Gestational Diabetes in South Asian and Chinese Women in BC & Alberta

Brooke Kinniburgh, Epidemiologist, Perinatal Services BC
Lily Lee, Director, Provincial Registry, Surveillance, Performance & Analytics, Perinatal Services BC
Disclosures

- None
Gestational Diabetes Mellitus (GDM)

- GDM is glucose intolerance first recognized during pregnancy
  - typically after 20 weeks gestation
  - generally temporary, resolves postpartum
  - established risk factor for Type 2 DM
- Increasing maternal age and obesity major factors contributing to GDM rates
- Largest global increase in diabetes is among women aged 20 - 49 years
GDM Rates in Canada
Rates of Diabetes in pregnant women, Canada

- GDM 54.5 per 1000 deliveries (2010/11)

**FIGURE 1:** Rates of diabetes among pregnant women in Canada, 2004/05–2010/11

SOURCE: Canadian Institute for Health Information, Discharge Abstract Database (DAD). Quebec data was not included because it does not contribute to DAD.
### Variability in GDM rates across Canada

#### TABLE 2: Rates of GDM, by province and territory, Canada, 2004/05–2010/11

<table>
<thead>
<tr>
<th>PROVINCE/TERRITORY</th>
<th>RATE PER 1,000 DELIVERIES</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newfoundland and Labrador</td>
<td>36.0</td>
<td>33.9–38.1</td>
</tr>
<tr>
<td>Prince Edward Island</td>
<td>20.6</td>
<td>17.9–23.7</td>
</tr>
<tr>
<td>Nova Scotia</td>
<td>36.6</td>
<td>35.0–38.1</td>
</tr>
<tr>
<td>New Brunswick</td>
<td>33.3</td>
<td>31.8–35.0</td>
</tr>
<tr>
<td>Ontario</td>
<td>44.0</td>
<td>43.6–44.4</td>
</tr>
<tr>
<td>Manitoba</td>
<td>40.9</td>
<td>39.7–42.1</td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>37.7</td>
<td>36.5–39.0</td>
</tr>
<tr>
<td><strong>Alberta</strong></td>
<td><strong>44.3</strong></td>
<td><strong>43.6–45.1</strong></td>
</tr>
<tr>
<td><strong>British Columbia</strong></td>
<td><strong>73.7</strong></td>
<td><strong>72.7–74.7</strong></td>
</tr>
<tr>
<td>Yukon</td>
<td>44.5</td>
<td>36.5–53.7</td>
</tr>
<tr>
<td>Northwest Territories</td>
<td>21.5</td>
<td>17.8–25.7</td>
</tr>
<tr>
<td>Nunavut</td>
<td>11.7</td>
<td>8.0–16.7</td>
</tr>
<tr>
<td>Canada</td>
<td>47.1</td>
<td>46.8–47.5</td>
</tr>
</tbody>
</table>

**SOURCE:** Canadian Institute for Health Information, Discharge Abstract Database (DAD). Quebec data was not included because it does not contribute to DAD.
Objective

• In two Canadian provinces:
  – Examine the contribution of ethnicity to GDM prevalence
  – Examine the contribution of ethnicity to obstetrical and neonatal outcomes among women with GDM
Ethnic Distribution of Female Population, Census of Canada 2006

BC
- White: 75%
- Chinese: 11%
- South Asian: 7%
- Other: 8%

Alberta
- White: 86%
- Chinese: 4%
- South Asian: 3%
- Other: 7%
Methods

• Retrospective cohort study
• Data from Alberta Perinatal Health Program and BC Perinatal Data Registry
• Study population
  ▪ Resident women aged 15-44 years in Alberta and BC
  ▪ Singleton deliveries between April 1, 2004 to March 31, 2010 in Alberta and BC (2004/05 to 2009/10)
  ▪ Unit of analysis is delivery i.e. women with >1 singleton delivery during the study time period are included more than once
• Exclusion:
  ▪ Late pregnancy terminations
Defining Ethnicity

- Used two previously validated algorithms based on surname
  - Quan and colleagues: sensitivity 78%, specificity 100%, PPV 91% for Chinese ethnicity
  - Nam Pehchan: sensitivity 90-94%, specificity 99% and PPV for South Asian ethnicity 63-96%
- All other categorized as Other (predominantly Caucasian origin)
**Definition of GDM**

