Diabetes Mellitus in Pregnancy

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Learning Objectives

- Describe the differences in the pathophysiology of Type 1, Type 2, and gestational diabetes and the expected effect these differences will have on glycemic control.

- State the rationale for the goal of tight glycemic control in pregnancy and discuss collaborative measures to attain this goal in the hospitalized antepartum, intrapartum, and post-partum patient.

- Review methods of treating diabetes in pregnancy.
Introduction

- Diabetes affects 8% of pregnancies in the United States
  - 10% of these cases are Gestational Diabetes
  - 1-2% of those are Type 1 and Type 2
- Diagnosis of diabetes during pregnancy has increased in recent years and continues to rise
- From 2000 to 2010, the percentage of pregnant women with gestational diabetes increased 56% and the percentage of women with type 1 or type 2 diabetes before pregnancy increased 37%.

**DIABETES RISK FACTORS**
- AMA
- Family history
- Ethnicity
- Overweight/obese
- Sedentary
Definitions

- **GESTATIONAL DIABETES (GDM)** - any degree of impaired glucose tolerance with onset or first recognition during pregnancy

- **PRE-EXISTING DIABETES OR PREGESTATIONAL DIABETES** - diagnosis of diabetes prior to pregnancy
  - Type 1 Diabetes, Type 2 Diabetes
Diagnosis of GDM

2-step approach (preferred method at OUHSC):

❖ To be done 24-28 wks (unless risk factors present indicating earlier screening)

1. 50 gram glucola screen:
   Normal <135. If ≥ 135 <200, do 3 hr GTT below
   If ≥ 200, do not do GTT and proceed with treatment for GDM

2. 100 gram, 3-hr GTT (Carpenter & Coustan)

Parameters for diagnosis:
   meet or exceed: 95 / 180 / 155 / 140
   2 or more abnormal values: GDM
Gestational Diabetes

- **Pregnancy hormones** cause insulin resistance
- The body isn’t able to make enough insulin for the pregnancy
Pathophysiology - GDM

- Pregnancy hormones
- Insulin resistance
- Not enough insulin for pregnancy
- Too much glucose from the liver

High Blood Glucose or hyperglycemia
Pathophysiology-Type 2 Diabetes

- Most common type of diabetes in reproductive aged women
- Insulin resistance
Pathophysiology - Type 1 Diabetes

- No insulin production
- Dependent on insulin
Why Is This A Concern?

➢ As pregnancy progresses, insulin resistance increases → Caused by increased hormones of pregnancy

➢ Insulin production is more than twice non-pregnant levels
Why is this a Concern?

- Maternal glucose crosses the placenta and increases baby’s glucose levels
Maternal and Fetal Risks
Gestational Diabetes

- Fetal Risks
  - Growth disturbances
  - Intrauterine fetal demise

- Neonatal
  - Hyperbilirubinemia
  - Hypoglycemia
  - Obesity
  - Diabetes

- Maternal Risks
  - Pregnancy induced hypertension
  - Preeclampsia
  - Polyhydramnios
  - UTI/pyelonephritis
Maternal and Fetal Risks
Pre-Existing Diabetes

- **Fetal Risks**
  - Growth disturbances
  - Congenital anomalies
  - Intrauterine fetal demise
  - Miscarriage

- **Maternal Risks**
  - Pregnancy induced hypertension
  - Preeclampsia
  - Polyhydramnios
  - UTI/pyelonephritis

- **Neonatal**
  - Hyperbilirubinemia
  - Hypoglycemia
  - Obesity
  - Diabetes
How to Treat Diabetes in Pregnancy

- Monitoring
- Nutrition / Meal Planning
- Exercise
- Medicine
Diabetes in Pregnancy
Goals of Treatment

- Achieve normal blood glucose and hemoglobin A1C levels
  - Fasting < 95 mg/dL and 1hr PP < 140 mg/dL

- Prevent and/or minimize maternal and perinatal morbidity/mortality

**How?**

- **Diabetes Education:** Monitoring, Nutrition, Exercise, Medication
Diabetes Management: Monitoring

