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Gestational Diabetes Mellitus (GDM)

Objectives:

- **Define GDM and Pregestational DM**
- **Identify how common GDM is in Saudi Arabia and worldwide**
- **Discuss how pregnancy predisposes to the development of GDM**
- **Describe the maternal and fetal complications of DM**
- **Describing the screening and diagnostics tests for GDM**
- **Identify the importance of a multidisciplinary approach in the management of these cases**

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Sources: 433 Team, Lecture notes, Doctor's notes, Doctor's lecture, Hacker and Moore's Essentials of Obstetrics and Gynecology

Types of Diabetes:

- **Type I Diabetes:** Early onset, insulin dependent
- **Type II Diabetes:** Late onset, insulin non-dependent
- **Gestational Diabetes:** Carbohydrate intolerance that occurs in pregnancy after the 24th week of gestation

The terms pregestational and pre-existing diabetes refer to type 1 or type 2 DM diagnosed prior to a woman's pregnancy or prior to the 24th week of gestation. In pregestational diabetes, maternal complications include worsening nephropathy and retinopathy, a greater incidence of preterm preeclampsia and a higher likelihood of DKA. **Hypoglycemia is much more common because of the tighter control attempted during pregnancy.** Fetal complications include an increased rate of abortions, anatomic birth defects, fetal growth restriction, and prematurity.
The prevalence of DM has greatly increase in the last 20 years. Reports show a rate of 3% to 8% of gestational DM. Pregestational diabetes is present in about 1% of pregnancies. Overall, 90% of diabetes in pregnant women is gestational and about 10% is pregestational.

- **NOTE:**

1) If the mother diagnosed with diabetes during her pregnancy before the 24th week of gestation, it is **NOT** GDM.
2) If the mother is diagnosed with diabetes during her pregnancy after the 24th week of gestation, it **IS** GDM.
3) If the GDM persists after pregnancy, it is **NO LONGER** considered GDM. It is frank diabetes. So the next time she gets pregnant, she will be considered a frank diabetic.

Carbohydrate Metabolism in Pregnancy:

> Pregnancy is potentially diabetogenic
> Diabetes may be aggravated by pregnancy
> Normal pregnancy is characterized by:

1. Mild fasting hypoglycemia, ↑ insulin level
2. Postprandial hyperglycemia
3. Hyperinsulinemia
4. Suppression of glucagon (role of glucagon in pregnancy is not fully understood)

Diagnosis During Pregnancy:

Diabetes can be diagnosed for the 1st time during pregnancy. If diagnosis is prior to 24 weeks of gestation, this is overt diabetes and not gestational.
Patients presenting with the following symptoms are easy to diagnose:
a. Hyperglycemia
b. Glucosuria
c. Ketoacidosis

Patients with mild carbohydrate metabolic disturbance need to be screened early based on the following risk factors:

1. Strong family history of diabetes
2. History of giving birth to large infants
3. Obesity
4. Unexplained fetal loss
5. Glucosuria which does not always indicate impaired glucose tolerance, but rather ↑ glomerular filtration rate. Nonetheless the detection of glucosuria in pregnancy mandates further investigations.
6. Age
7. Previous history of GDM

OLD Screening for GDM:

50 gm glucose challenge test between 24-28 weeks and a Plasma value of >7.8 or 140 mg/Dl

OLD Diagnostic test for GDM:

The 3hr 100 gm Oral Glucose Tolerance test after 8hrs of fasting
FBS 5.8
1 hr 10.6
2 hr 9.2
3 hr 8.1
At least 2 values have to be abnormal regardless of which ones they are.

Doctor's note: DO NOT STUDY THE OLD TESTS FOR GDM (screening and diagnostic). STUDY THE NEW CRITERIA AND THE NEW NUMBERS VERY WELL. THE OLD CRITERIA WILL NOT COME ON THE EXAM AND IF IT DOES, YOU CAN COMPLAIN AND THEY WILL CANCEL THE QUESTION (Doctor's words aka my mom lol).

NEW Diagnostic test for GDM:

Doctor's note:
NO SCREENING ANYMORE, BUT EVERY PREGNANT LADY HAS TO GO FOR THE DIAGNOSTIC TEST! NOT JUST HIGH-RISK PATIENTS! OGTT is ALWAYS DONE (even if FBS and urine glucose are normal). THE ONLY EXCEPTIONS FOR NOT DOING OGTT ARE:
1) DKA. If a woman comes to the clinic with DKA → immediately diagnosed with diabetes. No tests needed!

