Epidemiology of diabetes in pregnancy: risk factors and outcomes

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9 April 2015
Overview of Talk

- Understand the trends of diabetes in pregnancy, particularly gestational diabetes
- Become familiar with the primary risk factors for gestational diabetes
- Be aware of short and long term outcomes associated with gestational diabetes in both the mother and child
Disclaimers

- No conflicts of interest to declare
- I will present the findings of some of my research activities related to diabetes
Diabetes in pregnant women in Canada

Nova Scotia rates are very similar to the Canadian rates
### Established risk factors for Gestational Diabetes

**Am I at risk for gestational diabetes?**

Answer the questions below to learn your risk for gestational diabetes.

<table>
<thead>
<tr>
<th>YES/NO</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Are you overweight or very overweight?</td>
</tr>
<tr>
<td></td>
<td>Are you related to anyone who has diabetes now or had diabetes in his or her lifetime?</td>
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<tr>
<td></td>
<td>Are you Hispanic/Latina, African American, American Indian, Alaska Native, Asian American, or Pacific Islander?</td>
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<tr>
<td></td>
<td>Are you older than 25?</td>
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<tr>
<td></td>
<td>In a previous pregnancy, did you have any of the following?</td>
</tr>
<tr>
<td></td>
<td>• Gestational diabetes</td>
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<tr>
<td></td>
<td>• Stillbirth or miscarriage</td>
</tr>
<tr>
<td></td>
<td>• Large baby (weighing more than 9 pounds)</td>
</tr>
<tr>
<td></td>
<td>Do you have polycystic ovary syndrome (PCOS) or another health condition linked to problems with insulin?</td>
</tr>
<tr>
<td></td>
<td>Have you ever had problems with insulin or blood sugar, such as insulin resistance, glucose intolerance, or “prediabetes”?</td>
</tr>
<tr>
<td></td>
<td>Do you have high blood pressure, high cholesterol, and/or heart disease?</td>
</tr>
</tbody>
</table>

**Total YES answers**

**Risk score developed by the US National Institutes of Health**
Should I get tested for gestational diabetes?
Talk to your health care provider about gestational diabetes and your risk level.

<table>
<thead>
<tr>
<th>Total YES answers:</th>
<th>Your risk level is:</th>
<th>Your health care provider:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 or more</td>
<td>High</td>
<td>Will test you as soon as you know you are pregnant. If your first test is negative, will test you again when you are between 24 weeks and 28 weeks pregnant.</td>
</tr>
<tr>
<td>1</td>
<td>Average</td>
<td>Will test you when you are between 24 weeks and 28 weeks pregnant.</td>
</tr>
<tr>
<td>0</td>
<td>Low</td>
<td>May not test you at all, or will test you when you are between 24 weeks and 28 weeks pregnant.</td>
</tr>
</tbody>
</table>

Every pregnancy is different. If you didn’t have gestational diabetes when you were pregnant before, you might have it with this pregnancy. Or if you had gestational diabetes before, you might not have it with this pregnancy.
Of the 8 established risk factors for GDM: how many are modifiable?

- **Not Modifiable** (7 of 8 factors)
  - Family history of diabetes
  - Ethnicity
  - Age
  - Previous pregnancy history (GDM, stillbirth or large infant)
  - PCOS
  - Prediabetes
  - High blood pressure, high cholesterol, heart disease

- **Potentially Modifiable** (1 of 8 factors)
  - Overweight or obese
Recent research on potentially modifiable risk factors for gestational diabetes

**Vitamin D**
- In Canada, not possible to produce Vitamin D from sun exposure for at least 4-6 months/year

**Prenatal exposure to environmental contaminants**
- Exposure to endocrine disrupting chemicals have become widespread in our environment
- Examples are BPA and phthalates (used in plastics), pesticides, metals (such as lead, arsenic)
- Endocrine disrupting chemicals may play a part in GDM by interfering with naturally occurring hormones
Gestational diabetes by Vitamin D status (25(OH)D) in pregnancy in Halifax and Quebec City

As vitamin D status increases, risk of gestational diabetes decreases

Dodds L et al, manuscript in preparation
As maternal arsenic level increases, risk of GDM increases
Vitamin D and environmental contaminants are potential risk factors for GDM that may be modifiable.

