Diabetes in Pregnancy

Late at night, and without permission, Rueben would often enter the nursery and conduct experiments in static electricity.

Impact of Diabetes in Pregnancy

Incidence:

- 16 million people have diabetes in U.S.
- 800,000 have type 1 diabetes
- 75 million have type 2 diabetes
- 150,000 pregnancies complicated by diabetes
Statistics

- Diabetes responsible for 60,000 deaths in U.S. each year; contributes to another 190,000 deaths
- 2 to 4 times more likely to have stroke or heart attack
- Diabetes causes nerve damage to heart
- Lowers HDL, raises LDL
- 60 million- insulin resistance, 25% will develop diabetes

Types of Diabetes Mellitus

- **Type 1**
  - insulin dependent
  - pancreatic cell dysfunction
  - average age < 30

- **Type 2**
  - non-insulin dependent
  - appears more commonly in adults >40
  - obesity
  - positive family hx
  - insulin resistant
Types of Diabetes con’t

• Type 3
  – gestational

• Type 4
  – diabetes mellitus secondary to another disease or drug treatment

Classification Systems

• National Diabetes Data Group
• Pederson’s Prognostically Bad Signs of Pregnancy
• Buchanan and Coustan’s Classification System
• Dr. Priscilla White’s
National Diabetes Data Group Classification

- Insulin dependent diabetes mellitus (IDDM) or type 1
- Non insulin dependent diabetes mellitus (NIDDM) or type 2
- Secondary or other types of diabetes
- Malnutrition related diabetes
- Impaired glucose tolerance (IGT)
- Gestational diabetes mellitus (GDM)

Pederson’s Prognostically Bad Signs of Pregnancy

- Ketoacidosis
- Pylonephritis
- PIH
- Poor clinic attendance
- Self neglect
Buchanan and Coustan

classification by risk/outcomes

• **Pregestional Diabetes**  (10%)
  – Type of maternal diabetes (type 1 or 2)
  – Metabolic control and timing (early or late pregnancy)
  – Maternal vascular complications (retinopathy, nephropathy and/or atherosclerosis)

• **Gestational diabetes**  (90%)
  – fetal risks
  – neonatal risks
  – maternal risks

• **Metabolic control**
  – fasting glucose<105 mg/dL (class A1, GDMA1)
  – fasting glucose>105 mg/dL (class A2, GDMA2)
Priscilla White’s Classification of diabetes in pregnancy

Gestational Diabetes
• discovered during pregnancy
• diet controlled
• may require insulin

Pre-existing Diabetes Mellitus
• class A,B,C,D,R,F,RF,H,T

Metabolism in Pregnancy

• Pregnancy is a diabetogenic state
• Maternal metabolism is altered to ensure appropriate supply of glucose to fetus
• Maternal insulin does not cross the placenta
Normal Metabolism in the 1st Trimester

- Beta cells of pancreas become hypertrophied
- Hyperinsulinemia results
- Increased maternal fat storage (anabolism)
- Prepares mother for increased demands of pregnancy

Normal Maternal Metabolism During 2nd & 3rd Trimester

Rising levels of:
- human placental lactogen
- estrogen
- progesterone
- cortisol
- prolactin
- insulinase
2nd and 3rd Trimester, Normal Maternal Metabolism

Result:
Increase in insulin resistance
Late Pregnancy- catabolic state
Birth- expulsion of placenta causes immediate drop in hormone levels

Pathophysiology of Diabetes

Diabetes-
A systemic disorder of carbohydrate, protein and fat metabolism
This disease is characterized by hyperglycemia
Insulin

- Produced by the beta cells located in the islets of Langerhans in the pancreas
- Responsible for transport of glucose into the cell
- Lack of, or ineffective use of insulin, causes glucose to accumulate in the blood
- Hyperglycemia results

Metabolic Alterations

Hyperglycemia
- causes hyperosmolarity of the blood
- attracts intracellular fluid into the vascular system
- results in cellular dehydration & increase in blood volume
- results in polyuria, glycosuria, and polydipsia
Ketoacidosis

- Inability to convert carbohydrates (glucose) into energy
- Results in burning of protein (muscle) and fats
- End products: ketones & fatty acids
- Excess ketones \(\Rightarrow\) ketoacidosis
- Weight loss occurs
- State of starvation
- Polyphagia results (excessive eating)

DKA in Pregnancy, Signs and Symptoms:

- abdominal pain
- nausea/vomiting
- polyuria
- polydipsia
- fruity breath

**Diagnosis**

- BG> 300mg/dL
- bicarbonate 15mEq/L
- pH < 7.3

- kussmaul respirations
- leg cramps
- altered mental status
- hypotension
Hypoglycemia

