

GESTATIONAL DIABETES MELLITUS

Learning objectives

At the conclusion of this learning activity, participants should be able to discuss;

- The natural course and risk factors that contribute to gestational diabetes
- The screening and diagnostic methods available in clinical practice
- The health risks associated with gestational diabetes to mother and baby
- The management strategies employed in primary care

Definition

Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy, irrespective of the treatment with diet or insulin.

Epidemiology

Diabetes is present in 5% of pregnant women, more than 90% of whom have GDM. It complicates about 5-10% of pregnancies.

Pathophysiology

- Pregnancy is characterized by insulin resistance, which begins in the second trimester and increases to term.
- During the term, maternal metabolism is shifted toward greater use of lipids thus providing carbohydrates to the fetus.
- Both greater resistance to insulin and inadequate beta cell function contribute to the development of GDM.

What are the risk factors for developing GDM?

Table 1: Risk factors for developing GDM	
<ul style="list-style-type: none">• Previous history of gestational diabetes or glucose intolerance• A family history of diabetes• Previous macrosomia (>4,000 g)• Previous unexplained stillbirth• Previous neonatal hypoglycaemia, hypocalcaemia, or hyperbilirubinemia	<ul style="list-style-type: none">• Advanced maternal age• Obesity• Repeated glycosuria in pregnancy• Polyhydramnios• Suspected macrosomia

How to screen and diagnose a woman with GDM?

Worldwide there has been little consensus as to who should be screened for GDM. It is important to identify the high risk groups and screen accordingly. Screening is optimally performed at 24 to 28 weeks of gestation. However, it has been agreed worldwide that it should be done as early as the first prenatal visit if there are presence of risk factors or a high degree of suspicion.

Table 2: Screening of risk categories in GDM
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Risk category	Clinical characteristics	Screening recommendations
High risk	<ul style="list-style-type: none"> • Marked obesity • Personal history of GDM • Presence of glucose in urine • Strong family history of diabetes • Prior delivery of macrosomic infant (newborn with excessive birth weight) 	Blood glucose screening at initial antepartum visit or as soon as possible. If they are found not to have GDM at that initial screening, they should be retested between 24 and 28 weeks of gestation.
Average risk	<ul style="list-style-type: none"> • Fits neither high- or low-risk profile 	Blood glucose screening between 24 and 28 weeks of gestation.
Low risk	<ul style="list-style-type: none"> • Age less than 25 years • Normal weight before pregnancy (BMI less than 25 kg/m²) • Member of an ethnic group with a low prevalence of GDM (i.e. patient is NOT Hispanic American, African-American, Native American, South or East Asian, Pacific Islander) • No first degree relative with diabetes mellitus • No history of abnormal glucose tolerance • No history of poor obstetric outcome 	Blood glucose screening not required

When a woman is at high- or average risk of developing GDM, one of the two approaches given below should be followed to diagnose a woman with GDM.

1. The ADA method

One step approach

One step approach is used in patients at a very high risk of GDM. Here 100-g OGTT is done and interpreted similar to that mentioned in step 2 below.

Two step approach

Step 1: A 50 g glucose challenge test (GCT) is used for screening without regard to the time of last meal or time of the day. If 1 hour GCT value is >140 mg/dL follow step 2.

Step 2: 100g Oral Glucose Tolerance Test (OGTT) is done after an unrestricted carbohydrate intake and unlimited physical activity for 3 days with an overnight fast of 8–14 hours. Diagnosis of GDM is made if two or more values as shown in Table 2 are met.

	ADA 100 g OGTT
Fasting	95 mg/dL
1-h	180 mg/dL
2-h	155 mg/dL
3-h	140 mg/dL

Two or more of the venous plasma concentrations must be met or must exceed the above values for a positive diagnosis.

2. The WHO method

The World Health Organization (WHO) diagnostic criteria, is based on a 2-hour 75-g OGTT. GDM is diagnosed by WHO criteria if either the fasting glucose is >126 mg/dL or the 2-hour glucose is >140 mg/dL.

Pregestational diabetes

It is defined as the presence of unrecognized Type 1 or type 2 diabetes occurring before pregnancy and later diagnosed as GDM during pregnancy. If such a patient continues to have persistent impaired glucose tolerance after pregnancy, it is suggestive of pregestational diabetes. The probable diagnostic criterion for pregestational diabetes is given in Table 3.

Timing of sample	Serum or plasma glucose
After overnight fast	≥126 mg/dL
Random	≥200 mg/dL

What are the health risks associated with GDM?

GDM may impart significant and long-lasting health risks to mother and baby (Table 4).

Mother	Fetus	Newborn	Child/Adult
<ul style="list-style-type: none"> • Birth trauma • Increased caesarean delivery • Pre-eclampsia/ gestational hypertension • Type 2 diabetes • Metabolic syndrome 	<ul style="list-style-type: none"> • Hyperinsulinaemia • Cardiomyopathy • Birth trauma • Macrosomia • Stillbirth 	<ul style="list-style-type: none"> • Respiratory distress syndrome • Hypocalcaemia • Hypoglycaemia • Hypomagnesaemia • Polycythemia • Cardiomyopathy • Hyperviscosity • Hyperbilirubinaemia 	<ul style="list-style-type: none"> • Obesity • Type 2 diabetes • Metabolic syndrome

How to manage a woman with GDM?

The goals of treatment are to maintain blood glucose levels within normal limits during the duration of the pregnancy, and ensure the well-being of mother and fetus.