- ICD-10-CA codes for GDM (O24.4, O24.8) in delivery episode
- Clinician documented GDM based on clinical history in antenatal record
- Canadian Diabetes Association Guidance: 2003 & 2008: universal GDM 50g OGS at 24 -28 weeks of gestation
  - if 1h $\geq 10.3$ mmol/L, diagnose GDM;
  - if 1h 7.8- $<10.3$ mmol/L, diagnose if at least two values exceeding:

<table>
<thead>
<tr>
<th></th>
<th>AB- 75g 2h OGTT (mmol/L)</th>
<th>BC- 100g 3h OGTT (mmol/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting</td>
<td>5.3</td>
<td>5.3</td>
</tr>
<tr>
<td>1 hour PG</td>
<td>10.6</td>
<td>10.0</td>
</tr>
<tr>
<td>2 hour PG</td>
<td>8.9</td>
<td>8.6</td>
</tr>
<tr>
<td>3 hour PG</td>
<td>n/a</td>
<td>7.8</td>
</tr>
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</table>
### Baseline Characteristics – All deliveries

<table>
<thead>
<tr>
<th></th>
<th>Alberta</th>
<th>BC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>249,796 newborns 190,224 mothers</td>
<td>248,217 newborns 193,381 mothers</td>
</tr>
<tr>
<td><strong>Births n (%)</strong></td>
<td>218,730 (87.6)</td>
<td>201,790 (81.3)</td>
</tr>
<tr>
<td></td>
<td>23,262 (9.3)</td>
<td>24,703 (10.0)</td>
</tr>
<tr>
<td></td>
<td>7,804 (3.1)</td>
<td>21,724 (8.8)</td>
</tr>
<tr>
<td><strong>Mean maternal age (SD)</strong></td>
<td>29.1 (5.5)</td>
<td>30.1 (5.7)</td>
</tr>
<tr>
<td></td>
<td>29.3 (5.0)</td>
<td>29.9 (4.6)</td>
</tr>
<tr>
<td></td>
<td>32.7 (4.7)</td>
<td>33.0 (4.8)</td>
</tr>
<tr>
<td><strong>Urban resident, %</strong></td>
<td>81.9</td>
<td>86.3</td>
</tr>
<tr>
<td></td>
<td>95.9</td>
<td>98.1</td>
</tr>
<tr>
<td></td>
<td>98.4</td>
<td>98.4</td>
</tr>
<tr>
<td><strong>Mean Gestational age, (SD)</strong></td>
<td>38.8 (2.2)</td>
<td>38.7 (2.1)</td>
</tr>
<tr>
<td></td>
<td>38.7 (2.2)</td>
<td>38.6 (2.1)</td>
</tr>
<tr>
<td></td>
<td>38.7 (1.9)</td>
<td>38.6 (1.9)</td>
</tr>
</tbody>
</table>

**significant differences** at p<0.05 level among ethnic groups within province
## Baseline Characteristics – All deliveries

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<tr>
<td></td>
<td>190,224 mothers</td>
<td>193,381 mothers</td>
</tr>
<tr>
<td><strong>Pre-pregnancy weight ≥ 91 kg</strong>, %</td>
<td><strong>9.6</strong></td>
<td><strong>5.8</strong></td>
</tr>
<tr>
<td>Other</td>
<td><strong>4.9</strong></td>
<td><strong>1.8</strong></td>
</tr>
<tr>
<td>South Asian</td>
<td><strong>1.5</strong></td>
<td><strong>0.8</strong></td>
</tr>
<tr>
<td>Chinese</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Nulliparas, %</strong></td>
<td><strong>43.3</strong></td>
<td><strong>46.4</strong></td>
</tr>
<tr>
<td>Other</td>
<td><strong>42.0</strong></td>
<td><strong>45.2</strong></td>
</tr>
<tr>
<td>South Asian</td>
<td><strong>47.9</strong></td>
<td><strong>47.7</strong></td>
</tr>
<tr>
<td>Chinese</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Smoking, %</strong></td>
<td><strong>19.5</strong></td>
<td><strong>12.2</strong></td>
</tr>
<tr>
<td>Other</td>
<td><strong>6.2</strong></td>
<td><strong>1.3</strong></td>
</tr>
<tr>
<td>South Asian</td>
<td><strong>2.3</strong></td>
<td><strong>1.5</strong></td>
</tr>
<tr>
<td>Chinese</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GDM, %</strong></td>
<td><strong>4.2</strong></td>
<td><strong>5.7</strong></td>
</tr>
<tr>
<td>Other</td>
<td><strong>8.4</strong></td>
<td><strong>13.9</strong></td>
</tr>
<tr>
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<td><strong>11.0</strong></td>
<td></td>
</tr>
<tr>
<td>Chinese</td>
<td></td>
<td><strong>13.5</strong></td>
</tr>
</tbody>
</table>

