Excess Risk of Gestational Diabetes among Native American Mothers in Utah

Brenda Ralls, PhD, William F. Stinner, PhD, Richard Bullough, PhD, Michael F. Friedrichs, MS, Jeffrey Duncan, MS, Jenny Billy

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Abstract

The prevalence of gestational diabetes mellitus (GDM) and its underlying risk factors within minority populations has become a matter of increasing concern. National data indicate a particularly high risk for Native American mothers. This study focused on the patterns of GDM and two risk factors (maternal age and pre-pregnancy weight status) between Native American and non-Native American mothers in Utah. Data were obtained from a pooling of five years of Utah birth records. Descriptive and multivariate logistic regression techniques were used. The effect of being Native American on GDM was more than double that observed for their non-Native American counterparts. When age and pre-pregnancy weight status were simultaneously adjusted, the higher prevalence of diabetes among Native American mothers persisted.

Introduction

Gestational diabetes mellitus (GDM) increases the risk for adverse pregnancy outcomes, such as stillbirths, congenital malformations, macrosomia, and cesarean sections. There is also emerging evidence that infants born to mothers with diabetes may be at increased risk of developing diabetes themselves (Dabelea, Hanson, Pettitt, et al., 2000). While it usually disappears after delivery, GDM can also lead to an increased risk of permanent diabetes for women who develop it.

About 135,000 women are diagnosed with GDM each year in the U.S., accounting for about four percent of all pregnancies (American Diabetes Association, 2007). In Utah, birth records indicate that about two and one-half percent of all pregnancies, or approximately 1,100 women a year, are impacted by GDM. However, there is considerable variation by race and ethnicity, with higher prevalence observed among African American, Hispanic/Latina, Asian American mothers and most notably, Native American mothers (Berkowitz, Lapinski, Wein, & Lee, 1992). This study focuses on Native American mothers.

Two factors often cited as risk factors for GDM are maternal age and pre-pregnancy weight status. These two risk factors may interact with and mediate the influence of being a Native American mother on developing GDM. Two ways in which this might operate are: (1) the two risk factors might exert a stronger effect among
Native American than among non-Native American mothers; or (2) Native American mothers may have higher or lower prevalence of the two risk factors. For example, older mothers and mothers who were overweight or obese prior to pregnancy tend to have a higher propensity for GDM than younger mothers and mothers who were not overweight or obese. Thus, to the extent that Native American mothers differ from non-Native American mothers regarding these risk factors, one would expect age and pre-pregnancy weight status to account for any initially observed difference between the two populations.

This study, therefore, has two objectives:

1) To examine the extent to which Native American mothers have a higher prevalence of GDM and its risk factors than non-Native American mothers, and the degree to which the two risk factors account for any observed differences in GDM between the two populations, and
2) To examine the degree to which the two risk factors might exert a stronger effect among Native American than among non-Native American mothers.

**Methods**

Data for this study were obtained from a pooling of five years (2000-2004) of singleton Utah births (N = 228,680), including 2,567 births to Native American mothers and 226,113 births to non-Native American mothers. Native American mothers account for about one percent (1.1%) of all births to Utah mothers, while Native American women of child-bearing age (15-44) make up about two percent (2.1%) of the total number of women in Utah of child-bearing age (Center for Health Data, 2006). Cases for which mothers had less than two prenatal care visits and where any of the relevant information was missing were excluded from the analysis. Gestational diabetes (GDM) was measured as a two-category variable (present/not present). In the descriptive phase of the study, two risk factors (maternal age and pre-pregnancy weight status) were measured as follows: (1) maternal age - a four-category variable based on mother’s age at time of delivery (less than 25, 25-29, 30-34 and 35 and older); (2) maternal pre-pregnancy weight status - a three-category variable based on the mother’s body mass index (BMI) (weight in kilograms divided by height in meters squared). The three weight status categories were: not overweight (BMI <=24.9 kg/m2), overweight (25<=BMI<=29.9), and obese (BMI>=30). Mean age and mean BMI were also computed. Logistic regression is commonly used as a statistical method in epidemiological studies, and is especially useful where the number of cases in the comparison groups (e.g., exposed vs. unexposed populations) may be quite different (Friis & Sellers, 2004). Logistic regression was used to examine the effect of being Native American on the odds of having GDM. In this segment of the analysis, age category "less than 25" and the weight status category "not overweight" served as the reference categories.

In the descriptive phase of the investigation, differences in GDM prevalence as well as variations across the categories of maternal age and pre-pregnancy weight status between Native American and non-Native American
mothers were examined. In the logistic phase, separate analyses for Native American and non-Native American mothers were conducted to examine the patterning and relative strength of the odds ratios across the age and weight status categories, considered simultaneously. The main effects of being Native American on the odds of being diagnosed with GDM both without and with controls on age and weight status were assessed.

