

Management of Diabetes Mellitus in Pregnancy

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1. CLASSIFICATION SYSTEMS

a. Pre-gestational diabetes mellitus

- i. Type I: insulin dependent; ketosis prone. Patients are usually thin individuals
- ii. Type II - not insulin dependent, although insulin may be required for management; not ketosis prone. Patients are usually obese. Also known as mature or adult onset diabetes.

b. Pre-gestational and gestational White's Obstetrical Classification

- i. Class A (gestational diabetes only): When any two of the three hour GTT values are abnormal
 - (1) Class A1: Controlled only with diet.
 - (2) Class A2: Controlled with diet and insulin.
- ii. Class B^(*) (Non insulin dependent pre-gestational diabetes): Onset of diabetes after the age of 20 or the duration of diabetes is less than ten years. Insulin is required during pregnancy.
- iii. Class C: Onset of diabetes between the ages of 10 to 19 or duration greater than 10 years and less than 20.
- iv. Class D: Onset of diabetes before the age of 10 or duration of more than 20 years.
- v. Class E: This classification has been abandoned due to frequent errors from pelvic phleboliths.
- vi. Class F: Diabetes with nephropathy evidenced by proteinuria.
- vii. Class R: Diabetes with presence of proliferative retinopathy.
- viii. Class H: Diabetes with history of ischemic heart disease or other cardiomyopathy.
- ix. Class T: Patients with long-standing diabetes who have required renal transplantation for diabetic nephropathy.

^(*) Newly diagnosed gestational diabetics with persistently abnormal fasting blood sugars are to be classified as class B and managed as such due to the severity of the condition.

2. INCIDENCE

a. Gestational Diabetes

- i. Dependent on screening method and criteria for 3 hr GTT. The incidence in various literature reports varies from 1 to 8 percent. Most investigators accept a range of 2-4 percent.

b. Pre-gestational Diabetes Mellitus (Type I & II)

- i. Incidence stable at less than 0.5-1 percent.

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3. DIAGNOSIS

a. Gestational Diabetes

- i. Some women are diabetic before the pregnancy and happen to be diagnosed during pregnancy because this is their first exposure to diagnostic testing. This is very likely to be true in patients with elevated (>110 mg %) FBS in two or more occasions.
- ii. Screening of all patients should be performed at 24-26 weeks and completed no later than 28 weeks. Patients should be scheduled prior to 24 weeks to assure compliance. This provides results early enough to implement treatment and improve perinatal outcome.
- iii. Patients with high risk factors (family history of diabetes, obesity, previous infant with macrosomia or congenital anomalies, previous unexplained stillbirth), should be screened at the first visit. Patients with excessive weight gain, fetal macrosomia or hydramnios during the current pregnancy should be screened at the time of the diagnosis of the previously mentioned condition. Patients with negative screening prior to 20 weeks should be screened again at, 24-26 weeks.
- iv. Diabetic Screening with 50 Gm glucose load. This is the most widely used and accepted screening method. Fifty-gram oral glucose load is given. Patients may be allowed to have a light breakfast prior to testing if this makes ingestion of the glucose more acceptable; otherwise it is preferable that the patients enter the testing procedure while fasting. If plasma glucose one hour after ingestion of glucose is:

≥ 135 mg/dl: the result is abnormal

< 135 mg/dl: the result is normal *

- If test result is $>130 < 135$ you may consider repeat evaluation in one week.
- v. 3 hour oral glucose tolerance test (3hrGTT) for patients with abnormal screening. 100 gram oral glucose load is given.

Cut off values:**

FBS	95 mg/dl
1 hour	180 mg/dl
2 hour	155 mg/dl
3 hour	140 mg/dl

** If any two values are equal to or greater than the cut off values, the diagnosis of gestational diabetes is established. If FBS >110 mg %, repeat 2-3 days later.

b. Pregestational Diabetes Mellitus (Type I & II)

- i. Diagnosis usually established before pregnancy. No special testing needed during pregnancy to verify diagnosis.

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4. ANTEPARTUM MANAGEMENT OF GESTATIONAL DIABETICS

a. Diet

- i. ADA Diet with 35-40 calories/kilogram of ideal body weight started immediately. Distribution of calories should be: 45-50% carbohydrate, 20-25% protein and 25-30% fat. Ideally total calories should be distributed throughout the day in three main meals and three snacks. However, to increase compliance, the diet should be adjusted to accommodate patient's likes and habits.
- ii. Encourage increased intake of fiber to eliminate wide excursions of blood sugar levels.
- iii. Carbohydrates with high glycemic index (sugar containing foods and potatoes) should be avoided.
- iv. The goal of dietary control is to achieve fasting blood sugars less than 90 mg/dl (70-90 mg/dl and post-prandials <120 mg/dl.
- v. Refer to dietitian for diet recall and counseling and to the diabetes educator for instruction in home monitoring and insulin self administration.