Mild Hypoglycemia - symptoms:
- pallor
- hunger
- diaphoresis
- paresthesia
- tachycardia, palpitations
- shakiness

Treatment: ingest 10-15 grams carbohydrate, recheck BG in 15 minutes and retreat if unresolved

Moderate Hypoglycemia

Symptoms:
- inability to concentrate
- confusion
- slurred speech
- irrational behavior
- blurred vision
- somnolence
- extreme fatigue

Treatment:
- ingest 15-30 grams of carbohydrate
- recheck BG in 15 min. if unresolved
- symptoms may not resolve immediately
Severe Hypoglycemia

**Symptoms:**
- disorientation
- loss of consciousness
- inability to arouse
- seizures

**Treatment:**
- administer glucagon (1mg.) if unable to swallow
- if able to swallow, give honey, jelly or syrup
- retest BG frequently for several hours

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**Maternal Complications**

- Spontaneous abortion
- Preeclampsia
- Hydramnios
- Infections
- Diabetic emergencies:
  - hypoglycemia
  - DKA
Fetal Complications

- Congenital Anomalies
- Macrosomia
- IUGR
- RDS
- Hypoglycemia
- Polycythemia
- Hypocalcemia
- Hyperbilirubinemia
- Hypertrophic Cardiomyopathy

Management: Preconception Counseling

- Educate about all aspects of diabetes and pregnancy
- Discuss family planning
- Discuss achievement of optimal BG levels before pregnancy and why
- Evaluate the treatment of any existing maternal complications of diabetes
Preconception Assessment
Thorough History:

🔹 Type of diabetes
🔹 Age at diagnosis
🔹 Presence of acute/chronic complications
🔹 Knowledge deficits?
🔹 Dietary assessment
🔹 Psycho/social assess.
🔹 Physical exam

🔹 Labs:
  ➥ CBC, electrolytes
  ➥ UA/CS
  ➥ 24° urine for creatinine clearance & total protein
  ➥ Thyroid profile
  ➥ Lipid profile
  ➥ HbA1C

Antepartum Care:
Diet and Nutrition

• Women with desired pre-pregnancy wt. should gain 25-35 lbs.
• Underweight women should gain 28-40 lbs.
• Overweight women should only gain 15-25 lbs.
Diet for Pregnancy

- 40-50% carbohydrates (CHO)
- High in fiber
- 20% protein
- 30-40% fat

Sick Day Guidelines

- Take insulin at usual time
- Check urine for ketones
- If vomiting excessively check BG Q2°
- If unable to eat solid foods replace CHO with soft foods or fluids if BG<100
- Drink plenty of fluids, if BG>120 drink sugar free beverages
AP Fetal Monitoring Options for Insulin Dependent Women

NST’s:
• Weekly or semi-weekly starting no later than 32 weeks (earlier if complications) or-
• CSTs weekly starting no later than 32 weeks or-

BPPs:
• Weekly starting no later than 32 weeks

INSULIN (Humulin)

Initial dose: 0.5-1.0 U/kg/d or 0.2-0.4 U/lb/d
Distribution: 2/3 in AM ratio 1:2
1/3 in PM ratio 1:1

Insulin ratio is short acting to intermediate acting

<table>
<thead>
<tr>
<th>TYPE</th>
<th>ONSET</th>
<th>PEAK</th>
<th>DURATION</th>
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</thead>
<tbody>
<tr>
<td>Short acting (Regular)</td>
<td>15-30 min</td>
<td>2-4 hours</td>
<td>6-8 hours</td>
</tr>
<tr>
<td>Intermediate acting (NPH)</td>
<td>1-2 hours</td>
<td>6-12 hours</td>
<td>18-24 hours</td>
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</tbody>
</table>
Blood Glucose Goals in Pregnancy

Goals
- Fasting: 60-90 mg/dL
- Pre-Meal: 60-105 mg/dL
- 1 hour PP: 100-130 mg/dL
- 2 hour PP: 90-120 mg/dL
- 0200-0600: 60-120 mg/dL
- HbA1c: <6.0

Intrapartum
- NPO after midnight
- May take 1/3 to 1/2 usual dose insulin in AM
- Start IV (NS or LR at 70cc’s/hr)
- If insulin gtt needed, NS is mainline
- If pitocin used, a 2nd IV w/o glucose used
- Check BG Q1-2°, goal of 70-90mg/dL
- Administer glucose and insulin as necessary
- Continuous EFM
Postpartum Management

If type 1 diabetes and eating:
• ADA diet
• Follow with a sliding scale of Regular insulin or
• Give insulin dose 1/3 of her pre-pregnancy regimen
• Check FS Q 4-6 hours