*20% missing pre-pregnancy weight in BC **significant differences** at p<0.05 level among ethnic groups within province*
## Baseline Characteristics – GDM-involved deliveries

<table>
<thead>
<tr>
<th></th>
<th><strong>Alberta</strong></th>
<th></th>
<th><strong>BC</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12,036 deliveries</td>
<td></td>
<td>17,912 deliveries</td>
<td></td>
</tr>
<tr>
<td><strong>Births n (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>9,215 (76.6)</td>
<td>1,965 (16.3)</td>
<td>11,553 (64.5)</td>
<td>3,436 (19.2)</td>
</tr>
<tr>
<td>South Asian</td>
<td>1,965 (16.3)</td>
<td></td>
<td>3,436 (19.2)</td>
<td></td>
</tr>
<tr>
<td>Chinese</td>
<td>856 (7.1)</td>
<td></td>
<td>2,923 (16.3)</td>
<td></td>
</tr>
<tr>
<td>Maternal age, mean (SD)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>31.9 (5.3)</td>
<td>31.9 (4.8)</td>
<td>32.8 (5.2)</td>
<td>31.7 (4.6)</td>
</tr>
<tr>
<td>South Asian</td>
<td>31.9 (4.8)</td>
<td></td>
<td>31.7 (4.6)</td>
<td></td>
</tr>
<tr>
<td>Chinese</td>
<td>34.8 (4.3)</td>
<td></td>
<td>34.7 (4.3)</td>
<td></td>
</tr>
<tr>
<td>Urban resident, %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>84.4</td>
<td>98.4</td>
<td>92.5</td>
<td>99.4</td>
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<tr>
<td>South Asian</td>
<td>98.4</td>
<td></td>
<td>99.4</td>
<td></td>
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<tr>
<td>Chinese</td>
<td>99.2</td>
<td></td>
<td>99.5</td>
<td></td>
</tr>
<tr>
<td>Mean gestational age, (SD)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>38.2 (1.9)</td>
<td>38.1 (1.9)</td>
<td>38.3 (1.9)</td>
<td>38.4 (2.0)</td>
</tr>
<tr>
<td>South Asian</td>
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<td></td>
<td>38.4 (2.0)</td>
<td></td>
</tr>
<tr>
<td>Chinese</td>
<td>38.4 (1.6)</td>
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<td>38.4 (1.8)</td>
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**significant differences** at p<0.05 level among ethnic groups within province
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<td>12,036 deliveries</td>
<td>17,912 deliveries</td>
</tr>
<tr>
<td>Other</td>
<td>South Asian</td>
<td>Chinese</td>
</tr>
<tr>
<td>Pre-pregnancy weight ≥ 91 kg*, %</td>
<td>22.9</td>
<td>8.9</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>South Asian</td>
</tr>
<tr>
<td>Nulliparas, %</td>
<td>38.1</td>
<td>33.9</td>
</tr>
<tr>
<td>Smoking, %</td>
<td>18.9</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>13.7</td>
<td>3.9</td>
</tr>
<tr>
<td></td>
<td>42.0</td>
<td>38.7</td>
</tr>
<tr>
<td></td>
<td>9.9</td>
<td>0.8</td>
</tr>
</tbody>
</table>

*20% missing pre-pregnancy weight in BC significant differences at p<0.05 level among ethnic groups within province
Crude GDM prevalence by ethnicity and province, 2004/05 to 2009/10

