Diagnosis and Management of Gestational Diabetes Mellitus

Prof. Dr Md Faizul Islam Chowdhury
Professor of Medicine,
Department of Medicine, DMCH.
I, the Fetus

I, the fetus
Want to say
For this travel
What I pay?
It’s the sugar
Which is curse
Hit me, beat me
Break my parts
You have sugar
I have none
Should it bother
Should I run?
Gestational Diabetes Mellitus

Gestational diabetes is defined as

- Any degree of glucose intolerance
- first recognized during pregnancy,
- regardless of whether the condition may have predated the pregnancy or persisted after the pregnancy.

N.B.:
- Women with diabetes in the first trimester would be classified as having type 2 diabetes.
- GDM is diabetes diagnosed in the second and third trimester of pregnancy that is not clearly overt diabetes.
This definition will include a few patients who develop type 1 diabetes during pregnancy, where prompt action and insulin treatment will be required, and some patients who develop type 2 diabetes, or had unknown pre-existing type 2 diabetes, in whom the diabetes does not remit after pregnancy.
Fundamental Mechanism

Normal Mother
- Pregnancy
- Pregnancy induced insulin resistance (PIIR)
- Hyperglycaemia
- ↑ insulin
- Normal glucose level

GDM Mother
- Pregnancy induced insulin resistance (PIIR)
- Hyperglycaemia
- Insulin production mechanism ineffective
- Hyperglycaemia during pregnancy
Pathophysiology

• Insulin resistance during pregnancy
  - Growth hormone,
  - Cortisol secretion
  - Human placental lactogen
  - Insulinase
• Glucose insulin imbalance
  - Estrogen and
  - Progesterone
• Calorie imbalance

- Increased maternal adipose tissue deposition,
- Decreased exercise and
- Increased calorie intake
In Short

Pathophysiology of GDM

- Hormones produced by placenta like estrogen, progesterone, cortisol & human placental lactogen
  - Contra insulin effect
  - Additional insulin requirement to overcome the effect

  - Inadequate insulin production
    - GDM

  - Additional insulin produced by pancreatic β cells
    - Normal pregnancy
Risk factors

According to the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), risk factors for gestational diabetes including:

- Overweight or obesity
- Prediabetes
- Previously giving birth to a baby weighing more than 9 pounds

- Having a family member with Type 2 diabetes

- Having gestational diabetes in a previous pregnancy
Diagnosis

The diagnosis of GDM can be accomplished with either two strategies:

1. Traditional- One Step 75 gm OGTT
2. Two Step Strategy
“One-step” 75 g OGTT:

Candidates are:
1. Pregnant mother at 24-28 weeks of gestation
2. not previously diagnosed with overt diabetes

Plasma glucose measurement ---
- when patient is fasting,
- at 1 and
- At 2 hr

**The OGTT should be performed in the morning after an overnight fast of at least 8 hr.**
The diagnosis of GDM is made if the following values are met or exceeded:

<table>
<thead>
<tr>
<th>Fasting</th>
<th>92 mg/dl (5.1 mmol/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 hr</td>
<td>180 mg/dl (10.0 mmol/L)</td>
</tr>
<tr>
<td>2 hr</td>
<td>153 mg/dl (8.5 mmol/L)</td>
</tr>
</tbody>
</table>
Two step Strategy

• Step 1:
  - Perform a 50 g GLT (non fasting)
  - Plasma glucose measurement at 1 hr,
  - 24-28 weeks of pregnancy in women not previously diagnosed with overt diabetes.