Postpartum Management

If type 1 diabetes and NPO:
• Follow on a sliding insulin scale
• Then give insulin dose approximately 1/2 of her pre-pregnancy regimen
• Check FS Q 4-6 hours
Postpartum Management

Type 2 diabetes:
- Check FS 4 times a day
- If blood glucose exceeds 150-200 consistently, oral hypoglycemics

Lactation
- Provide support and education
- Meal plan used in 3rd trimester works well during lactation
- Cannot use oral hypoglycemics
- Women with type 2 diabetes who cannot maintain BG values with diet alone will need to take insulin throughout lactation
Gestational Diabetes

Carbohydrate intolerance of variable severity that is first detected during pregnancy
GDM is usually detected between 24 & 28 weeks gestation when insulin resistance of pregnancy becomes marked

Implications for Mother and Offspring

- There is a 6.4% mortality rate for pregnancies of women > 25 years old with untreated GDM compared to 1.5% rate in women with normal glucose tolerance
- Today fetal mortality is not significantly higher than general population if treated
- Same incidence of fetal/neonatal complications as women with pre-existing diabetes: macrosomia, shoulder dystocia, hypoglycemia, hypocalcemia, polycythemia, and hyperbilirubinemia
Indications for Screening

- Pregnancy between 24-28 weeks
- History of glucose intolerance
- Obesity
- Family history of type 2 diabetes
- Hypertension or hyperlipidemia
- Hispanic, Native American, African American
- Fasting BG of 126 or random BG of 200

Screening/Testing: 50 gram oral glucose

- Measures blood glucose 1 hour after 50 gram oral glucose dose
- Can be performed any time of day
- Reference range is 65-139
- Positive screen (>139mg/dL) should be followed by a 100 gm oral glucose load challenge and a 3 hour glucose tolerance test
### Reference Ranges for 3º test for GDM

<table>
<thead>
<tr>
<th>Time</th>
<th>Range</th>
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<tbody>
<tr>
<td>Fasting</td>
<td>65-94 mg/dL</td>
</tr>
<tr>
<td>1 Hour</td>
<td>65-179 mg/dL</td>
</tr>
<tr>
<td>2 Hour</td>
<td>65-154 mg/dL</td>
</tr>
<tr>
<td>3 Hour</td>
<td>65-139 mg/dL</td>
</tr>
</tbody>
</table>

### Blood Glucose Goals in Pregnancy with Diabetes

<table>
<thead>
<tr>
<th>Time</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting</td>
<td>60-90 mg/dL</td>
</tr>
<tr>
<td>Premeal</td>
<td>60-105 mg/dL</td>
</tr>
<tr>
<td>1 hour postprandial</td>
<td>100-120 mg/dL</td>
</tr>
<tr>
<td>2 hour - 6 hour</td>
<td>60-120 mg/dL</td>
</tr>
</tbody>
</table>
Diabetes Meal Plan

- Individualized with 3 meals and 2-4 snacks
- Meals and snacks eaten same time each day
- Avoid concentrated sweets and convenience foods
- Eat small breakfast
- Avoid fruit or juice in AM

Educational Considerations for Women with Pre-existing Diabetes

- Explain effects of maternal diabetes on baby
- Discuss insulin requirements
- Explain possible difficulty of glycemic control
- Offer referral to registered dietitian
- Assess her blood glucose monitoring technique periodically
Educational Considerations for Women with Pre-existing Diabetes Con’t

- Review S/S, treatment, causes, prevention of hypoglycemia
- Review injection sites
- Ask about her daily routine, create a schedule
- Provide written information
- Continue to work with mother during postpartum period

Educational Considerations for Women with GDM

- Teach pathophysiology of GDM
- Describe role of insulin
- Review results of 3° OGTT
- Emphasize implications for mother & baby
- Review basics of type 2 diabetes
- Refer to registered dietitian
- Discuss goals of glycemia
Educational Considerations for Women with GDM

- Teach self glucose monitoring
- Teach to test their 1st AM urine for ketones
- Provide written guidelines on when to contact member of healthcare team
- Stress importance of follow-up in postpartum period

Lantus

- Once a day insulin that delivers 24° basal coverage
- Administered at bedtime
- Used for adults with type 2 diabetes or adults/children with type 1 diabetes
- Should be used in pregnancy only if clearly needed
- Lactating women are advised to use caution because it is unknown if this insulin is excreted in significant amounts in human milk
Diabetes in Pregnancy

Late at night, and without permission, Rueben would often enter the nursery and conduct experiments in static electricity.

Barbara Craft Orekondy MS, RNC