b. Glucose Monitoring

- i. For initial control of diabetes, monitor blood sugars with four finger sticks daily (before breakfast, two hours after breakfast, late afternoon (4 PM) and two hours after dinner). If indicated you may obtain two measurements at midnight and 4-5 AM to distinguish between the Somogyi and dawn phenomena. Additional blood sugar checks may be required depending on stability of control.
- ii. In the early stages of management, the patient's ability to monitor her blood sugars should be evaluated by running standardized controls. The diabetes educator will do this. The patient's blood sugar values should be adjusted according to this check. If the patient is unreliable, then periodic (weekly to twice weekly) blood sugars by the lab may be performed.
- iii. Get a baseline hemoglobin A_{1C} upon diagnosis and every four weeks until delivery, if the patient's compliance is in question only.
- iv. After initial control, patients should measure finger stick blood sugars twice daily (one fasting and one post-prandial at alternating times of the day). If the fasting blood sugar exceeds 90 mg/dl or the 2-hour post prandial exceeds 120 mg/dl, then insulin therapy is indicated. Patients treated with insulin should have a goal of achieving fasting blood sugars of 70- 90 mg/dl and 2-hour postprandial sugars of <120 mg/dl. Insulin requirement will be judged and ordered according to the patient's individual needs by the primary or consulting physician.
- v. The management of gestational diabetes can be accomplished on an outpatient basis. Poorly controlled patients (FBS > 150 or PPBS >300) should be assessed for diabetic control twice weekly and with aggressive insulin therapy.

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Use or Oral hypoglycemic medication instead of Insulin

***** Every effort should be made to maintain the patient's compliance by minimizing the need for the number of injections and number of finger sticks. NPH and R insulin should be administered in the same syringe before breakfast and before dinner. Evening NPH should be administered separately from the evening R only when there is evidence that the patient's maximum response at night takes place too early. This should be documented in the chart with 12AM and 4-5AM blood sugars indicating a lower blood sugar earlier at night. In no other occasion should the patient's comfort be compromised.**

5. ANTENATAL FETAL ASSESSMENT OF GESTATIONAL DIABETES

a. **Gestational Diabetics with good control (diet controlled, FBS of 70-90 and PPBS of <120 mg %).**

Ultrasound evaluation of fetal growth should be done at the time of diagnosis and every 2 weeks as necessary to rule out macrosomia and secondary poor control. Uterine artery Doppler flow studies and complete fetal Doppler studies to assure normal fetal oxygenation and to R/O brain sparing due to fetal hyperglycemia. The so called "siphoning effect" is a condition where a fetus that has been exposed to hyperglycemia prior to diagnosis of maternal diabetes, develops hyperinsulinemia and constantly drains glucose from the maternal circulation while maternal blood sugars are deceptively normal. Fetal hyperglycemia causes lactic acidosis, which in turn causes placental vascular constriction and fetal compromise. These conditions can only be seen with complete fetal Doppler. Biophysical profile alone has been reported to miss this condition and fetuses died the next or same day after a "normal biophysical profile".

b. **Gestational diabetics with previous stillbirth or chronic hypertension**

- i. Complete Doppler evaluation of fetal vessels and uterine arteries every two weeks to evaluate for evidence of circulatory and oxygen distribution disturbances.
- vi. Fetal growth evaluation as soon as the diagnosis is established and every 2 weeks thereafter.

c. **Gestational diabetes controlled with diet alone but with evidence of fetal macrosomia despite normal BS measurements.**

- i. These women should be started on insulin.
- ii. Complete Doppler evaluation of fetal vessels and uterine arteries every two weeks to evaluate for evidence of circulatory and oxygen distribution disturbances.
- iii. Fetal growth evaluation as soon as the diagnosis is established and every 2 weeks thereafter.

d. **Delivery Management**

- i. For gestational diabetics not on insulin, with good control (FBS 70- 90, PP <120), and normal fetal growth delivery may be instituted at 39 weeks by best means. If macrosomia or fetal body asymmetry is present, primary cesarean section should be considered.

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- ii. Gestational diabetics with chronic hypertension or previous stillbirth and those with fetal macrosomia despite good control efforts should be delivered electively at 37 - 39 weeks after lung maturity has been established with amniocentesis.

6. INTRAPARTUM AND POSTPARTUM MANAGEMENT OF GESTATIONAL DIABETICS

a. Intra-partum Management

- i. Routine - management is acceptable for gestational diabetics controlled by diet.
- ii. Gestational diabetics who require insulin antenatally should not receive insulin the day of induction because labor consumes large amounts of glucose. Obtain fasting blood sugar. If FBS is 80 - 120 mg/dl, infuse Ringer's lactate. If FBS < 80 mg/dl, infuse D5/Ringer's lactate. If FBS > 120 mg/dl, add 10-20 units regular insulin to IV Ringer's lactate and adjust the rate to give 1-2 units/hour.
- iii. Evaluate blood sugars every one to two hours with finger sticks.

b. Postpartum Management

- i. Gestational diabetics usually do well on a regular diet postpartum. A fasting blood sugar prior to discharge and one at the six-week postpartum check up may be considered to verify good metabolic control after the pregnancy. This is necessary because a small number of patients continue to be diabetic and may have been diabetic prior to the pregnancy.
- ii. After the pregnancy, gestational diabetics with excessive body weight should be advised of the benefits of weight loss and be encouraged to initiate a weight loss program.