2) A RISK OF DKA (Critical FBS). In this case, the critical FBS is enough to diagnose the Pt. as diabetic.
Scenarios (TEST YOURSELF BASED ON THE RULES ABOVE!):

Glucosuria	FBS	Do we do OGTT (75 g)?
negative	normal	Yes! (done for every Pt.)
mild/normal (+1)	mild/normal	Yes! (done for every Pt.)

mild/normal (+1)	**Critical (>10)**	**No! (Risk of DKA)**
Severe (+3)	**mild/normal**	**Yes! (No risk of DKA)**
Severe (+3)	**Critical (>10)**	**No! (Risk of DKA)**

- 1 or more values have to be abnormal regardless of which ones they are.
- Screening Postpartum is done with 75 gm glucose at 6 weeks after delivery.

75 g of glucose	Fasting:	Less than 95 mg/dL or 5.3 mmol/L
	1-hour:	Less than 180 mg/dL or 10.0 mmol/L
	2-hour:	Less than 153 mg/dL or 8.5 mmol/L

Pathophysiology:

Insulin antagonism happens in pregnancy due to the action of HPL produced by the placenta as well as estrogen, Progesterone, prolactin, cortisol and TNF → difficulty in controlling diabetes.

Effects of Diabetes on Pregnancy:

TABEL 1 MATERNAL AND FETAL COMPLICATIONS OF DIABETES MELLITUS

MATERNAL COMPLICATIONS	FETAL AND NEONATAL COMPLICATIONS
OBSTETRIC COMPLICATIONS	Macrosomia with traumatic delivery
1. Polyhydramnios 2. Preeclampsia 3. Infections, e.g., urinary tract infection and candidiasis 4. Cesarean delivery 5. Genital trauma	shoulder dystocia, Erb's palsy
DIABETIC EMERGENCIES	DELAYED ORGAN MATURITY
1. Hypoglycemia 2. Diabetic coma 3. Ketoacidosis	Pulmonary, hepatic, neurologic, pituitary-thyroid axis; with respiratory distress syndrome, hypocalcemia
VASCULAR AND END-ORGAN INVOLVEMENT OR DETERIORATION (IN PATIENTS WITH PREGESTATIONALDIABETES MELLITUS)	CONGENITAL DEFECTS
1. Cardiac 2. Renal 3. Ophthalmic 4. Peripheral vascular	1. Cardiovascular anomalies 2. Neural tube defects 3. Caudal regression syndrome 4. Other defects, e.g., renal
NEUROLOGIC	FETAL COMPROMISE
1. Peripheral neuropathy 2. Gastrointestinal disturbance	1. Intrauterine growth restriction 2. Intrauterine fetal death 3. Abnormal fetal heart rate patterns
LONG-TERM OUTCOME	
1. Type 2 diabetes 2. Metabolic syndrome 3. Obesity 4. Cardiovascular disease	

A) Maternal Effects:

1. Pre-eclampsia / eclampsia 4 folds, even in the absence of vascular disease (in both GDM and Pre-existing DM, but more in pre-existing)
2. Infections (e.g. candida, UTIs, pylonephritis) (in both, but only if GDM is poorly controlled)

3. Injury to the birth canal secondary to macrosomia (both, but more in pre-existing)
4. Incidence of C/S (both, but more in pre-existing)
5. Hydramnios leading to cardiorespiratory symptoms (both, but more in pre-existing)
6. Maternal Mortality (both, but more in pre-existing)

B) Fetal and Neonatal Effects:

1. ↑ Risk of congenital anomalies especially cardiac and CNS (only in pre-existing because GDM is after 24 weeks of gestation and congenital anomalies do not occur after 24 weeks) (Do a fetal heart echo, especially in T1 DM pregnant women)

Note: Congenital anomalies are directly linked to HbA1c levels (for both T1 and T2 pre-existing diabetes). If HbA1c is controlled in these patients (2 months pre-conception), the risk of fetal congenital anomalies is reduced to that of a normal pregnant woman.

2. ↑ Risk of abortion (only pre-existing because abortion is before 20 weeks, and GDM is after 24 weeks!)
3. ↑ Risk of perinatal death (both, but more in pre-existing)
4. ↑ Risk of preterm labor due to overdistended uterus (both, but more in pre-existing)
5. ↑ Neonatal morbidity (both, but more in pre-existing), for example:
    a. birth injury – shoulder dystocia and Erb's palsy
    b. Brachial plexus injury
    c. RDS even if born >36 weeks
    d. Metabolic such as hypoglycemia, acidosis and hypoxia (from increased metabolism coupled with inadequate placental oxygen transfer)
6. Inheritance of diabetes or its predisposition (both, but more in pre-existing)

It is to be noted that congenital anomalies and abortion are not risks with gestational diabetes.

