GESTATIONAL DIABETES MELLITUS

Dr. Ghavami

DIABETES IN PREGNANCY

▶ The rise in GDM and type 2 diabetes in parallel with obesity both in the U.S. and worldwide is of particular concern.

▶ Both type 1 diabetes and type 2 diabetes confer significantly greater maternal and fetal risk **than** GDM, with some differences according to type of diabetes as outlined below.

- In general, specific risks of uncontrolled diabetes in pregnancy include **spontaneous abortion**, **fetal anomalies**, **preeclampsia,fetal demise**, **macrosomia**, **neonatal hypoglycemia**,and **neonatal hyperbilirubinemia** ,among others.

- In addition, diabetes in pregnancy may increase the risk of obesity and type 2 diabetes in offspring later in life

OUTLINE:-

- DEFINITION
- IMPORTANCE
- PREGNANCY - A DIABETOGENIC STATE
- WHEN DOES GESTATIONAL DIABETES DEVELOP?
- WHEN SHOULD WE DO SCREENING?
- WHAT ARE THE SCREENING TESTS?

DEFINITION:-

- **Gestational diabetes** is defined as carbohydrate intolerance of variable severity with onset or first recognition during pregnancy (American College of Obstetricians and Gynecologists, 2013).

- Therefore, it may include women with pre – existing but previously unrecognized diabetes.

- Since it occurs in the later half of pregnancy, it doesn't have any effect on organogenesis.

- The main problem with gestational diabetes is **macrosomia** which usually reverts to normal following delivery.

IMPORTANCE

▶ Use of the term gestational diabetes has been encouraged to communicate the need for increased surveillance and to stimulate women to seek further testing postpartum.

▶ The most important perinatal correlate is excessive fetal growth, which may result in both maternal and fetal birth trauma.

▶ The likelihood of fetal death with appropriately treated gestational diabetes is not different from that in the general population.

▶ Importantly, more than half of women with gestational diabetes ultimately develop overt diabetes in the ensuing 20 years

PREVALENCE

- The prevalence of gestational diabetes as traditionally defined is at least 2 percent, and as high as 25 percent in some reports.

- The prevalence varies worldwide and among racial and ethnic groups, generally in step with the prevalence of type 2 diabetes.

- Prevalence also varies because of differences in screening practices (universal versus selective screening), population characteristics (eg, average age and body mass index [BMI] of pregnant women), testing method, and diagnostic criteria.

- Prevalence has been increasing over time, possibly related to increases in mean maternal age and weight.

WHY PREGNANCY IS A DIABETOGENIC STATE?

▶ Pregnancy is a state of physiological Insulin Resistance especially in the second half.

▶ Estrogen, Progesterone and Human Placental Lactogen act as insulin antagonists causing insulin resistance.

▶ HPL → LIPOLYSIS → FREE FATY ACIDS → INSULIN RESISTANCE

▶ Plasma cortisol also increase leading to Insulin Resistance.

▶ As a result pancreas produce more insulin and plasma glucose levels fall.

▶ Pregnancy is characterised by fasting hypoglycemia and postprandial hyperglycemia.

- In the fasting state there is hypoglycemia, decreased amino acids, and increased triglycerides breaking down into free fatty acids and ketone bodies.

- When fasting is prolonged, these all are exaggerated and ketosis appears.

- This pregnancy – induced switch in fuels from glucose to lipids has been described as accelerated starvation.

WHEN DOES GESTATIONAL DIABETES DEVELOP?

▶ GDM develops when a stage is reached, when the pancreas despite the increased insulin production cannot counter the insulin resistance caused by the pregnancy hormones.

▶ GDM usually occurs in women with poor pancreatic reserve and insulin resistance such as those with polycystic ovary syndrome or a family history of diabetes.

▶ It usually appears after 24 weeks of pregnancy.

Fifth International Workshop-Conference on Gestational Diabetes: Recommended Screening Strategy Based on Risk Assessment for Detecting Gestational Diabetes (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:

(i)   Member of an ethnic group with a low prevalence of GDM

(ii)   No known diabetes in first-degree relatives

(iii) Age < 25 years

(iv) Weight normal before pregnancy

(v)   Weight normal at birth

(vi) No history of abnormal glucose metabolism

(vii) No history of poor obstetrical outcome

► Average Risk: Perform screening test between 24 to 28 weeks using either: Two-step procedure: 50-g oral glucose challenge test (GCT), followed by a

A diagnostic100-g OGTT for those meeting the threshold value in the GCT.

One-step procedure: diagnostic 100-g OGTT performed on all subjects.

