

# Gestational Diabetes in High-Risk Populations

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**G**estational diabetes mellitus (GDM) is defined as glucose intolerance first recognized during pregnancy. Asian-American, Native Hawaiian, Pacific Islander, Hispanic, and African-American women are at a disparately higher risk for GDM or its long-term effects than non-Hispanic white women. Women with a history of GDM have a higher risk for subsequent type 2 diabetes. Therefore, diagnostic testing and prevention measures should be undertaken during postnatal follow-up. The former is necessary to diagnose persistent postnatal glucose intolerance, and the latter is supported by several studies showing that treating insulin resistance reduces the risk of type 2 diabetes in women who have had GDM.<sup>1-3</sup>

## Clinical Significance of GDM

GDM is associated with significant complications during pregnancy, including an increased need for Cesarean sections; higher risks of ketonemia, preeclampsia, and urinary tract infection in both mothers and infants; increased perinatal morbidity (e.g., macrosomia, neonatal hypoglycemia, and neonatal jaundice); and possibly mortality. GDM also identifies women with a high risk for future GDM and type 2 diabetes. In a systematic review of 13 studies,<sup>4</sup> recurrence rates for GDM after the index pregnancy varied widely, with lower rates observed in non-Hispanic white populations (30–37%) and higher rates in minority populations

(52–69%). In a systematic review of 28 studies, Kim et al.<sup>5</sup> found the subsequent incidence of type 2 diabetes to also vary widely, but after adjusting for many of the differences among these studies, women from mixed (non-Hispanic white plus non-white) as well as non-white cohorts seemed to progress to diabetes at similar rates, with progression increasing steeply within the first 5 years after delivery and then reaching a plateau. The Diabetes Prevention Program<sup>1</sup> showed that women who had a history of GDM had a 74% increased age-adjusted risk for diabetes compared to women who had no history of GDM.

## GDM Prevalence in Asian, Native Hawaiian, Pacific Islander, Hispanic, and African-American Women

Similar to their higher rates of type 2 diabetes, the risk of developing GDM has been generally reported to be higher among Asian, Native Hawaiian, other Pacific Islander, and Hispanic women than in non-Hispanic white women. Although African Americans are known to have higher rates of type 2 diabetes, the data regarding GDM do not always show higher risk in African-American women. Almost uniformly across studies carried out in a variety of locations and settings, Asian/Pacific Islander pregnant women have had the highest risk of GDM.<sup>6-11</sup> Interestingly, several studies have shown foreign-born women to have a higher risk than U.S.-born women.<sup>8,10</sup>

There are limited disaggregated data available within racial/ethnic groups. We have some evidence that disaggregating the data further clarifies which subgroups within a racial/ethnic group are at the highest risk. For example, Florida's live birth certificate data from 2004 to 2007 showed GDM prevalence estimates for Asian Indians (11.6%), Vietnamese (10.0%), and Pacific Islanders (Hawaiian, Guamanian, Samoan, Filipino, or other Pacific Islanders, 9.8%) to be higher than that of East Asian women (Chinese, Korean, or Japanese, 7.9%).<sup>12</sup> Also, that same study found GDM prevalence within Hispanic subgroups to be higher for Mexicans (6.0%) and Puerto Ricans (5.3%) than for other Central and South Americans (4.6%) and Cubans (4.4%), which is closer to the prevalence rate for non-Hispanic African Americans (4.0%) and non-Hispanic whites (4.7%).<sup>12</sup>

More widespread data disaggregated by race/ethnicity would be informative to direct public health efforts and advocacy. The Revisions to the Standards for the Classifications of Federal Data on Race and Ethnicity issued by the Office of Management and Budget in 1997 instructed the 2000 Census and all other federal agencies to comply with new racial and ethnic classifications by 1 January 2003 and called for the disaggregation of data, especially from Asian and Pacific Islander populations.<sup>13</sup> However, there are few disaggregated reports

describing GDM in these distinct populations at the national level.

**Ethnic/Racial Differences in Outcomes**

Disparities exist in the risk of developing diabetes after GDM. A Kaiser study<sup>14</sup> showed Hispanics at slightly higher risk and African-American women at significantly higher risk than non-Hispanic white women (although their risk remains high relative to the non-GDM population). Further adjustment for prepregnancy BMI reduced diabetes risk associated with GDM for each group but did not explain the risk differences across groups.

