Diabetes In Pregnancy

This Presentation by
Rafal Laith Faris
This Presentation will Discuss

- Definition of DM in Pregnancy
- Types of DM in Pregnancy
- Effect of Pregnancy on DM
- Effect of DM on Pregnancy
- Diagnosis of DM in Pregnancy
- Labor & Delivery of Diabetic Pregnant
- Management of DM in Pregnancy
Definition of DM in Pregnancy

- Abnormal maternal glucose regulation which occurs in 3-10% of pregnancies
Types of DM in Pregnancy

Gestational Diabetes

Preexisting DM
Diabetes in pregnancy

Pre-existing diabetes
- IDDM (Type 1)
- NIDDM (Type 2)

Gestational diabetes
- Pre-existing diabetes
- True GDM

IDDM (Type 1)
NIDDM (Type 2)
Pre-existing diabetes
True GDM
Preexisting DM in Pregnancy

- It’s chronic hyperglycemia present before the occurrence of pregnancy.
Pre-existing DM

- Type I (IDDM): There is absolute insulin deficiency, usually effects children and young adults.

- Type II diabetes (NIDDM): There is increase insulin resistance, usually effects adults.
Gestational Diabetes

- Carbohydrate intolerance of variable severity first recognized during the present pregnancy.

- This includes women with preexisting but previously unrecognized diabetes.
Gestational Diabetes

- Incidence 2-9%.
- More common in Asian and Indian women.
- In developed countries, increasing trend because of epidemic of obesity.
PHYSIOLOGICAL CHANGES OF GLUCOSE METABOLISM IN PREGNANCY

- Pregnancy is a state of insulin resistance & relative glucose intolerance.
- This is due to placental production of anti-insulin hormones: hPL, cortisol, and glucagon.
- FBS ↓↓.
- Postprandial glucose ↑↑.
- Insulin production ↑↑ 2 folds in N women.
- Insulin requirements ↑↑ in diabetic women.
- ↓↓ renal threshold for glucose ➔ glycosuria.
EFFECT OF PREGNANCY ON DM

- Insulin requirement ↑↑ in pregnancy reaching a max at term & being at least 2 X the pre-pregnancy requirement

- Pt with diabetic nephropathy ➠ deterioration in renal function with ↓ in creatinine clearance & proteinuria

- this deterioration in renal function is usually reversed after delivery
EFFECT OF PREGNANCY ON DM

- 2X ↑↑ in retinopathy
  - rapid improvement in glycemic control ➔ worsening retinopathy due to ↑↑ retinal blood flow

- ↑↑ incidence of hypoglycemia

- Ketoacidosis is rare unless associated with hyperemesis, infections, tocolytic & corticosteroid Rx
Effect of DM on Pregnancy

1) Maternal
Increase risk of pre-eclampsia.

Increase risk of infection; UTI, candidiasis, and postpartum.

Increase cesarean section rate.
Effect of DM on Pregnancy

2) Fetal
Early pregnancy:
Miscarriage, congenital abnormalities,

Late pregnancy:
Macrosomia, polyhydramnios, unexplained intrauterine fetal death, IUGR, increase perinatal mortality, shoulder dystocia.

Neonatal:
Hypoglycemia, hypomagnesemia, hypokalemia, hyperbilirubinemia, RDS, polycythemia.
Macrosomia

- Defined as birthweight above 90th % or >4000 grams.
- Occurs in 15-45% of diabetic pregnancies, a 4-fold increase over normal.
- Carries many morbidities including birth trauma, RDS, neonatal jaundice and severe hypoglycemia.
Congenital anomaly and diabetes

- Hyperglycemia is teratogenic.
- Chromosomal abnormalities are not increased.
- The commonest abnormality is congenital heart disease and neural tube defects.
- Other abnormalities may occur.
- Sacral agenesis is characteristic but rare.
POTENTIAL CONTRAINDICATIONS TO PREGNANCY

- Ischaemic heart diseases
- Active proliferative retinopathy, untreated
- Renal insufficiency: Cr. C1 < 50 ml/min or serum creatinine > 2mg/dl or heavy protein > 2g/24hr or hypertension (BP > 140/90 despite treatment)
- Severe gastroneuropathy: nausea, vomiting, and diarrhea
Diagnosis of Gestational DM
Diagnosis of Gestational DM