ACOG Guidelines - GDM, T2DM
- Fasting and Pre-prandial <95
- One hour postprandial <140
  - Two hour postprandial <120

- Type 1 DM - 7-8x daily testing, Fasting, Pre-meal, Post-meal, and HS, occasional 0300
- Hospitalized patients admitted for glucose control: 7-8x daily
- 3AM if nighttime hypoglycemia is a problem

Avoid blood sugars less than 70
Diabetes Management: Monitoring

- **Hemoglobin A1c**
  - Assess every trimester during pregnancy
  - **Pregnancy goal is A1C <6 %**
  - If A1c is elevated in first trimester, patient may have undiagnosed diabetes
Diabetes Education is Important!

- Any pregnant patient who has diabetes or develops GDM should have outpatient diabetes education.

- When hospitalized, if available, a diabetes educator can reinforce outpatient education.
Diabetes Management:
What happens if you don’t eat carbs?

- Possible ketosis
- Constipation
- Quick weight loss
- Lack of energy
- Decreased consumption of fruits and vegetables
- May interfere with insulin sensitivity (no improvement in BG control)
- No studies on low carb diets/pregnancy
WHAT TO DO WHEN DIET ISN’T ENOUGH?
Insulin Treatment in Pregnancy
Insulin Treatment in Pregnancy

Types of Insulin:
- Rapid-acting: starts to work 5-10 minutes, peaks 30-90 minutes
- Regular/Short-acting: starts to work 30 mins - 1 hour, peaks 2-5 hours
- Intermediate-acting: starts to work 1-2 hours, peaks 4-12 hours
- Long-acting: starts to work 1-2 hours, does not peak

Duration (hours):

Intensity
Intrapartum Management
Intrapartum Management: GDM

- Diet Controlled
  - BG on admission and every 2 hours
  - Carb controlled diets
  - IV: LR with D5 piggyback prn BG <100 mg/dl

- Insulin-requiring
  - BG on admission and every 2 hours
  - Insulin not usually needed in active labor
  - Insulin drip if BG >110 mg/dl
Intrapartum Management: Type 1 or Type 2 DM

- Target BG 70-110 mg/dl (best 110)
- Insulin infusion or insulin pump (if allowed)
- IV fluids (maintain LR, Kcal needed or BG <100 mg/dl: dextrose IV)
- Check BG on admission and every hour
- NPO or carb free liquids
# Intrapartum Management: Insulin Drip Protocol

**Initial Order**

**START PROTOCOL**

This protocol is NOT for treatment of diabetic ketoacidosis or hyperosmolar coma.

### IV

- Primary IV infusion: D10W at 30 ml/hr. UNLESS patient is on Total Parenteral Nutrition (TPN) with Dextrose 10% or greater OR on enteral feedings (continuous carbohydrate in tube feedings).
- Secondary IV infusion: 100 units of regular insulin/100 ml NS
- The dextrose infusion must be continued for at least 2 hours after insulin is discontinued. ALL IV PBS IN NORMAL SALINE IF COMPATIBLE.

### Insulin

**Start INITIAL INSULIN INFUSION RATE (100 units Regular Insulin/100 ml 0.9% Sodium Chloride):**

<table>
<thead>
<tr>
<th>Blood Glucose (mg/dL)</th>
<th>Initial Insulin Infusion Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>75 - 150</td>
<td>1 unit IV push then 1 unit per hour</td>
</tr>
<tr>
<td>151 - 250</td>
<td>2 units IV push then 2 units per hour</td>
</tr>
<tr>
<td>251 - 350</td>
<td>3 units IV push then 3 units per hour</td>
</tr>
<tr>
<td>Above 350</td>
<td>4 units IV push then 4 units per hour</td>
</tr>
</tbody>
</table>

**ADJUSTING INSULIN INFUSION RATE AFTER INITIAL RATE HAS BEGUN:**

- Choose Adjustment Table 1, 2 or 3 based on last insulin infusion rate before adjustment.
- Determine the last BS result and locate it in the first column.
- Determine the current BS and locate that in the row across the top.
- Determine the rate of change at the intersection of the row and column.
- Minimum infusion rate is 0 units/hour even if the calculated rate is less.
- If insulin drip is STOPPED for one (1) hour or more, check BS and restart using initial Insulin Infusion (as above).