Alberta

BC

Other  South Asian  Chinese

Perinatal Services BC
An agency of the Provincial Health Services Authority
Crude and Age-adjusted prevalence of GDM by ethnicity and province, 2004/05 to 2009/10

Per 100

Alberta

BC

Other South Asian Chinese

Other South Asian Chinese

Crude Age-adjusted

Perinatal Services BC
An agency of the Provincial Health Services Authority
### Ethnicity and Odds of GDM

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Alberta % GDM</th>
<th>Adjusted OR (95% CI)</th>
<th>BC % GDM</th>
<th>Adjusted OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other</td>
<td>4.2</td>
<td>Ref.</td>
<td>5.8</td>
<td>Ref.</td>
</tr>
<tr>
<td>South Asian</td>
<td>8.5</td>
<td>2.26 (2.13, 2.39)</td>
<td>14.0</td>
<td>2.13 (2.03, 2.23)</td>
</tr>
<tr>
<td>Chinese</td>
<td>11.0</td>
<td>2.27 (2.09, 2.47)</td>
<td>13.5</td>
<td>2.93 (2.80, 3.06)</td>
</tr>
</tbody>
</table>

Multivariable logistic model adjusted for maternal age, urban residency, pre-pregnancy weight (≤45kg, 46kg-90kg, ≥91kg), height (<152cm), smoking during pregnancy, multiple deliveries to same woman.
## Maternal and Neonatal Outcomes by GDM 2004/05 to 2009/10

<table>
<thead>
<tr>
<th></th>
<th>Alberta</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Other GDM</td>
<td>Other No GDM</td>
<td>South Asian GDM</td>
<td>South Asian No GDM</td>
<td>Chinese GDM</td>
<td>Chinese No GDM</td>
<td>BC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Induction %</td>
<td>Cesarean %</td>
<td>LGA %</td>
<td>SGA %</td>
<td>Induction %</td>
<td>Cesarean %</td>
<td>LGA %</td>
</tr>
<tr>
<td>GDM</td>
<td>36.6</td>
<td>33.7</td>
<td>37.3</td>
<td>19.8</td>
<td>6.9</td>
<td>42.6</td>
<td>24.4</td>
<td>22.1</td>
</tr>
<tr>
<td>No GDM</td>
<td>22.9</td>
<td>22.0</td>
<td>26.6</td>
<td>10.4</td>
<td>8.2</td>
<td>16.8</td>
<td>28.4</td>
<td>14.5</td>
</tr>
<tr>
<td>South Asian</td>
<td>29.6</td>
<td>34.0</td>
<td>26.5</td>
<td>6.0</td>
<td>10.9</td>
<td>20.1</td>
<td>28.4</td>
<td>11.5</td>
</tr>
<tr>
<td>Chinese</td>
<td>20.1</td>
<td>30.5</td>
<td>11.5</td>
<td>5.0</td>
<td>13.9</td>
<td>16.8</td>
<td>30.5</td>
<td>7.0</td>
</tr>
<tr>
<td>Other GDM</td>
<td>42.6</td>
<td>24.4</td>
<td>22.1</td>
<td>11.5</td>
<td>4.9</td>
<td>20.7</td>
<td>38.5</td>
<td>10.1</td>
</tr>
<tr>
<td>Other No GDM</td>
<td>16.8</td>
<td>28.4</td>
<td>14.5</td>
<td>7.0</td>
<td>5.8</td>
<td>17.1</td>
<td>30.5</td>
<td>7.4</td>
</tr>
<tr>
<td>South Asian GDM</td>
<td>20.7</td>
<td>38.5</td>
<td>11.5</td>
<td>8.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Asian No GDM</td>
<td>18.3</td>
<td>34.3</td>
<td>30.5</td>
<td>11.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chinese GDM</td>
<td>13.4</td>
<td>28.3</td>
<td>7.4</td>
<td>8.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chinese No GDM</td>
<td>12.3</td>
<td>8.6</td>
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</tbody>
</table>

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Perinatal Services BC
An agency of the Provincial Health Services Authority
## Maternal and Neonatal Outcomes
**GDM-involved deliveries, 2004/05 to 2009/10**