▶ High Risk: Perform screening test as soon as possible, using the procedures described above, if one or more of these factors are present:

(i) Severe obesity

(ii) Strong family history of type 2 diabetes

(iii) Previous history of GDM, impaired glucose metabolism, or glycosuria

(iv) If GDM is not diagnosed, screening should be repeated at 24 to 28 weeks' gestation or at any time symptoms or signs suggest hyperglycemia

Gestational Diabetes Mellitus – Screening Guidelines
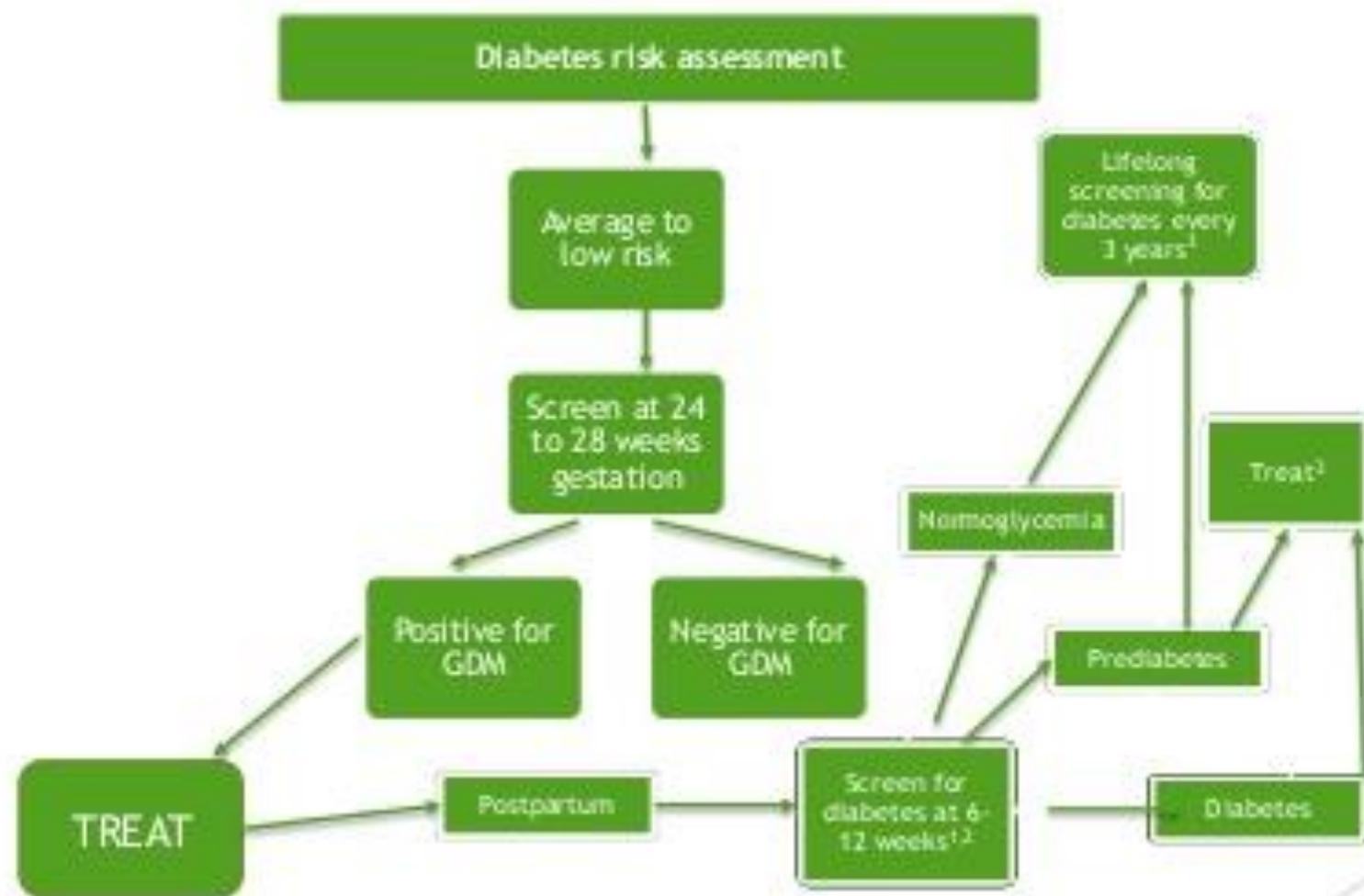
THRESHOLD VALUES FOR DIAGNOSING GDM

Plasma glucose	Glucose concentration Threshold		Above threshold (%) cumulative
	mmol/L	mg/dl	
Fasting	5.1	92	5.6
1 hour OGTT	10.0	180	14.0
2 hour OGTT	8.5	153	16.1

One or more of these values must be equaled or exceeded for the diagnosis of gestational diabetes.

THE SCREENING TESTS....

▶ There are two approaches:-

1. SINGLE STEP APPROACH

2. TWO STEP APPROACH

▶ This Single Step Approach was greatly influenced by results of the Hypoglycemia and Pregnancy Outcomes (HAPO) Study. Although the ADA adopted this new scheme, the American College of Obstetricians and Gynecologists (2013) declined to endorse the single 75-gram oral glucose tolerance test.

▶ Instead, the College continues to recommend a two-step approach to screen and diagnose gestational diabetes.

SINGLE STEP APPROACH

▶ Here the patient is given 75g of oral glucose without prior 50g glucose challenge test.