If plasma glucose level measured 1 hr after the load is $\geq 140$ mg/dl (7.8 mmol/L), proceed to a 100 gm OGTT.
• Step 2:
The 100 gm OGTT should be performed when the patient is fasting. The diagnosis of GDM is made if at least two of the following four plasma glucose level are met or exceeded:

<table>
<thead>
<tr>
<th>Timing</th>
<th>Carpenter/Coustan</th>
<th>NDDG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting</td>
<td>95 mg/dl (5.3 mmol/L)</td>
<td>105 mg/dl (5.8 mmol/L)</td>
</tr>
<tr>
<td>1 hr</td>
<td>180 mg/dl (10.0 mmol/L)</td>
<td>190 mg/dl (10.6 mmol/L)</td>
</tr>
<tr>
<td>2 hr</td>
<td>155 mg/dl (8.6 mmol/L)</td>
<td>165 mg/dl (9.2 mmol/L)</td>
</tr>
<tr>
<td>3 hr</td>
<td>140 mg/dl (7.8 mmol/L)</td>
<td>145 mg/dl (8.0 mmol/L)</td>
</tr>
</tbody>
</table>
COMPLICATIONS OF GDM
Oh Womb, my womb

Oh womb, my womb
Am I wrong?

It’s my travel
Too much long

Sometimes large (Macro.)
And sometimes trifled (Gr. retd.)

Sometimes yellow (↑bili.)
Sometimes crippled (cong. ano)

It’s your sugar
Fall in danger (hypo.)

Breaks my travel
Too much bother
Not much, not much
   Be I alive
You with sugar
   Of course shrive.
Make me larger
   Movement rare (Obst. lab)
How I see light
   With this fear?
Sometimes dusky
   Sometimes bluish (Polycyth)
Muscle twitching (Hypocal)
   As you wish
Fetal Complications
Macrosomia
Hypoglycemia
Hypocalcaemia
Polycythemia
IUGR
ARDS
Cong. anomalies
## Complications

### Baby

- Macrosomia
- Intrauterine growth retardation
- Neonatal hypoglycemia
- Polycythemia
- Hyperbilirubinemia
- Neonatal hypocalcaemia
- Respiratory distress syndrome
- Congenital malformations
Macrosomia

Gestational Diabetes

High blood glucose levels in mother

Brings extra glucose to baby

Causes baby to put on extra weight
Hyperbilirunanaemia
Maternal Complications
Helpless, helpless I to abort
Out out out out with little support

Drinking sinking in the ocean
Dying living in the mission
Mission mission mission blurring vision

Body bloater, Kidney porous
Limbs are jerky, unconscious

Abortion
IUD
Polyhydramnios
Pre-eclampsia
Eclampsia
Helpless, helpless I to abort
Out out out out with little support

Sugar flourish (DM uncontrolled)
Organ vanish (Organ failure)
Lost my fetus, will I perish?

Helpless helpless I to abort
Out out out out with little support
GDM

Abortion

Eclampsia

Pre eclampsia

Polyhydramnios

Uncontrolled DM

Chronic complications of DM
## Complications

<table>
<thead>
<tr>
<th>Mother</th>
</tr>
</thead>
</table>
| - Pregnancy loss - abortion  
- Polyhydramnios  
- Pre eclampsia  
- Eclampsia  
- Difficulty in diabetes control  
- Deterioration of pre existing complications like retinopathy or neuropathy etc. |
IUGR
Fetus and neonates:

• **Fetal death** has long been thought to be associated with GDM, but there have been no well-designed trials.

• The hallmark complication of GDM is **macrosomia**, defined as an infant weighing more than 9 lb (~4 kg).
Shoulder dystocia, a complication of macrosomia, is defined as impaction of the anterior fetal shoulder behind the maternal pubic symphysis.
Neonatal hypoglycemia occurs more often in pregnancies complicated by GDM, resulting in possible coma or even death if undetected.
What I Feel….

Short to breath and
hard to cry
Should I survive
Or to die.
Lot, lot and lot
Oh my Lord!
Why thou bind me
With this cord?
It’s my query
To my womb
Wrong it? wrong it?
Oh my womb….
What womb Says...