⇒ Fasting plasma glucose: ≤95 mg/dL
⇒ 1-h plasma glucose after eating: ≤ 140 mg/dL
⇒ 2-h plasma glucose after eating: ≤ 120 mg/dL

Steps in management are;

1. Self monitoring of blood glucose

- ⇒ Women on diet treatment should self check their blood glucose 4 times daily (fasting blood glucose once a day and postprandial blood glucose thrice a day)
- ⇒ Women on drug therapy should check 4 to 6 times a day including fasting blood glucose.
- ⇒ Women on dietary and exercise therapy with normal blood glucose levels can decrease the frequency of monitoring to twice a day.

2. Medical Nutrition Therapy

- ⇒ Maternal glucose levels can be reduced by;

- Taking low calorie breakfast
 - Intake of food containing carbohydrates with low calories
 - Avoiding foods with high glucose content
- ⇒ The recommended diet during pregnancy is 30 to 35 kcal/kg/day based on ideal body weight, with a composition of 40 to 50% carbohydrate, 20% protein, and 30 to 40% fat.
- ⇒ Excessive caloric restriction should be avoided since it may affect the fetus.
- ⇒ For obese women (BMI >30 kg/m²), a 30% caloric restriction (an intake of ~1800 calories per day) has been shown to reduce hyperglycaemia and plasma triglycerides with no increase in ketonuria.

3. Drug treatment

- ⇒ Insulin is the drug of choice for GDM. Human insulin is currently recommended by the ADA.
- ⇒ Oral glucose-lowering agents are not recommended during pregnancy by ADA or AJOG.
- ⇒ Insulin should be started when medical nutrition therapy fails to maintain the treatment goals.
- ⇒ Starting dose of insulin is 0.7 U/kg actual body weight to prevent hypoglycemia at home.
- ⇒ Insulin is administered as a combination of short- and intermediate-acting insulin given in two to four injections per day to reach the fasting and postprandial target levels.
- ⇒ For women already taking insulin, their requirements usually decrease slightly during the first trimester and then increase until term.

▪ Antepartum fetal assessment

- ⇒ Antepartum fetal assessment is recommended in women
- Whose blood glucose is poorly controlled
 - Who require insulin therapy
 - Who have a history of an adverse obstetrical event, or
 - Who have a history of a hypertensive disorder.
- ⇒ Antepartum testing can be done using biophysical profile, nonstress test, or contraction stress test.
- ⇒ The recommendations of the 4th International Workshop-Conference on GDM are to consider nonstress testing starting at 32 weeks of gestation in patients on insulin and at or near term in patients managed by diet alone.

▪ Peripartum considerations

- ⇒ When glycemic control is acceptable and there are no other known complications, routine delivery before 40 weeks of gestation is not recommended.
- ⇒ If a delivery is indicated before 39 weeks, pulmonary maturity should be assessed by amniocentesis before induction if possible.
- ⇒ Patient should be considered for caesarean deliveries without labor when the estimated fetal weight is >4,500 g.

▪ Postpartum considerations

- ⇒ Women with GDM have an increased risk of developing diabetes, most commonly Type 2 diabetes, after pregnancy.
- ⇒ Factors associated with an increased risk of progression to diabetes within 5 years of the diagnosis of GDM include gestational age at diagnosis, the level of glycemia at diagnosis and at the first postpartum assessment, impairment of β -cell function, obesity, and further pregnancy.
- ⇒ Maternal glycemic status should be reclassified 6 weeks or more after pregnancy ends and every 3 years thereafter as either diabetes mellitus, impaired fasting glucose, impaired glucose tolerance, or normoglycemia.
- ⇒ A 6-week postpartum 75-g 2-hour OGTT should be done.

Suggested Readings

- ⇒ American Diabetes Association. Diagnosis and Classification of Diabetes Mellitus. *Diabetes Care* 2010; 33:S62.
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- ⇒ Di Cianni G; Seghieri G; Lencioni C et al. Normal glucose tolerance and gestational diabetes mellitus: what is in between? *Diabetes Care.* 2007; vol. 30(7): 1783-8.
- ⇒ Elliot DL. Chapter 259 – Pregnancy: Hypertension And Other Common Medical
- ⇒ PROBLEMS. Goldman: Cecil Medicine, 23rd edition; 2007.
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- ⇒ Omori, Y, Jovanovic, L. Proposal for the reconsideration of the definition of gestational diabetes. *Diabetes Care* 2005; 28:2592.
- ⇒ Perkins JM, Dunn JP, Jagasia SM. Perspectives in gestational diabetes mellitus: A review of screening, diagnosis, and treatment. *Clinical Diabetes.* 2007;25(2):57-62.
- ⇒ Pridjian G, Benjamin TD. Update on Gestational Diabetes. *Obstetrics and Gynecology Clinics.* 2010; vol. 37 (2): 255-67.
- ⇒ Seshiah V. Gestational Diabetes Mellitus – Guidelines. *JAPI.* 2006; Vol. 54: 622-28.

TEST QUESTIONS

- 1. The factors associated with high-risk of GDM are all except;**
 - a. Marked obesity
 - b. Age less than 25 years**
 - c. Prior delivery of macrosomic infant
 - d. Strong family history of diabetes

- 2. The diagnosis of GDM is made when _____ blood glucose values of 100 g OGTT are met.**
 - a. All the values
 - b. Three or more values
 - c. Two or more values**
 - d. Any one of the value

- 3. The health risk caused by GDM to both the fetus and newborn is**
 - a. Birth trauma

- b. Hyperinsulinaemia
- c. Hypoglycaemia
- d. Cardiomyopathy**

4. The starting dose of insulin for women with GDM is

- a. 0.8 U/kg
- b. 0.75 U/kg
- c. 0.7 U/kg**
- d. 0.6 U/kg

5. Antepartum assessment is considered in women with

- a. Poor glycaemic control
- b. History of hypertensive disorder
- c. History of an adverse obstetrical event
- d. Any of the above**