However, research is required to evaluate the effect of increasing Vitamin D exposure in pregnancy or reducing exposure to environmental contaminants on the development of GDM.
Rates of gestational diabetes in Nova Scotia
(Nova Scotia residents, singleton births, no pre-existing diabetes)

Why the dramatic increase after 2009?
2003-2009 Gestational Diabetes Rate = 3.5%

2010-2013 Gestational Diabetes Rate = 5.2%

**GDM increased 45% between two time periods**

How many people think the increase in gestational diabetes is largely due to the increase in maternal pre-pregnancy obesity?

Using ‘decomposition methods’*, we can quantify the change in GDM rates that are due to the change in the rates of overweight and obesity

BMI-specific rates of gestational diabetes in two time periods

Percent Gestational Diabetes

- Underwt/NI
- Overwt
- Obese

2003-2009
2010-2013
Distribution of BMI categories between two time periods

% of births

- Under/NI
- Overwt
- Obese

2003-2009
2010-2013
After decomposition analyses.....

Percent change in GDM rates associated with change in BMI distribution:

6.7%

Therefore, a very small amount of the increase is attributable to the change in BMI!
Not clear what is contributing to the increase in rates of gestational diabetes!
Pregnancy outcomes among women with diabetes in Nova Scotia: Fetal risks

Source: Nova Scotia Atlee Perinatal Database, 2012
Pregnancy outcomes among women with diabetes in Nova Scotia: Short-term maternal risks

Source: Nova Scotia Atlee Perinatal Database, 2012
## Type of preterm birth by diabetic status in Nova Scotia, 1988-2009

<table>
<thead>
<tr>
<th>Preterm Birth</th>
<th>Non-diabetic %</th>
<th>Pre-gestational %</th>
<th>Gestational %</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;37 weeks</td>
<td>4.9%</td>
<td>22.0%</td>
<td>8.1%</td>
</tr>
<tr>
<td>Spontaneous</td>
<td>3.1%</td>
<td>9.1%</td>
<td>4.7%</td>
</tr>
<tr>
<td>Indicated</td>
<td>1.8%</td>
<td>12.9%</td>
<td>3.4%</td>
</tr>
</tbody>
</table>

Data from MSc thesis by Donna Jones, MD, July 2014
Pregnancy outcomes among women with diabetes in Nova Scotia: Neonatal risks

Source: Nova Scotia Atlee Perinatal Database, 2012
Long-term outcomes among women who have had gestational diabetes (GDM)

Increased risk of type 2 diabetes in 5-10 years after pregnancy

- 7-fold increase in risk compared to women who did not have GDM*

- In Nova Scotia among women with a first pregnancy with GDM between 1989-2002,
  15% developed diabetes by 5 years post-partum
  22% developed diabetes by 10 years post-partum**

Increased risk of future hypertension

- In Nova Scotia, women with GDM in a pregnancy had a 62% increase in hypertension later in life compared to women without GDM***

*Bellamy et al, Lancet 2009;373:1773-9
** Russell C, BJOG 2008; 115:253-60
*** De Sousa M, Dalhousie Medical Student project, in progress
Long-term outcomes among the offspring of women who have had gestational diabetes (GDM)

*In utero* programming- “metabolic memory”

- Increased risk of type 2 diabetes
- Increased risk of obesity

Can pregnancy interventions for GDM have an effect on childhood BMI?

- Some observational studies suggest less adiposity in offspring with treating GDM.
- But, results of a randomized controlled trial of treatment for mild GDM suggest no reduction in BMI at age 4-5 years*.

*Gillman et al, Diab Care 2010*
Conclusions

Rates of Type 1 and Type 2 diabetes in pregnancy have been stable over the past 10 years in Canada and Nova Scotia.

Rates of gestational diabetes have been increasing in Canada and Nova Scotia, especially in the past 7 years. It is not clear what is contributing to this increase.

Prevention of gestational diabetes difficult since most risk factors are non-modifiable.

Many short and long term adverse outcomes are associated with pre-existing and gestational diabetes, in both mother and offspring.
Acknowledgments

Thank you to the Reproductive Care Program of NS for access to data in the Atlee Perinatal Database

Thank you to all the students/trainees who have worked on projects related to diabetes