Not that wrong
Mostly right
I will try
Help you fight
Might, might and might
With all my might
I will try
To give your right
Now we will try to establish the right of the fetus -------
Management of GDM
Management Strategies

• Preconception counseling
• Medical nutrition therapy (Diet)
• Exercise for pregnant mother
• OHA for pregnant mother
• Insulin for pregnant mother
Preconception counseling

• Importance of the strict glycemi control prior to conception and during pregnancy.

**Increased risk of diabetic embryopathy with elevated A1C----

✓ Anencephaly,
✓ Microcephaly and
✓ Congenital heart disease
Preconception counseling visits should include:

- Routine rubella,
- Hepatitis B virus, and
- HIV testing as well as
- Pap smear,
- Cervical cultures,
- Blood typing and
- Prescription of prenatal vitamins.
Diabetes specific management should include

- A1C,
- TSH,
- S. Creatinine
- ACR testing

** Referral for an ophthalmologic examination is also recommended.
Treatment of gestational diabetes mellitus—
- Medical nutrition therapy,
- Exercise and
- Glucose monitoring.

** Insulin has been recommended treatment for GDM.

** Randomized controlled trials support the efficacy and short term safety of glyburide and metformin for the treatment of GDM. However, both agents cross the placenta, and long term safety data are not available.
Medical nutrition therapy

• Ideally, by a licensed dietitian
• But this is not always feasible.
Daily total calorie intake in ideal body weight:

<table>
<thead>
<tr>
<th>Trimester</th>
<th>Kilo calorie</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>30 Kcal/Kg</td>
</tr>
<tr>
<td>Second and third</td>
<td>38 Kcal/Kg</td>
</tr>
</tbody>
</table>

Macro and micro nutrients:

<table>
<thead>
<tr>
<th>Name</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrate</td>
<td>50-60</td>
</tr>
<tr>
<td>Fat</td>
<td>30</td>
</tr>
<tr>
<td>Protein</td>
<td>10-20</td>
</tr>
<tr>
<td>Iron</td>
<td>Adequate</td>
</tr>
<tr>
<td>Folic acid</td>
<td>Adequate</td>
</tr>
<tr>
<td>calcium</td>
<td>Adequate</td>
</tr>
</tbody>
</table>
## Exercise
(Encourage, advice, avoid)

<table>
<thead>
<tr>
<th>Encourage</th>
<th>Moderate exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advise</td>
<td>Walking at a moderate speed for 30 minutes per day at a time or divided fashion</td>
</tr>
<tr>
<td>Avoide</td>
<td>Vigorous exercise or exercise with pressure on abdomen</td>
</tr>
</tbody>
</table>
**Treatment**

- **Oral hypoglycemic agents:**
  - OHA used in pregnancy include
    - Metformin,
    - Glibenclamide and
    - Glyburide;

**Most oral agents cross placenta or lack long term safety data.**

**Glibenclamide should be used rather than other sulphonylureas because it doesn’t cross the placenta.**
Insulin in Pregnancy

Why insulin is preferred in pregnancy?

1. It’s an effective blood sugar controller.

2. Lack of long term safety data for non-insulin agents.

3. The physiology of pregnancy requires frequent titration of insulin to meet changing requirements.
4. In the first trimester, there is often a decrease in total daily dose of insulin.

5. In the second trimester, rapidly increasing insulin resistance requires weekly or biweekly increase in insulin dose to achieve glycemic targets.
## Insulin and pregnancy categories

<table>
<thead>
<tr>
<th>Types of Insulin</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Insulin</td>
<td>Category B</td>
</tr>
<tr>
<td>Except Glargine &amp; Glulisine</td>
<td>Category C</td>
</tr>
</tbody>
</table>
Type and Dose of Insulin:

1. Short acting – bolus (prandial), large proportion

2. Intermediate acting – basal, small proportion

3. Insulin analogues may be used.

**injectable incretin-based therapies should not be used in pregnancy.**
Concerns related to type 1 DM in pregnancy

Women with type 1 diabetes----

• increased risk of hypoglycemia in the first trimester, associated with interuterine growth restriction.