Perinatal outcomes among women with GDM differ by race/ethnicity and particularly affect African Americans, Native Hawaiian/Pacific Islanders, and, within the Asian-American cohort, Filipinos. Studies of African-American women with GDM in California<sup>15,16</sup> have found higher odds of Cesarean delivery, intrauterine fetal death, preeclampsia, neonatal hypoglycemia, and preterm delivery than for any other ethnic/racial cohort. Those same studies found that Asian-American women have the lowest odds of complications such as primary Cesarean delivery, large-for-gestational-age infants, and neonatal respiratory distress syndrome.<sup>15,16</sup>

However, studies disaggregating the data on the Asian-American population and including Native Hawaiian and Pacific Islanders tell a different story. A review of the largest GDM program in Hawaii<sup>17</sup> showed that Native Hawaiian/Pacific Islander mothers had statistically higher prevalence of macrosomia and neonatal hypoglycemia than the white population. This same study found that within the Asian-American cohort, Filipino mothers had statistically twice the prevalence of neonatal hypoglycemia as the rest of their Asian-American cohort and a higher prevalence of macrosomia

compared to all groups except Native Hawaiian/Pacific Islanders.<sup>17</sup>

The infant mortality rate (IMR), the rate at which babies < 1 year of age die, has long been used as one indicator of the health of populations. The U.S. IMR has steadily declined from 26.0 per 1,000 live births in 1960 to 6.9 per 1,000 live births in 2000.<sup>18,19</sup>

However, this decline masks large health disparities experienced by some racial/ethnic groups. A four-fold increase in the perinatal IMR has been reported in pregnancies complicated by improperly managed GDM.<sup>20</sup> The highest IMRs are experienced by racial/ethnic groups that have the highest prevalence of type 2 diabetes. Whether common factors contribute to infant mortality and the development of diabetes should be a topic for further investigation.

**Identification of Women With GDM**

Identifying women with GDM requires glucose testing. Because of the growing prevalence of type 2 diabetes, it is important to distinguish women who have prepregnancy diabetes from those with GDM. Thus, women should be screened at their initial prenatal visit for known risk factors for diabetes, and those who are at risk should be tested for diabetes using standard diagnostic criteria (Table 1).<sup>21</sup> Women who are diagnosed with diabetes at this visit should receive a diagnosis of diabetes and not a diagnosis of GDM because the diabetes predates the pregnancy.

There is some disagreement about the preferred procedure to identify women with GDM. Traditional recommendations have called for a clinical risk assessment that identifies risk factors for GDM (Table 2), followed by glucose testing. Women were considered to be at low risk for GDM if they had none of the listed risk factors. However, it is now recommended that all pregnant women

be screened at 24–28 weeks’ gestation, keeping in mind that women who meet the above criteria are at the highest risk of GDM.<sup>21</sup>

Traditionally, glucose tolerance testing for GDM has consisted of a 50-g oral glucose challenge, followed by a 100-g oral glucose tolerance test (OGTT) in women who have a positive initial challenge test (Table 3).<sup>22</sup>

Recently, the International Association of Diabetes and Pregnancy Study Groups<sup>22</sup> called for a 75-g OGTT in all women without a preceding challenge test, with only one abnormal glucose level required to make the GDM

**Table 1. Criteria for Diagnosis of Diabetes<sup>21</sup>**

- A1C  $\geq$  6.5% using a method that is NGSP certified and standardized to the Diabetes Control and Complications Trial assay
- OR
- Fasting plasma glucose (FPG)  $\geq$  126 mg/dl, after no caloric intake for at least 8 hours
- OR
- 2-hour plasma glucose  $\geq$  200 mg/dl during an OGTT using a glucose load containing the equivalent of 75 g of anhydrous glucose dissolved in water
- OR
- In a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose  $\geq$  200 mg/dl

**Table 2. Risk Factors for GDM<sup>21</sup>**

- $\geq$  25 years of age
- Member of Asian, Pacific Islander, Native American, Hispanic, or black racial/ethnic group
- Family history of diabetes
- Overweight or obese
- Previous pregnancy with birth weight  $\geq$  9 lb
- History of random plasma glucose  $\geq$  120 mg/dl

diagnosis. Current American Diabetes Association (ADA) recommendations for GDM screening are based on this and summarized in Table 4.<sup>21</sup> ADA also recommends that all women diagnosed with GDM be screened for type 2 diabetes 6–12 weeks postpartum.

