

Gestational Diabetes Mellitus

White's Classification of diabetes during pregnancy

Women can be separated into :

- Those who were known to have diabetes before pregnancy—*pregestational* or *overt*,
- Those diagnosed during pregnancy—*gestational*.

		Plasma Glucose Level			
Class	Onset	Fasting	2-hour Postprandial	Therapy	
A ₁	Gestational Diabetes glucose intolerance developing during pregnancy	<105 mg/dL (Normal)	<120 mg/dL (normal)	Diet alone	
A ₂	Gestational Diabetes	>105 mg/dL	>120 mg/dL	Insulin	
Class	Onset	Age of Onset (yr)	Duration (yr)	Vascular Disease	Therapy
B	Overt Diabetes, developing :	Over 20	<10	None	Insulin
C		10 to 19	10 to 19	None	Insulin
D		Before 10	>20	Benign retinopathy	Insulin
F		Any	Any	Nephropathy ^a	Insulin
R		Any	Any	Proliferative retinopathy	Insulin
H		Any	Any	Heart	Insulin

- Class A:** Gestational diabetes, subdivided into → those with fasting hyperglycemia of 105 mg/dL (A1) or greater (A2).
 - Classes B to H:** have overt diabetes antedating pregnancy.
- The White system emphasized that end-organ derangements, especially involving the eyes, kidneys, and heart, have significant effects on pregnancy outcome.

Screening

- Instead of *universal screening*, recommendations are now for *selective screening* using the guidelines shown in Table →.
- This evaluation is usually done in two steps (the two-step procedure)
 - Screening:** 50-g oral glucose challenge test (GCT) is followed by →
 - Diagnostic:** 100-g oral glucose tolerance test (OGTT) if initial results exceed a predetermined plasma glucose concentration.

1- Screening test → 1h 50-g Oral Glucose Challenge Test (OGCT)

- Screening should be performed between **24 to 28 weeks**.
- Screening is advised **at the first prenatal visit** in pregnant women with risk factors (see table →)

→ Without regard to time of day or time of last meal (no fasting state is needed):

Plasma glucose level is measured 1 hour after a 50-g glucose load

- Normal Value:** < 140 mg/dl
- Abnormal Value:** ≥ 140 mg/dL identifies 80 % of all women with gestational diabetes.

- If the first-trimester screen is negative, it should be repeated at → 24 to 28 weeks.
- Glucose values above 130 to 140 mg/dL on a GCT are considered abnormal and have an 80% to 90% sensitivity in detecting GDM
- if 130 mg/d used as cutoff value results in 20% to 25% false positive results, compared to 14% to 18% false positive results with 140mg/dl.
- If the 1-hour screening (50-g oral glucose) plasma glucose exceeds 200 mg/dL, a glucose tolerance test is not required and may dangerously elevate blood glucose values.

2- Diagnostic test → 3h 100-g oral glucose tolerance test (OGTT)

- An abnormal screening GCT is followed with a diagnostic: 3-hour 100-g oral glucose tolerance test.

→ After an overnight fast, a fasting blood sugar (FBS) is drawn :

- If FBS > 125 mg/dl, indicates overt diabetes mellitus → No further testing is performed
- If FBS < 126 mg/dl → Administer a 100-g glucose load, and check glucose levels hourly for 3 hours.

Time	100-g Glucose (Used in USA)	
Fasting	95 mg/dL	5.3 mmol/L
1-h	180 mg/dL	10.0 mmol/L
2-h	155 mg/dL	8.6 mmol/L
3-h	140 mg/dL	mmol/L

- If two or more abnormal values : Patient is diagnosed with GDM
- If only one value is abnormal : Impaired glucose tolerance

Definition & Incidence

Overt Diabetes, Diagnosis during pregnancy :

- Women with **high plasma glucose levels + glucosuria + ketoacidosis** present no problem in diagnosis.
- Women with a **random plasma glucose level > 200 mg/dL**

plus
Classic signs & symptoms such as polydipsia, polyuria,

- Fasting plasma glucose level exceeding 125 mg/dL (≥ 126 mg/dl)**
- The diagnostic cutoff value for overt diabetes is a fasting plasma glucose of 126 mg/dL or higher.

The likelihood of impaired carbohydrate metabolism is increased in women who:

- have a strong familial history of diabetes,
- have given birth to large infants,
- demonstrate persistent glucosuria, or have unexplained fetal losses.

Gestational Diabetes: (diagnosis will be explained later)

It's defined as glucose intolerance with onset or first recognition during pregnancy.

- Pregnancy is associated with progressive insulin resistance.
- Human placental lactogen, progesterone, prolactin, cortisol, and tumor necrosis factor are associated with increased insulin resistance during pregnancy.
- Some women with gestational diabetes have previously unrecognized overt diabetes. It was found that women with fasting hyperglycemia diagnosed before 24 weeks had pregnancy outcomes similar to those for women with overt diabetes. Thus, fasting hyperglycemia early in pregnancy almost invariably represents overt diabetes.

- Reports show a rate of 3% to 8% of gestational diabetes mellitus (GDM).
- Pregestational diabetes is present in about 1% of pregnancies.
- 90% of diabetes in pregnant women is gestational - 10% is pregestational.
- Studies suggest that women who develop GDM have chronic insulin resistance and that GDM is a "stress test" for the development of diabetes in later life.

