; 95% CI 0.39–0.74). Compared to women with normal BMI, overweight women had increased odds of GDM (AOR 2.00; 95% CI 1.40–2.85) and obese women had even greater odds (AOR 3.28; 95% CI (2.28–4.72). After adjusting for age there was no significant association with ethnicity, race, Medicaid status or previous live birth (Table 1).

Women with self-reported GDM had a statistically significantly higher percent of adverse health outcomes such as large infants for gestational age, cesarean delivery, and preeclampsia but not labor complications, preterm births or postpartum depression (Figure 1). After adjusting for age, all women regardless of weight category prior to pregnancy

Figure 1: Table 3. Prevalence of selected health outcomes in women with self-reported GDM and without self-reported GDM



*Significant at 0.05 level

Table 2. Adjusted odds ratio of selected health outcomes in women with self-reported GDM vs. without self-reported GDM[a]

	Underweight and normal BMI OR (95% CI)		P-value	Overweight and obese BMI OR (95% CI)		P-value
	Women with GDM	Women without GDM		Women with GDM	Women without GDM	
Large for gestational age	0.72 (0.17-3.01)	1.00	0.669	2.36 (1.20-4.62)	1.00	0.012*
Cesarean delivery	1.71 (1.06-2.76)	1.00	0.029*	1.93 (1.32-2.83)	1.00	0.001*
Preeclampsia	1.87 (0.95-3.65)	1.00	0.068	1.49 (0.94-2.35)	1.00	0.090
Labor complications	.67 (.39-1.15)	1.00	0.147	0.90 (0.59-1.37)	1.00	0.628
Preterm births	0.44 (0.31-0.63)	1.00	<.001*	2.04 (1.31-3.16)	1.00	0.002*
Post partum depression	2.20 (1.12-4.30)	1.00	0.021*	0.72 (0.40-1.32)	1.00	0.287

*Significant at 0.05 level
[a] Adjusted for age

were at increased odds of cesarean delivery compared to their peers who did not have GDM (AOR 1.71; 95% CI 1.06–2.76 among women with BMI < 25 and (AOR 1.93; CI 1.32–2.83) among women with BMI ≥ 25). (Table 2) There were also statistically significant inverse associations between preterm births and GDM based on BMI status prior to pregnancy. Overweight and obese women with GDM had greater odds (AOR 2.04; 95% CI 1.31–3.16), whereas underweight and normal weight women with GDM conversely exhibited lower odds (AOR 0.44, 95% CI 0.31–0.63) compared to their peers without GDM. Among the overweight and obese women, those with GDM have 2.36 (95% CI 1.20–4.62) times the odds of having a large for gestational age child compared to those without GDM. A statistical significance in the relationship between GDM and postpartum depression was only observed in underweight and normal weight women (AOR 2.11, 95% CI 1.08–4.12). There were no significant associations between preeclampsia or labor complications and GDM in either BMI group.

CONCLUSION

The prevalence of GDM in Rhode Island was significantly greater than the estimated national average of 7%, comparisons with other states is difficult since different methods are used for determining GDM. Michigan rates range between 4.0 (based on birth certificates) to 8.6% (based on self-reported responses from PRAMS), while Massachusetts reported 6.9% (based on self-reported responses from PRAMS and birth certificates).[10, 11] The prevalence of GDM in Rhode Island is greater than the prevalence of 9.3% self-reported GDM in Oklahoma, where obesity and diabetes type 2 are greater than the rates in Rhode Island.[12] Oklahoma's obesity rate in 2011 is 31.1% and percentage of existing cases of diabetes adjusted for age is 10.1% among adults, whereas Rhode Island has comparatively lower rates of 25.4% for obesity and 6.8% for diabetes.[13]

The high prevalence in Rhode Island may be due to two factors other than an actual higher prevalence. A possible explanation for the high prevalence is that Rhode Island may have more complete assessment of gestational diabetes compared to other states. Another factor is the difficulty in discriminating between preexisting undiagnosed type 2 diabetes and hyperglycemia induced by pregnancy. Many women of childbearing age are not usually screened for diabetes; thus women with preexisting diabetes who are screened for the first time for diabetes during pregnancy may be mistakenly diagnosed as having GDM. Data from the 2009 Rhode Island Behavioral Risk Factor Surveillance System indicate that only 55% of women between the ages of 18 and 44 have been tested for diabetes in the past three years.

Currently, Rhode Island's Birth Medical Worksheet provides only one general option of 'Diabetes' for physicians to select. Two separate options, one for existing diabetes and one for GDM will be implemented starting with 2014 births. To address the issue of only having one diabetes option, secondary analyses were performed. First, women who self-reported previous diabetes were removed from the analyses, the resulting prevalence estimate was 12.0% (95% CI 10.5–13.5). Second, women for whom a physician indicated diabetes, either GDM or pre-existing type 1 or 2 diabetes, were removed from the analyses. The resulting prevalence estimate was 9.1% (95% CI 7.7–10.4), which is likely an underestimate since women with gestational diabetes would also be excluded.

The study has several strengths. PRAMS has a population-based sample, rather than clinical-based sample and thus reduces the bias of recruiting subjects that are more likely to attend clinical visits, to be more health-aware or have more comorbidities. Another strength of PRAMS is that although it is made up of primarily self-reported data,

the PRAMS survey data is linked to the birth file, thus allowing validation of medical information such as adverse pregnancy outcomes.

Despite these strengths, the study has two limitations. First, the self-reported measures of diagnosis of GDM and BMI before pregnancy are collected 2 to 6 months after delivery. This may lend to recall bias and reporting error, and thus may result in inaccurate measurements of the variables. Second, only women with live births were surveyed in the study. Therefore, the findings cannot be generalizable to all pregnancies, including women with stillbirths.

It is important to further explore the risk factors that are unique to Rhode Island that contribute to the high prevalence of GDM.

Footnote

* Labor complication includes one or more of the following conditions: febrile (>100 F), meconium (moderate/heavy), premature rupture of the membrane, abruption placenta, placenta previa, other excessive bleeding, seizures during labor, precipitous labor (<3 hours), prolonged labor (>20 hours), dysfunctional labor, breech/malrepresentation, cephalopelvic disproportion, cord prolapse, anesthetic complications, fetal distress.

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