Findings

Figure 1. Percentage of Native American and Non-Native American Mothers with Gestational Diabetes Mellitus (GDM)

The prevalence of GDM for Native American and non-Native American mothers in Utah is shown in Figure 1. As can be seen, prevalence of GDM among Native American mothers was more than double that found for non-Native American mothers in Utah (5.6% vs. 2.3%; p<.001).

As may be seen in Table 1, Native American mothers were actually younger than non-Native American mothers. More than half (51.4%) of Native American mothers with live births were under age 25, compared to about two of five (39.0%) non-Native American mothers. However, the percentages of mothers aged 35 and over were similar for Native American and non-Native American mothers, 8.5% and 8.7%, respectively. The mean age for Native American mothers was lower than that for non-Native American mothers, 25.2 vs. 26.6 years, respectively.

The percentage of Native American mothers who were overweight or obese was greater than that for non-Native American mothers. Over one of four (27.7%) Native American mothers were overweight, compared to about one of five (20.5%) non-Native American mothers. Fully 26.6 percent of Native American mothers were obese, nearly double that observed for non-Native American mothers (13.9%). The average BMI for Native American mothers was higher than that for non-Native American mothers (26.8 vs. 24.4 kg/m2, respectively).
Table 1. Maternal Age and Pre-Pregnancy Weight Status for Native American and Non-Native American Mothers 2000-2004

<table>
<thead>
<tr>
<th>Age and Pre-Pregnancy Weight Status</th>
<th>Native American Mothers (N=2,567)</th>
<th>Non-Native American Mothers (N=226,113)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 25</td>
<td>51.4</td>
<td>39.0</td>
</tr>
<tr>
<td>25-29</td>
<td>26.1</td>
<td>33.3</td>
</tr>
<tr>
<td>30-34</td>
<td>13.9</td>
<td>19.0</td>
</tr>
<tr>
<td>35 and over</td>
<td>8.5</td>
<td>8.7</td>
</tr>
<tr>
<td>Total</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Mean age (years)</td>
<td>25.2</td>
<td>26.6</td>
</tr>
<tr>
<td>BMI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not overweight</td>
<td>45.7</td>
<td>65.6</td>
</tr>
<tr>
<td>Overweight</td>
<td>27.7</td>
<td>20.5</td>
</tr>
<tr>
<td>Obese</td>
<td>26.6</td>
<td>13.9</td>
</tr>
<tr>
<td>Total</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Mean BMI (kg/m²)</td>
<td>26.8</td>
<td>24.4</td>
</tr>
</tbody>
</table>

Source: Utah Birth Records 2000-2004
Totals may not sum to 100.0% due to rounding
Cases where any of the relevant information was missing were excluded

Figures 2 and 3 depict the patterning of GDM differences across maternal age and weight status subgroups for Native American and non-Native American mothers. The older the maternal age subgroup, the greater the GDM for both Native American and non-Native American mothers, with the difference between Native American and non-Native American mothers expanding the older the age subgroup (Figure 2). A relatively small percentage of both Native American and non-Native American mothers less than 25 years of age had GDM, with only a slight difference between the two (2.4% vs. 1.2%, p<.001). However, the GDM difference between Native American and non-Native American mothers grew wider the older the age subgroup. In the oldest age subgroup (35 and older), GDM prevalence among Native American mothers was 12.3 percent—more than five times that observed for Native American mothers less than 25 years of age, and more than twice that of non-Native American mothers in the oldest age subgroup (12.3% vs. 5.4%, p<.001).

Equally pronounced was the response difference between Native American and non-Native American mothers in GDM rates across categories of maternal pre-pregnancy weight status (Figure 3). GDM rates among both Native American and non Native American mothers who were not overweight were low and differed only slightly in magnitude (2.3% vs. 1.3%, p<.001). The GDM rates, however, were higher among overweight and obese mothers, albeit more so among Native American than non Native American mothers.
Figure 2. Percentage of Native American and Non-Native American Mothers with Gestational Diabetes Mellitus (GDM) by Maternal Age

Figure 3. Percentage of Native American and Non-Native American Mothers with Gestational Diabetes Mellitus (GDM) by Maternal Pre-Pregnancy Weight Status
Native American mothers who were overweight, but not obese, had a rate over one and one-half times that for non-Native American mothers (5.1% vs. 2.9%, p<.001). GDM prevalence among obese Native American mothers was 11.8 percent, nearly twice that for non-Native American mothers who were obese (11.8% vs. 6.0%, p<.001). In sum, the oldest and obese mothers exhibited the highest GDM rates for both Native American and non-Native American mothers, but the magnitude was greater for Native American mothers.