Table: Recommended Screening Strategy Based on Risk Assessment for Detecting GDM

GDM risk assessment: Should be ascertained at the first prenatal visit

Low Risk: Blood glucose testing **not routinely required** if all the following are present:

- Member of an ethnic group with a low prevalence of GDM
- No known diabetes in first-degree relatives
- Age < 25 years
- Weight normal before pregnancy
- Weight normal at birth
- No history of abnormal glucose metabolism
- No history of poor obstetrical outcome



Average Risk: Perform blood glucose testing at 24 to 28 weeks using either:

- Two-step procedure:
 - Screening test :50-g oral glucose challenge test (GCT), followed by →
 - Diagnostic test : 100-g oral glucose tolerance test, for those meeting the threshold value in the GCT.
- One-step procedure:
 - Diagnostic 100-g oral glucose tolerance test performed on all subjects.

High Risk: Perform blood glucose testing, using the procedures described above if one or more of these present :

- Positive glucosuria (not necessary in GDM, but if found need further investigation) .
- Severe obesity > 90 kg .
- Positive family history of type 2 diabetes .
- Previous history of :
 - Gestational diabetes mellitus
 - Impaired glucose metabolism, or glucosuria.
 - Repeated unexplained abortions
 - Unexplained IUFD
 - Major congenital anomalies
 - Macrosomic infant > 4 kg
 - Neonatal death
- History of :
 - Polyhydramnios
 - Recurrent monilia or UTI.

If GDM is not diagnosed, blood glucose testing should be repeated at 24 to 28 weeks or at any time there are symptoms or signs suggestive of hyperglycemia.

Fetal & Neonatal complications

Entity	Monitoring
1- Macrosomia with traumatic delivery (shoulder dystocia, Erb's palsy)	Ultrasonography for estimated fetal weight before delivery; consider cesarean delivery if estimated fetal weight > 4250-4500 g
DELAYED ORGAN MATURITY	
2- Pulmonary, hepatic, neurologic, pituitary-thyroid axis; with respiratory distress syndrome, hypocalcemia	Avoid delivery before 39 weeks in the absence of maternal or fetal indications unless amniocentesis indicates lung maturity. Maintain euglycemia intrapartum.
CONGENITAL DEFECTS	
1- Cardiovascular anomalies (Most common)	- Preconception counseling and glucose control, - HbA _{1c} in the first trimester
2- Neural tube defects	- Maternal serum alpha-fetoprotein screening; - fetal ultrasonography and fetal echocardiogram; - amniocentesis and genetic counseling
3- Caudal regression syndrome (most specific)	- If U/S shows sacral agenesis (most specific) → HbA _{1c}
4- Other defects, e.g., renal	
FETAL COMPROMISE	
1- Intrauterine growth restriction	Serial ultrasonography for fetal growth and estimated fetal weight, serial fetal surveillance with nonstress test, amniotic fluid index, and fetal Doppler. Avoid postdates pregnancy.
2- Intrauterine fetal death	
3- Abnormal fetal heart rate patterns	

Metabolic Assessments Recommended after Pregnancy with Gestational Diabetes

Time	Test	Purpose
Postdelivery (1-3 d)	Fasting or random plasma glucose	Detect persistent, overt diabetes
Early postpartum (6-12 wks)	75-g 2-h OGTT	Postpartum classification of glucose metabolism
1 yr postpartum	75-g 2-h OGTT	Assess glucose metabolism
Annually	Fasting plasma glucose	Assess glucose metabolism
Tri-annually	75-g 2-h OGTT	Assess glucose metabolism
Prepregnancy	75-g 2-h OGTT	Classify glucose metabolism

Classification of the American Diabetes Association (2003)

Normal	IFG or IGT	Diabetes Mellitus
Fasting < 110 mg/dL	110-125 mg/dL	≥ 126 mg/dL
2 hr < 140 mg/dL	2 hr ≥ 140-199 mg/dL	2 hr ≥ 200 mg/dL

Maternal Complications of Diabetes Mellitus

Entity	Monitoring
OBSTETRIC COMPLICATIONS	
1- Polyhydramnios	- Close prenatal surveillance; - blood glucose monitoring, - ultrasonography
2- Preeclampsia	Evaluation for signs and symptoms
3- Infections,	e.g., UTI & candidiasis: Urine culture, wet mount, appropriate therapy
4- C.S delivery	- Blood glucose monitoring, - insulin and dietary adjustment to prevent fetal overgrowth
5- Genital trauma	U/S to detect macrosomia, cesarean delivery for macrosomia
DIABETIC EMERGENCIES	
1- Hypoglycemia	Teach signs and symptoms; blood glucose monitoring; insulin and dietary adjustment; check for ketones, blood gases, and electrolytes if glucose > 300 mg/dL
2- Diabetic coma	
3- Ketoacidosis	
VASCULAR AND END-ORGAN INVOLVEMENT OR DETERIORATION (IN PATIENTS WITH PREGESTATIONAL DIABETES MELLITUS)	
1- Cardiac	Electrocardiogram first visit and as needed
2- Renal	Renal function studies, first visit and as needed
3- Ophthalmic	Funduscopy evaluation, first visit and as needed
4- Periph. vascular	Check for ulcers, foot sores; noninvasive Doppler studies
5- NEUROLOGIC	
- Peri. neuropathy	Neurologic and gastrointestinal consultations as needed
- GIT disturbance	
6- LONG-TERM OUTCOME	
- Type 2 diabetes	Postpartum glucose testing, lifestyle changes (diet & exercise)
- Metabolic syndrome	Lifestyle changes (diet and exercise)
- Obesity	Lifestyle changes (diet and exercise)
- CVS disease	Annual checkup by physician, lifestyle changes (diet and exercise)