- In general, the test is performed between 24-28 wk because at this point in gestation the diabetogenic effect of pregnancy is manifest and there is sufficient time remaining in pregnancy for therapy to exert its effect.
Diagnosis of Gestational DM

- **Women at greater risk of developing GDM**
  1. age > 25y
  2. BMI > 25
  3. previous GDM
  4. Family hx of DM in 1st degree relative
  5. previous macrosomic baby (<4 kg)
  6. Polyhydramnios
  7. large for date baby in current pregnancy
  8. previous unexplained stillbirth
Women at low risk of developing GDM

1) Members of ethnic group with low prevalence of GDM.
2) No DM in 1st degree relatives.
3) Age < 25 year.
4) Not obese before pregnancy.
5) No HX. Of abnormal glucose metabolism.
6) No HX. Of poor obstetric outcome.
Diagnosis of Gestational DM

- In an identified low-risk group the risk of GDM is less than 2%.

- Women within the high-risk group should undergo glucose testing as soon as feasible.

- Women of average risk or found negative on initial screening should undergo the testing at 24-28 weeks of gestation.

- A FBS > 7 mmol/L or causal plasma glucose > 11.1 meets the threshold for diagnosis of DM and if confirmed on a subsequent day there is no need to do any glucose challenge.
Diagnosis of Gestational DM

- Women in whom the criteria of DM are met in pregnancy include women with diabetes who were undiagnosed before pregnancy.
- FBS > 7 mmol/L on 2 occasions.
- Or
- RBS > 11.1 mmol/L on 2 occasions.
- Borderline cases GTT DM is Dx if FBS > 7 mmol/L or 2 hrs > 11.1 mmol/L.
- Impaired glucose tolerance 2hrs G 8-11 mmol/L with a Normal FBS
Diagnosis

- **Glucose Challenge Test (24-28 wks)**
  - 50 gram glucose load with blood level 1 hour later.
  - Does NOT require fasting state.
  - Normal finding is <140 mg/dl.
  - If >140, need to do a 3 hour glucose tolerance test.
Diagnosis

**Glucose Tolerance Test**

- Draw a fasting glucose level (normal<95).
- Give 100 gram glucose load with glucose levels drawn after 1, 2 and 3 hours.
- Normal levels vary widely depending on who you ask but should be in the following ranges:
  - 1 hr:<180
  - 2 hr:<155
  - 3 hr:<140
- 2 or more abnormal values = GDM.
Monitoring

- Regular home glucose monitoring
- Bp Measurements
- Insulin may be need to be adjusted as gestation advances
- HbA1c monitoring
- Fetal monitoring with USG
Monitoring
1). Pre-existing Diabetes :-

- It is useful in evaluation of the degree of diabetic control over the period of 4-6 weeks before its measured and it is therefore very useful in the critical early weeks of pregnancy.

- Its level has been directly correlated with the increased incidence of congenital malformation in infants of diabetic mothers. The risks of congenital anomalies when the HbA1c is higher than the man value of the non-diabetic women in the first 8 weeks of gestation reached 28%.

- It is important to measure the HbA1c level when the diabetic woman first presents with plans for pregnancy. This should be advised to be as early as possible and continue with serial measurements every 4-6 weeks until the pre-pregnancy goal of near normal HbA1c value is achieved.
HbA1c measurement in pregnancy

2). Gestational DM :-
   - Initial HbA1C measurement is helpful.

1). If it’s in the non diabetic range which is usually the case, it reassures the woman the GDM was DX. At appropriate time & was probably not present earlier in gestation.
2). If is elevated: then it warns that glucose intolerance or even overt DM may have been present earlier in the pregnancy or even predated the pregnancy.

3). It serves as a baseline value in pregnancy. It should be measured every 4-6 weeks to monitor the control and help in adjustment of the insulin doses.
Ketonaemia during pregnancy has been associated with changes in the developing nervous system of the fetus and with decreased intelligence. It may also signal development of maternal ketoacidosis, which is associated with 50-90% mortality rate in the fetus.

Starvation ketosis commonly occurs after an overnight fast; so it is best to test for urinary ketones in a first monitoring urine sample.
If ketonuria occurs despite good glucose control and is repeatedly seen at a particular time of the day, then the patient may need the addition of a snack before that particular time.