7. ANTEPARTUM MANAGEMENT OF INSULIN DEPENDENT DIABETICS

a. Diet

- i. See diet section for ante partum management of gestational diabetics.

b. Glucose Monitoring

- i. Patients need not be admitted unless FBS > 150 and post-partum. Baseline laboratory studies should include CBC with differential, a catheterized urine specimen for UA and C+S, blood sugar profile (0700 [fasting], 1000 [two hour post-prandial], 1600, 1900 [two hour post-prandial], 2300 and 0200, hemoglobin A_{1C}, and serum creatinine. A 24 hour urine for protein and creatinine clearance should be done initially and every trimester, or more frequently if indicated.
- ii. Ophthalmology consultation for evaluation of the retina should be obtained at the first visit and once each trimester if indicated.

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- iii. The dietitian and the diabetes educator should see patient.
- iv. Insulin administration should be adjusted to achieve fasting blood sugars 70-90 mg/dl and post-prandial blood sugars of <120 mg/dl.
- v. Following discharge, the patient should be seen weekly and given the opportunity to communicate by telephone whenever fine adjustments of insulin requirements are necessary.
- vi. Patients should follow their glucose levels with finger sticks four times a day and more if necessary. Results should be recorded on a flow sheet and presented to the physician at their weekly visits.
- vii. The patient should be recorded dietary indiscretions and other irregularities in the blood sugar flow sheet.

8. ANTENATAL FETAL ASSESSMENT OF INSULIN DEPENDENT DIABETICS

a. Testing

- i. All insulin dependent diabetics should have an ultrasound as early as possible to establish dating of the pregnancy.
- ii. Extended anatomical ultrasound and fetal echocardiography should be done at 22 weeks to rule out major congenital defects associated with diabetes. Make sure to schedule the patient not later than 22 and not prior to 20 weeks in order to obtain the best possible information and still maintain the option for termination if it becomes necessary.
- iii. Doppler flow evaluation of fetal vessels and uterine arteries is recommended at about 24 weeks or earlier if clinically indicated (to diagnose patients with vascular disease). Fetal surveillance with umbilical artery, MCA and if needed descending aorta Doppler is preferable. Uteroplacental Doppler should also be done every two weeks to assure normal flow.
- iv. Serial ultrasound should be ordered every 2-3 weeks after weeks gestation to evaluate fetal growth.
- v. Fetal movement charting.

b. Delivery

- i. Delivery should be instituted electively at 37-39 weeks after fetal lung maturity has been established by amniocentesis. Well-controlled diabetics with normal fetal growth do not need lung maturity documentation if delivered after 38 completed weeks gestation.

9. INTRAPARTUM AND POSTPARTUM MANAGEMENT OF INSULIN DEPENDENT DIABETICS

a. Intra-partum

- i. During induction or in spontaneous labor
 - (1) NPO after midnight.

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- (2) Do not give any subcutaneous insulin the a.m. of induction
- (3) Get a finger stick FBS at 6-7 a.m.
 - (a) If FBS is between 80-120 mg % start an IV with LR to run at 125 ml/hour.
 - (b) If FBS is < 80 mg % start IV with D5 LR to run 125 ml/hour.
 - (c) If FBS is > 120 mg % start IV with 1000 ml LR with 20 units of regular insulin and run at 125 ml/hr.
 - (d) Check blood sugar by finger stick q 1-2 hours or more frequently if clinically indicated during labor.
 - (e) Post-op, check blood sugars as clinically indicated.
 - (f) Discontinue insulin infusion immediately after delivery if insulin has been started.
- ii. Cesarean Delivery
 - (1) NPO after midnight.
 - (2) Do not give any NPH or Regular insulin in a.m.
 - (3) Get a finger stick FBS at 6-7 a.m.
 - (a) If FBS is between 80-120 mg % start an IV with LR to run at 125 ml/hour.
 - (b) If FBS is < 80 mg % start an IV with D5 LR to run 125 ml/hour.
 - (c) If FBS is > 120 mg % start IV with 1000 ml LR with 20 units of regular insulin and run at 125 ml/hour.
 - (4) Discontinue insulin infusion immediately after delivery if insulin has been started.
 - (5) Post-op, check blood sugars as clinically indicated.
 - (6) While NPO, do not give insulin for FBS< 200. If FBS> 200 give 5 or more units regular insulin according to blood sugar levels.

b. Postpartum Management

- i. 1800 calorie ADA diet.
- ii. Nursing mothers should be allowed extra calories.
- iii. Institute pre-pregnancy insulin dosage when patient is on oral feeding.
- iv. Be cautious to avoid hypoglycemia since postpartum insulin requirements are greatly decreased.
- v. Contraception should be discussed prior to discharge and family planning should be well coordinated. The importance of pre-conception counseling and diabetic control prior to the next pregnancy should be stressed to patients.