These latest criteria will significantly increase the prevalence of GDM because they require only one abnormal value instead of the previous two. According to the Quest Diagnostics clinical laboratory dataset,<sup>23</sup> using the new diagnostic criteria almost doubled the number of positive GDM results obtained from the 75-g OGTT. In 2010, it was estimated that using these diagnostic criteria would result in 18% of all pregnant women being diagnosed with GDM, more than double the

proportion diagnosed using the older criteria.<sup>24,25</sup> It should be noted that the American College of Obstetrics and Gynecology continues to recommend the prior diagnostic criteria.<sup>26</sup>

Quest Diagnostics has reported the GDM screening rate as only 68% of pregnant women 25–40 years of age who used their services.<sup>23</sup> Of their entire pregnant population (18–40 years of age) who received GDM screening, 5% had positive test results. However, only 19% of those diagnosed with GDM received postpartum glucose tolerance testing within 6 months after delivery. Hence, both GDM screening during pregnancy and postpartum diabetes screening were low.

**Ethnic/Racial Differences in Diagnostic Characteristics**

Obesity is associated with insulin resistance and is a well-known risk factor for developing type 2 diabetes and GDM. Yet, the rates of obesity are much lower in Asian Americans than in any other racial group, despite their having high rates of GDM.<sup>11</sup> The prevalence of GDM increased with increasing BMI for all ethnic/racial groups in Florida, but the fraction of cases attributable to overweight and obesity was low for Asian/Pacific Islander women (15.1%) compared to 39.1% for Hispanics, 41.2% for non-Hispanic whites, and 50.4% in non-Hispanic African Americans.<sup>12</sup> Among Asian/Pacific Islander women, the adjusted percentage of GDM deliveries attributable to overweight and obesity ranged from 9.1% in Vietnamese to 34.0% in Asian Indian women. According to McNeely and Boyko’s analysis of the National Health Interview Survey,<sup>27</sup> similar proportions of Asian and non-Hispanic white Americans report having diabetes, but after accounting for the lower BMI of Asians, the adjusted prevalence of diabetes was 60% higher in Asian Americans.

One possible explanation for these racial/ethnic differences is that the association between BMI and proportion of body fat may vary because of racial/ethnic differences in skeletal frame and body composition.<sup>28</sup> A recent study reported that, for a given percentage of body fat, Asians have a 3–4 kg/m<sup>2</sup> lower BMI than whites, suggesting that Asians may have a greater propensity for depositing body fat for any given amount of weight gain compared to other groups.<sup>29</sup> Because of the association between obesity and GDM, BMI ≥ 25 kg/m<sup>2</sup> has been used as a screening threshold for identifying those at higher risk for GDM. However, this identifies only 25% of Asian women with GDM, compared to 76% of African American, 58% of Hispanic, and 46% of white women (*P* < 0.001).<sup>30</sup> Controlling for confounders and comparing to a BMI ≤ 25 kg/m<sup>2</sup>, African Americans had the greatest odds of GDM (5.1, 95% CI 3.0–8.5) followed by whites (3.6, 2.7–4.8), Hispanics (2.7, 1.9–3.8), and Asians (2.3, 1.8–3.0).

Despite differences in prepregnancy BMI (white 25.2, South Asian 23.3, and Asian 21.4 kg/m<sup>2</sup>, *P* = 0.0001), insulin sensitivity in late pregnancy measured using data from an OGTT showed no significant ethnic differences.<sup>31</sup> Prepregnancy BMI had a much greater effect on insulin resistance during pregnancy in Asian than in white women. A recent report from Oslo, Norway,<sup>32</sup> comparing changes in insulin resistance and β-cell function in a multi-ethnic cohort of pregnant women found that East and South Asians were more insulin resistant than Western Europeans, even at their first visit (mean 15 weeks’ gestation), whereas the increase of insulin resistance thereafter to their second visit (mean 28 weeks’ gestation) was similar across the groups. However, the increase in β-cell function was signifi-

**Table 3. Diagnosis of GDM<sup>22</sup>**

Plasma glucose ≥ 140 mg/dl with a random 50-g 1-hour oral glucose challenge test

If 50-g test is positive, administer a 100-g 3-hour OGTT after an 8-hour overnight fast. GDM is diagnosed if two or more of the following plasma glucose results are met:

- Fasting ≥ 95 mg/dl
- 1-hour ≥ 180 mg/dl
- 2-hour ≥ 155 mg/dl
- 3-hour ≥ 140 mg/dl

**Table 4. ADA Recommendations for Detection and Diagnosis of GDM<sup>21</sup>**

All pregnant women not known to have diabetes should be screened for GDM at 24–28 weeks’ gestation with a 75-g, 2-hour OGTT after an overnight fast of at least 8 hours. Diagnosis is made when any of the following plasma glucose values are exceeded:

- FPG ≥ 92 mg/dl
- 1-hour glucose ≥ 180 mg/dl
- 2-hour glucose ≥ 153 mg/dl

cantly lower in East and South Asians compared to Western Europeans, indicating a mismatch between  $\beta$ -cell function and insulin sensitivity.