<table>
<thead>
<tr>
<th></th>
<th>Alberta</th>
<th></th>
<th></th>
<th>BC</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Other</td>
<td>South Asian</td>
<td>Chinese</td>
<td>Other</td>
<td>South Asian</td>
</tr>
<tr>
<td>Induction</td>
<td>Ref.</td>
<td>0.96 (0.86, 1.07)</td>
<td>0.76 (0.64, 0.89)</td>
<td>Ref. 0.72 (0.65, 0.80)</td>
<td>0.89 (0.81, 0.99)</td>
</tr>
<tr>
<td>Cesarean</td>
<td>Ref.</td>
<td>1.01 (0.90, 1.12)</td>
<td>0.76 (0.65, 0.89)</td>
<td>Ref. 0.68 (0.62, 0.74)</td>
<td>0.93 (0.85, 1.01)</td>
</tr>
<tr>
<td>LGA</td>
<td>Ref.</td>
<td>0.54 (0.46, 0.63)</td>
<td>0.37 (0.28, 0.50)</td>
<td>Ref. 0.49 (0.43, 0.56)</td>
<td>0.48 (0.42, 0.54)</td>
</tr>
<tr>
<td>SGA</td>
<td>Ref.</td>
<td>1.70 (1.43, 2.02)</td>
<td>1.35 (1.05, 1.72)</td>
<td>Ref. 1.60 (1.35, 1.89)</td>
<td>2.07 (1.77, 2.41)</td>
</tr>
</tbody>
</table>

Multivariable logistic model adjusted for maternal age, urban residency, pre-pregnancy weight (≤45kg, 46kg-90kg, ≥91kg), height (<152cm), smoking during pregnancy, multiple deliveries to same woman.
Conclusion

• Maternal age is a major contributor to ethnic differences in GDM prevalence, and more pronounced in Chinese women
• Similar or lower odds of induction and cesarean delivery among ethnic women with GDM (except cesarean delivery for Chinese women in BC)
• Babies born to ethnic women with GDM have increased odds of being considered SGA
• Future exploration of ethnic differences are needed to tailor strategies to reduce/prevent GDM
Limitations

• Misclassification:
  – Diagnosis of GDM
  – Ethnicity determined by surname-based algorithms
  – LGA/SGA definition is a Canadian standard

• Selection bias
  – Universal screening?

• Uncaptured confounders
  – No adjustment for GDM treatments
Acknowledgements

- Padma Kaul, PhD\textsuperscript{1}
- Ana Savu, PhD\textsuperscript{1}
- Roseanne O Yeung, MD, MPH\textsuperscript{1}
- Jeffrey A Johnson, PhD\textsuperscript{2}
- Lois E Donovan, MD\textsuperscript{3}

\textsuperscript{1}Division of Epidemiology, University of Alberta
\textsuperscript{2}School of Public Health, University of Alberta
\textsuperscript{3}Division of Endocrinology, University of Alberta
Questions?
Ethnic Distribution of Female Population and GDM cases

- **BC GDM**
  - Other: 65% (16% Chinese, 19% South Asian)

- **BC Pop.**
  - Other: 83% (11% Chinese, 7% South Asian)

- **Alberta GDM**
  - Other: 77% (7% Chinese, 16% South Asian)

- **Alberta Pop.**
  - Other: 92% (4% Chinese, 4% South Asian)
GDM rate within BMI categories, 2004/05 to 2009/10
GDM rate within BMI categories by HA
2004/05 to 2009/10
GDM rates by age, Canada

FIGURE 2: Rates of maternal diabetes by age group in Canada, 2010/11

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Type 1 Diabetes</th>
<th>Type 2 Diabetes</th>
<th>Gestational Diabetes</th>
</tr>
</thead>
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<td>15-19 YRS</td>
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<td>45-49 YRS</td>
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</tr>
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</table>

SOURCE: Canadian Institute for Health Information, Discharge Abstract Database (DAD). Quebec data was not included because it does not contribute to DAD. Rates have been suppressed <5

Source: PHAC Report Maternal Diabetes in Canada
GDM rate within age groups, 2004/05 to 2009/10
GDM rate within age categories by HA 2004/05 to 2009/10
GDM rate within ethnic groups by HA 2004/05 to 2009/10