• In addition, rapid implementation of strict glycemic control in the setting of retinopathy is associated with worsening retinopathy.

• Insulin resistance drops rapidly with delivery of the placenta.
Concerns related to type 2 DM in pregnancy

Pregestational diabetes---
  • associated with obesity.
  • Recommended weight gain

<table>
<thead>
<tr>
<th>Over weight</th>
<th>15-25 lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obese</td>
<td>10-20 lb</td>
</tr>
</tbody>
</table>

• Glycemic control is often easier to achieve in type 2 diabetes than in type 1 diabetes.
Glycemic target in pregnancy

Recommendations from the Fifth International Workshop-Conference on Gestational Diabetes Mellitus (6) stated maternal capillary glucose concentrations:

<table>
<thead>
<tr>
<th></th>
<th>≤95 mg/dl (5.3 mmol/L) &amp; either</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-prandial</td>
<td></td>
</tr>
<tr>
<td>One-hour post meal</td>
<td>≤140 mg/dl (7.8 mmol/L)</td>
</tr>
<tr>
<td>Two hour post meal</td>
<td>≤120 mg/dl (6.7 mmol/L)</td>
</tr>
</tbody>
</table>
For women with preexisting type 1 diabetes or type 2 diabetes who become pregnant, the following are recommended:

<table>
<thead>
<tr>
<th>Glucose Parameter</th>
<th>Target Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premeal, bedtime and overnight glucose</td>
<td>60-99 mg/dl (3.3-5.4 mmol/L)</td>
</tr>
<tr>
<td>Peak postprandial glucose</td>
<td>100-129 mg/dl (5.4-7.1 mmol/L)</td>
</tr>
<tr>
<td>A1C</td>
<td>&lt; 6.0%</td>
</tr>
</tbody>
</table>
A1C should be used as secondary measure

- Due to increases in red blood cell turnover, A1C levels fall during pregnancy.

- A1C represents an average, it may not fully capture physiologically relevant glycemic parameters in pregnancy.
Important specific ante natal check ups

- Retinal and renal assessment --- 1st visit
- Detailed ultrasound (anomaly scan) --- 20th week
- Ultrasound monitoring of fetal growth and amniotic fluid volume --- 28th week
- Tests of fetal well-being --- 38th week

Some of them may be repeated periodically.
Postpartum screening

• GDM may represent preexisting undiagnosed type 2 diabetes.

• Women with GDM should be screened for persistent diabetes or prediabetes at 6-12 weeks postpartum using non-pregnancy criteria and every 1-3 year thereafter depending on the risk factors.
RECOMMENDATIONS
5.1 – Fasting glucose

6 – Target A1C

7 – Achieving A1C

8.5 – 2hr glucose value
Recommendation 1

- Tight control will reduce the risk of congenital anomalies.
- achieve A1C < 7% without hypoglycaemia
Recommendation 2

- Target A1C is <6% without hypoglycemia
Recommendation 3

- Avoid teratogenic medications like
  - ACE inhibitors
  - Statins
Recommendation 4

- Proper medical nutrition therapy and exercise – 1st line
- Necessary medications – 2nd line
Recommendation 5

- For pregestational diabetes, baseline ophthalmologic examination during the 1st trimester, then every trimester.
Medications widely used during pregnancy include Insulin, metformin, glyburide and glibenclamide; though OHA lack long term safety data.
Diabetes means head not to bow
It means not to go slow
Diabetes means courage, it means pride
Diabetes means healthy and delight
ডায়াবেটিস মানে----রোগের কাছে মাথা নত না করা
ডায়াবেটিস মানে----চিকিৎসা নিয়ে সমঝোতা না করা
ডায়াবেটিস মানে সাহস, ডায়াবেটিস মানে দৃঢ় প্রত্যেক
ডায়াবেটিস মানে ভালভাবে যে চে থাকার তৃতীয় প্রত্যেক
THANK YOU ALL