The results (odds ratios) for the logistic regression analysis of the impact of maternal age and pre-pregnancy weight status on GDM for Native American and non-Native American mothers are shown in Table 2. Generally, the older the mother and the greater the degree of being overweight, the greater were the odds of having GDM among both groups of mothers.

Native American mothers aged 25 - 29, however, were not significantly different from their counterparts less than 25 years of age in their odds of having been diagnosed with GDM. For both Native American and non-Native American mothers, those aged 35 and over exhibited the highest odds of having GDM compared to those less than 25 years of age, with the odds ratio being higher among Native American mothers (O.R. 5.7 vs. 4.7).
On the other hand, merely being overweight, but not obese, increased the odds of having GDM compared to mothers who were not overweight, but the increase was not statistically significant. This pattern was observed regardless of whether those mothers were Native American or not. Obesity, however, significantly increased the odds of having GDM among both groups of mothers compared to those mothers who were not overweight. The impact of obesity on risk of GDM was higher for Native American mothers than for their non-Native American counterparts (O.R. 5.7 and 4.8, respectively).

While the response effect was higher for Native American mothers, there did not appear to be a major difference in the pattern of the influence of the two risk factors between the two populations. In order to examine the effects of being a Native American mother on GDM, a logistic regression analysis was also conducted with being a non-Native American mother as the reference category. Odds ratios are presented for four assessments of being a Native American mother on the likelihood of having GDM (Figure 4). The four assessments include a bivariate analysis and three multivariate analyses including age adjustment, weight adjustment, and age-and-weight adjustment.

In the bivariate analysis, being a Native American mother increased the risk of developing GDM by 150 percent. Because Native American mothers were younger, on average, age adjustment actually increased the risk to 180 percent (p<.001). When weight status was adjusted, the odds decreased; nonetheless, Native American mothers remained two times more likely to develop GDM than non-Native American mothers (p<.001). With both age
and weight adjustment, the higher prevalence of GDM persisted, with Native American mothers more than twice as likely to develop GDM as non-Native American mothers (p<.001). In other words, the effect of being a Native American mother increased the odds of GDM, even with maternal age and pre-pregnancy weight status controlled.

Conclusions

The basic aims of this study were to evaluate the manner in which being a Native American mother interacted with and is mediated by two risk factors, namely, maternal age and pre-pregnancy weight status, in affecting the odds of developing GDM. Descriptive analysis suggested that the pattern of the impact of maternal age and pre-pregnancy weight status were similar for Native American and non-Native American mothers, but the magnitude of the impact was greater for Native American mothers. However, when the joint effects of the two risk factors, namely maternal age and weight status, were considered separately for Native American and non-Native American mothers, their operation was roughly similar for the two groups of women. In other words, there did not appear to be support for the notion that maternal age and weight status impact the risk of GDM differently for Native American and non-Native American mothers.

The above finding, nonetheless, does not necessarily mean that being a Native American mother has no effect on GDM, independent of the two risk factors; only that the two risk factors, when considered simultaneously, do not affect GDM differently for Native American and non-Native American mothers.

When the main effect of being a Native American mother on GDM was examined, the excess risk of GDM became clearer. While some of this excess could be traced to the greater prevalence of overweight and obesity in this population, it only partially accounted for the higher prevalence of GDM among Native American mothers. Moreover, were it not for the fact that Native American mothers were younger, their rates of GDM would be even higher. In fact, even accounting for the "protective" effect of younger age, Native American mothers still had a rate of GDM over twice that of their non-Native American counterparts.

Because the excess risk was particularly pronounced among Native American mothers who were obese, efforts aimed at promoting weight reduction prior to pregnancy may help to mitigate the risk of GDM in this population. If interventions are to be effective, however, they must be suitable and reflect cultural and lifestyle practices prominent in the Native American population. Involvement of members of the Native American communities is important for developing successful interventions.

Limitations

Native American status was obtained from birth records, and the accuracy of the findings in this study is limited to the accuracy of reporting on birth certificates. Presence of GDM during pregnancy may not always be listed on
birth certificates; however, because a check box method of reporting is used, there is likely to be less risk of underreporting than there would be if it had to be written in. Pre-pregnancy weight status was self-reported by the mother and subject to reporting error. Use of body mass index, while a reasonable proxy measure for body fat, may not capture perfectly a person’s weight status. Finally, the records did not have a unique identifier, and therefore, a woman may have been included more than once in the dataset.

References