For insulin infusion rates >8 units/h, do not exceed, where indicated, the (MAXIMUM INFUSION) rates in table 3.

**Use Glucometer values only for insulin protocol.** (Levels that need lab confirmation must still be obtained for linearity)
Intrapartum Management: Elective Cesarean Section

- Take usual intermediate acting insulin on the evening prior to delivery
  - Take 80% of dose of long acting insulin in morning based on morning BG

- Measure blood glucose level in OR prior to anesthesia

- Postoperatively use sliding scale
- Check BS q2-4h until oral intake established
- Fasting and 2h postprandial once eating
Diabetes Technology Use During Delivery

- Can be ideal for Type 1 DM management

**Common guidelines**
- Alert, oriented, Demonstrate Knowledge
- Discontinue for decreased cognition
- Physician orders
- Non-suicidal
- Furnish own supplies
- Remove for surgery, MRI/CT scans/X-rays
- Possible release form
- Must not be off pump for >1 hr, risk of DKA

- Continuous glucose monitor: not approved for hospital use, helpful with Type 1/pregnancy, measures glucose in interstitial fluid
Intrapartum Management: Timing of Delivery

- Depends on fetal size and glucose control
  - Usually 37-39 weeks gestation

- Diet controlled, AGA fetus – may be able to deliver at 39-40 weeks
Intrapartum Management: Betamethasone Use in Preterm Labor

- Glucocorticoids (Corticosteroids)
- Increase hepatic glucose production
- Inhibit glucose uptake into muscle
- Affect beta-cell function
  - Day 1: double all insulin (IV or subQ) within 4 hours of injection
  - Day 2: continue increased doses, modify prn
  - Day 3: decrease by 50%, add to original dose
  - Day 4: revert to pre-Betamethasone dose
Intrapartum Management: BG Control During Admission

- Follow Hospital Policy and Procedure
- Use hospital monitor, not patient’s
- **Factor’s affecting accuracy**: Hematocrit, fluid status, temperature, meds, hypotension, pH, oxygenation, user error

**Frequency**
- Before meal, HS (if correcting pre-meal)
- Before meals, 1-2 hours post-meal, HS
- Type 1 or 2 may include 3 AM
Postpartum Care: GDM

- **Discontinue insulin (or oral agent) after delivery**
- Blood glucose monitoring for 48 hours
- If fasting blood glucose levels are persistently elevated (>126) after 48 hours, consider restarting insulin or oral hypoglycemic

**TESTING**

- ACOG recommends a 2 hour (75 g) GTT at 4-12 weeks postpartum for all women with gestational DM, then 1-3 years since pregnancy

- Between 15-70% of women with GDM will develop diabetes later in life
Postpartum Care: Type 1 and Type 2 Diabetes

- Insulin requirements decline sharply after delivery
  - (honeymoon period after placental delivery)
- Glycemic goals less stringent:
  - FBG <100, 1 hour PP <150
- Type 2: D/C insulin @ placental delivery, may need SC insulin
- Type 1: convert IV insulin to SC insulin
  - Usually require 40-50% of pregnancy dose
  - Re-initiate pre-pregnancy regimen after delivery
  - Sliding Scale insulin for additional coverage
Breastfeeding: Type 1 and Type 2 Diabetes

- Type 2: assess oral agents
- Insulin safe, Metformin safe in breastfeeding
- Hypoglycemia precautions important, especially with Type 1 (frequent monitoring, may be able to snack with no insulin)
- Good control necessary for milk production
Breastfeeding GDM

- May reduce risk of diabetes in child

- Promotes weight loss (burns 500 kcal/day) while exclusively breastfeeding

- Lowers BG, may delay need for medication
Conclusions

- Early, aggressive treatment of diabetes during pregnancy is important to improve outcomes (maternal, fetal, neonatal, and possibly lifelong).

- All people caring for the patient with diabetes are responsible for teaching, and altering treatment plan as necessary.

- Long term follow up of women who had gestational diabetes is recommended.
Questions?