Urinary ketones need also to be checked if a meal is delayed or missed, with any illness, and with any blood glucose >200mg/dl. Persistent ketonuria not responding to dietary change will require adjustment in the insulin doses.
# Frequency of Testing Maternal Status During Pregnancy for Women with Pre-existing Diabetes

<table>
<thead>
<tr>
<th>Test</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>HbA1c</td>
<td>Every 4-6 weeks</td>
</tr>
<tr>
<td>Glucose during weekly visits</td>
<td>During weekly or bi-weekly</td>
</tr>
<tr>
<td>Ketones</td>
<td>Daily</td>
</tr>
<tr>
<td>Urinalysis</td>
<td>SMBG 4-8 times daily</td>
</tr>
<tr>
<td>Kidney function</td>
<td>Daily</td>
</tr>
<tr>
<td>Thyroid function</td>
<td>During weekly or</td>
</tr>
<tr>
<td>Eye status</td>
<td>Each trimester</td>
</tr>
<tr>
<td>Repeat as necessary</td>
<td>Repeated</td>
</tr>
</tbody>
</table>

**SMBG** (Self-Monitoring Blood Glucose)
Pre-pregnancy counseling

- Most important in the management of diabetes.
- Good diabetic control is essential before pregnancy to prevent early complications.
- Diabetic control is measured by glycosylated Hb.
- Folic acid to reduce NTD 3 months before.
- If uncontrolled use contraception.
- If on oral hypoglycemic change to insulin.
- Advice healthy diet and lifestyle.
- May advice against pregnancy in some cases.
Antenatal care :-

- Should be managed in a joint clinic.
- Early booking.
- Anomaly scan at 18-22 weeks.
- Frequent antenatal follow up with U/S to monitor fetal growth.
- Check blood pressure and urine albumin at every visit.
- Avoid delivery before 38 weeks unless other complications.
- Pregnancy should not go beyond 40 weeks.
Controlling blood sugar

- Good control of blood sugar improves maternal and fetal complications.
- Good diet control but avoid starvation (3 meals and 3 snacks).
- Patients with newly diagnosed with gestational diabetes is can be first treated with diet control.
<table>
<thead>
<tr>
<th></th>
<th>Range</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fasting</strong></td>
<td>60 – 90mg/dl</td>
<td>3.3 – 5.0 mmol</td>
</tr>
<tr>
<td><strong>Pre-meal</strong></td>
<td>60 – 105mg/dl</td>
<td>3.3 – 5.8 mmol</td>
</tr>
<tr>
<td><strong>1 hr post prandial</strong></td>
<td>110 – 130mg/dl</td>
<td>6.1 – 7.3 mmol</td>
</tr>
<tr>
<td><strong>2 hr post prandial</strong></td>
<td>90 – 120mg/dl</td>
<td>5.0 – 6.7 mmol</td>
</tr>
<tr>
<td><strong>02.00 – 06.00 AM</strong></td>
<td>60 – 120mG/dl</td>
<td>3.3 – 6.7 mmol</td>
</tr>
</tbody>
</table>
Management of DM in Pregnancy

**Diet :-**

- Low-carbohydrate diet, high fiber with caloric restriction
- Frequent small snacks may be needed between meals
- Avoid starvation
Insulin in GDM

**Insulin used** if fasting blood glucose > 105 mg/dl or 1 hr postprandial blood glucose > 120 mg/dl on a diet

- Use basal bolus regime or pre-mixed insulin
- Short acting insulins (e.g. Lispro and Aspart) can be used to achieve postprandial control
- Long acting insulins (Glargine and Determir) are NOT licensed in pregnancy
- Insulin requirements increase by 50% from 20-24 weeks to 30-32 weeks, after which insulin needs often stabilize.
Management of DM in Pregnancy

**Insulin Analouges**

1. **rapid-acting insulin analogs (lispro)**
   - concerns about teratogenesis, antibodies formation, growth-promoting properties ,
   - majority of evidence showed that it does not cross placenta, and has no adverse maternal or fetal effects.