Management of Diabetes in Pregnancy:

If not newly diagnosed:
Continue on her medication but you may need to increase the dose (because of her weight gain → needs a higher dose, and because pregnancy is diabetogenic)

If newly diagnosed:
Put patient on diet x 3 days
30-35 kcal /kg of **ideal** body wt.
40 – 50 % carbs
12 – 20 % proteins
30 – 35 % Fat
Do BSS

if controlled → continue with monitoring
if not→ start oral hypoglycemic (Metformin/Glucophage)
if oral hypoglycemic fails to control blood sugar → Insulin
(You can try mixed oral hypoglycemics with insulin first to lower the number of insulin injections)
2/3 am 2/3 NPH, 1/3 Reg.
1/3 pm ½ NPH, ½ Reg.

N.B oral hypoglycemics are no longer contraindicated in pregnancy.

Frequent U/S scanning to assess growth + A.F.V. as well as fetal well being and to look for anomalies in cases of overt diabetes. (and AC (abdominal circumference) of the fetus)

Antepartum Obstetric Management:

- ✓ first-trimester dating ultrasound followed by a detailed obstetric ultrasonic study
- ✓ fetal echocardiogram
- ✓ and maternal serum alpha-fetoprotein level should be obtained at 16 to 20 weeks to check for congenital malformations.
- ✓ Maternal renal, cardiac, and ophthalmic functions must be closely monitored.
- ✓ **The HbA_{1c} should be obtained at the first prenatal visit, which is preferably scheduled early in the first trimester. Individuals with significantly elevated values (>8.5%) should be particularly targeted for careful ultrasonic assessment for congenital anomalies.** Regular electronic, biochemical, and ultrasonographic fetal monitoring should be performed.

Intrapartum Management:

- ✓ **Intrapartum management of a diabetic patient requires the establishment of maternal euglycemia during labor.** This may be achieved by giving a continuous infusion of regular insulin. **Plasma glucose levels are measured frequently, and insulin dosage is adjusted accordingly to maintain a plasma glucose level between 80 and 120 mg/dL.**
- ✓ Not all insulin-dependent patients require exogenous insulin during labor.
- ✓ Continuous electronic **fetal heart rate monitoring is recommended for all diabetic patients.**

Postpartum Management:

- ✓ **After delivery of the fetus and placenta, insulin requirements drop sharply because the placenta, which is the source of many insulin antagonists, has been removed.**
- ✓ **Plasma glucose levels should be monitored and lispro or regular insulin given when plasma glucose levels are elevated.**
- ✓ **A fasting blood glucose or a 75-g oral glucose tolerance test should be performed at 6 to 12 weeks postpartum.**

Timing and Mode of Delivery:

IOL at completed 38 weeks for diabetics on oral hypoglycemic/ insulin.
IOL at completed 38 weeks for diabetics that were on diet (at 32 weeks, for example) and switched to oral hypoglycemic/insulin.
IOL at term (40 weeks) for diabetics on diet. Provided sugar is well controlled.
C/S for **ONLY** for obstetric indications (GDM is NOT an indication of C/S!)

The woman should always have a trial of labor, even if the baby is macrosomic. US cannot determine whether the mother needs a C/S or not because it is usually the fat of the baby's shoulders that causes obstructive birth (which cannot be seen on US).

Management before conception:

1- Pre conceptual counseling:
   a) Reduction of weight
   b) Exercise
2- Blood sugar control
3- HbA1c
4- Early dating* and FU of the pregnancy

*Preferably in the first trimester to avoid false maturity of the baby. After the first trimester, it is difficult to determine the gestational age of the baby because of the macrosomia. The baby could look older than it actually is → induce labor too early (e.g. the baby looks 38 weeks old but it is actually 33 weeks old) → immature lungs and prematurity
Note: In the Hacker and Moore's book, the doctor said there is no need to know White's Classification of Diabetes in Pregnancy, so if you're reading the book don't worry about that table. Just skip it! :)

★ **Q1: A 35-year-old lady G4 P2 +1, presented at 30 weeks' gestation to the clinic with abnormal OGTT result that ultimately required insulin therapy. Which one of the following places her fetus at an increased risk?**

A. Congenital heart disease
B. Intrauterine growth restriction
C. Down syndrome
D. Macrosomia

The Answer is: D

★ **Q2: A lady with diabetes on insulin. What fetal anomalies that she might have when she get pregnant?**

A. Renal agenesis.
B. Cataract.
C. Caudal regression.
D. Pyloric stenosis.

The Answer is: C

★ **Q3: 27-year-old Pregnant lady, she is diabetic on insulin, which one of the following complication might she has?**

A. Intrauterine growth restriction (IUGR).
B. Polycystic ovarian disease (PCO)
C. Respiratory distress syndrome.

The Answer is: B

★ **Q4: A known diabetic is G3 P2 + 0 , both were normal deliveries. She has been in insulin throughout this pregnancy, which has been otherwise uneventful. She is now 40 weeks of gestation. Which one of the following is the best management?**

A. Cesarean section.
B. Blood sugar series.
C. Induction of labor.
D. Wait for spontaneous labor.

The answer is: C