Insulin resistance increases at mid-pregnancy and progresses to levels that are similar to those seen in most patients with type 2 diabetes. Women who develop GDM have insufficient  $\beta$ -cell function to meet these increased insulin needs. In many of these women, the increased insulin requirements of pregnancy are superimposed on previous chronic insulin resistance. Several studies have supported an approach to treating insulin resistance to reduce the risk of type 2 diabetes in women who have had GDM.<sup>1-3</sup>

### Existing Gaps in Knowledge

The available data indicate that Asians/Pacific Islanders, Hispanics, and African Americans are at an increased risk to develop diabetes before and during pregnancy. The available data also show that there are racial/ethnic differences in the risks for diabetes, GDM, diabetes-associated outcomes, and pregnancy-associated outcomes that should be taken into account when considering strategies for disease diagnosis, management, and prevention in pregnant women from these racial/ethnic groups.

Moreover, there are significant differences even within broad racial/ethnic groups—GDM prevalence among Hispanics and Asian Pacific Islanders being a notable example—making it important to have more disaggregated information regarding these possible differences to avoid generalizations within racial/ethnic groups.

Some of these racial/ethnic differences may be the result of variations in biological factors such as insulin sensitivity,  $\beta$ -cell function, and body fat that could be clarified by more research. However, other differences are probably the result of sociocul-

tural factors that may affect access to and quality of prenatal care, postnatal follow-up, diagnosis and management during pregnancy, and development of comorbid complications.<sup>33,34</sup> Because approaches to diagnosing and managing diabetes and GDM in white pregnant women may not be applicable to pregnant women from other racial/ethnic groups, consideration should be given to obtaining more information about GDM etiopathogenesis, diagnosis, management, and prevention in these racial/ethnic populations.

### The Gestational Diabetes Act

The Patient Protection and Affordable Care Act mandated private insurance coverage of women's preventive health care services with no cost sharing. The U.S. Department of Health and Human Services directed the Institute of Medicine (IOM) to provide recommendations about what preventive services are necessary for women's health and well-being and should be covered with no cost sharing. The ADA testified before the IOM about the importance of screening pregnant women for diabetes.

As a result of the IOM recommendations, the administration of President Barack Obama announced historic new guidelines in August 2011 related to insurance coverage of diabetes screening during pregnancy. The guidelines stated that beginning 1 August 2012, health insurers are required to cover specific preventive health services for women at no cost, including GDM screening for pregnant women between 24 and 28 weeks of gestation and diabetes screening at the first prenatal visit for pregnant women identified as being at high risk for type 2 diabetes.

Eliminating the cost barrier to preventive services such as GDM screening during pregnancy will help more women receive this important service, both because of affordability and because the message it sends to

practitioners about the importance of testing pregnant women for GDM and type 2 diabetes. The result will be seen in more women with GDM and/or type 2 diabetes receiving the care they need to reduce the risk of costly complications, including pre-eclampsia, birth injury, and neonatal hypoglycemia in the short term and the long-term risk of diabetes for both mothers and their children.

Screening rates for GDM and type 2 diabetes in pregnant women are expected to improve as a result of the new coverage guidelines. However, more needs to be done. To protect today's mothers and the next generation, policymakers must recognize the seriousness of diabetes.

In an effort to reduce the incidence of GDM and improve our knowledge of the disease, members of the U.S. House of Representatives and U.S. Senate have introduced and are championing bipartisan legislation to steer additional federal research dollars to GDM research. The Gestational Diabetes Act calls for improved tracking, surveillance, and public health research on GDM to gain a better understanding of which women are at the greatest risk, how we can prevent women from developing GDM, and how we can prevent its reoccurrence in subsequent pregnancies. The legislation has been endorsed by numerous health advocacy, provider, and public health organizations.

In 2010, the legislation successfully passed in the House of Representatives, but no action was taken on it in the Senate before adjournment. Although the legislation did not receive action in the 2011–2012 session of Congress, its sponsors are committed to advancing it during the 113th Congress, which began in January. The legislation is an ADA priority, and its passage should be a priority for anyone

concerned about diabetes, minority health, and health disparities.

To learn more about GDM and other issues important to people with or at risk for diabetes, become an ADA Diabetes Advocate by visiting the Web site [www.diabetes.org/takeaction](http://www.diabetes.org/takeaction).

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