2. **Long acting analogs (glargine)**
   - Not well studied systemically.
Doses of insulin

Insulin

- Predominantly biosynthetic human insulin (U100)
- Requirements
  - 1st trimester 0.7-0.8 U/kg/d
  - 2nd trimester 0.8-1.0 U/kg/d
  - 3rd trimester 0.9-1.2 U/kg/d
Human insulin regimens

Combination of short-acting insulin with intermediate-acting or long-acting insulin in 1 2 to 4-injection routine

A.N, 0.5-1.0 Ukg⁻¹ day⁻¹ (0.2-0.4 Ulb⁻¹ day) \( \frac{2}{3} \) total dose in A.M, \( \frac{1}{3} \) total dose in P.M

Examples

Short-and-intermediate-acting insulin prebreakfast and predinner

Short-acting insulin before each meal + intermediate or long-Acting insulin at bedtime

Short-intermediate-action insulin before lunch

Most intensive insulin regimes will consist of > 2 injections/day to maintain euglycemia
Adjustments for unexplained hyperglycemia: check for deviations in diet and/or illness, then:

If prebreakfast blood glucose BG > 100mg/dl (5.5 mM) for 2-3 days
increase P.M intermediate-acting insulin by 2U or long-acting insulin by 1-2U.

If prelunch BG > 100mg/dl (5.5 mM) for 2-3 day, increase prebreakfast short-acting insulin by 2U or prelunch short-acting insulin by 1-2 U

If predinner BG > 100mg/dl (5.5 mM) for 2-3 days, Increase prebreakfast intermediate-acting insulin by 2U Prelunch short acting insulin by 1-2U

If bedtime BG > 120mg/dl (6.6 mM) for 2-3 days, increase predinner shot-acting insulin by 1-2U.
Management of DM in Pregnancy

Oral Hypoglycemic agents

Sulfonylureas:

- 1st generation drug increase risk of neonatal hypoglycemia
- 2nd generation drug (Glyburide) no such effect and other morbidities.
- 4%-20% patients failed to achieve glucose control with maximum dose of drug
- Increase risk of preeclampsia.
Oral Hypoglycemic agents

- **Biguanides (metformin):**
  - Commonly used in Polycystic Ovarian Disease (PCOD) to treat insulin resistance and normalize reproductive function.
  - Not teratogenic.
  - Reduce first trimester miscarriage.
  - 10X reduce gestational diabetes.
Management of DM in Pregnancy

Dosing of Oral agents

- **Glyburide**
  
  2.5 mg QD increased by 2.5 mg in 1 week and then increase 5mg weekly to maximum of 20mg

- **Metformin**
  
  500 mg QD to BID increase every 1 to 2 weeks to maximum of 2500 mg
LABOR & DELIVERY
LABOR & DELIVERY

- With well controlled DM with appropriately grown fetus ➔ pregnancy is allowed to proceed till term

- When there is concern about fetal well being or macrosomia ➔ the risk of IUFD must be weighed against the risk of RDS

- ½ of the babies are > 90\textsuperscript{th} centile ➔ CS rate of 50-60%
Management of diabetes in labour.

- C/S is for obstetric indications.
- Patient is kept NPO.
- Dextrose infusion is set up.
- Insulin infusion at rate of 2-6 units per hour.
- If patient is having a cesarean section morning dose of insulin is omitted.
- Continuous electronic fetal monitoring.
<table>
<thead>
<tr>
<th>Blood glucose, mmol/l</th>
<th>Insulin, u/hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 4</td>
<td>0</td>
</tr>
<tr>
<td>4 - 6</td>
<td>1</td>
</tr>
<tr>
<td>6.1 - 8</td>
<td>2</td>
</tr>
<tr>
<td>8.1 - 10</td>
<td>3</td>
</tr>
<tr>
<td>&gt; 10</td>
<td>Ask advice</td>
</tr>
</tbody>
</table>

If blood glucose remains above 7 after 1 hr of insulin infusion at 2u/hr, increase rate to 3u/hr
Patients with gestational diabetes may improve after delivery but they have an increased risk of developing GD in their next pregnancies and NIDDM later in life (40-60%).
Postpartum management

- Reduce the insulin to pre-pregnancy dose or half the pregnancy dose.
- Breast feeding mothers have lower insulin requirements.
- If delivered by C/S continue insulin infusion until the patient is eating then return to subcutaneous insulin.
Thank You Very Much !!