▶ The test should be performed in the morning after an overnight fast of at least 8 hr but not more than 14 hr and after at least 3 days of unrestricted diet (≥ 150 g/d) and physical activity.

▶ Fasting and 2hr values are estimated.

TWO STEP APPROACH

▶ The recommended two-step approach begins with either universal or risk-based selective screening using a 50-g, 1-hour oral glucose challenge test.

▶ This 50-g screening test is followed by a diagnostic 100-g, 3-hour oral glucose tolerance test (OGTT) if screening results meet or exceed a predetermined plasma glucose concentration.

▶ The plasma glucose level is measured 1 hour after a 50-g oral glucose load without regard to the time of day or time of last meal.

▶ The American College of Obstetricians and Gynecologists (2013) recommends using either 135 or 140 mg/dL as the 50-g screen threshold.

▶ In the 100g OGTT, the woman should have been on an unrestricted diet for the previous 3 days and fasting overnight.

▶ The fasting, 1 hour, 2 hour and 3 hour values are estimated.

IN SHORT...

2 Approaches for Diagnosing Gestational Diabetes Mellitus (GDM)	
AACE- and ADA-recommended	1-step 75-g 2-hour oral glucose tolerance test (OGTT)[1,2] or
ACOG-recommended	2 steps: a 50-g 1-hour glucose challenge test (GCT), followed by a 100-g 3-hour OGTT (if necessary)[1]

GDM Diagnostic Criteria for OGTT Testing		
	75-g 2-hour[†]	100-g 3-hour*
Fasting plasma glucose (FPG)	92 mg/dL (5.1 mmol/L)[2]	95 mg/dL (5.3 mmol/L)[2]
1-hour post-challenge glucose	180 mg/dL (10.0 mmol/L)[2]	180 mg/dL (10.0 mmol/L)[2]
2-hour post-challenge glucose	153 mg/dL (8.5 mmol/L)[2]	155 mg/dL (8.6 mmol/L)[2]
3-hour post-challenge glucose		140 mg/dL (7.8 mmol/L)[2]

[†] A positive diagnosis requires that test results satisfy any one of these criteria.
* A positive diagnosis requires that ≥2 thresholds are met or exceeded

Adverse outcomes

▶ Adverse outcomes include:

▶ Preeclampsia

▶ Hydramnios

▶ Fetal macrosomia

▶ Fetal organomegaly (hepatomegaly, cardiomegaly)

▶ Birth trauma

▶ Operative delivery

▶ Perinatal mortality

▶ Neonatal respiratory problems and metabolic complications (hypoglycemia, hyperbilirubinemia, hypocalcemia, erythremia)

RISK FACTORS FOR DIABETES DURING PREGNANCY

•A family history of diabetes, especially in first degree relatives

•Prepregnancy weight ≥110 percent of ideal body weight or body mass index >30 kg/m ^{2} , significant weight gain in early adulthood and between pregnancies, or excessive gestational weight gain

•Age >25 years

•Previous delivery of a baby >9 pounds [4.1 kg]

•Personal history of impaired glucose tolerance

•Member of an ethnic group with higher than the background rate of type 2 diabetes (eg, Hispanic-American, African-American, Native American, South or East Asian, Pacific Islander

RISK FACTORS FOR DIABETES DURING PREGNANCY

- Previous unexplained perinatal loss or birth of a malformed infant
- Maternal birthweight >9 pounds [4.1 kg] or <6 pounds [2.7 kg]
- Glycosuria at the first prenatal visit
- Polycystic ovary syndrome
- Current use of glucocorticoids
- Essential hypertension or pregnancy-related hypertension
- Metabolic syndrome

BENEFITS AND HARMS OF SCREENING

▶ The benefit of screening is that identifying pregnant women with diabetes followed by appropriate therapy can decrease **fetal** and **maternal** morbidity, particularly macrosomia, shoulder dystocia, and preeclampsia.

Glucose monitoring and glycemic targets
Self-monitoring of blood glucose

▶ 3.1. We recommend self-monitoring of blood glucose in all pregnant women with gestational or overt diabetes and suggest testing before and either 1 or 2 hours after the start of each meal (choosing the postmeal time when it is estimated that peak postprandial blood glucose is most likely to occur) and, as indicated, at bedtime and during the night.

Management of elevated blood glucose

▶ 2.3b. We recommend that the initial treatment of gestational diabetes should consist of medical nutrition therapy and daily moderate exercise for 30 minutes or more.

▶ 2.3c. We recommend using blood glucose-lowering pharmacological therapy if lifestyle therapy is insufficient to maintain normoglycemia in women with gestational diabetes.

Glucose Monitoring

▶ Reflecting this physiology, fasting and postprandial monitoring of blood glucose is recommended to achieve metabolic control in pregnant women with diabetes.

▶ Preprandial testing is also recommended for women with preexisting diabetes using insulin pumps or basal bolus therapy, so that premeal rapidacting insulin dosage can be adjusted.

▶ Postprandial monitoring is associated with better glycemic control and lower risk of preeclampsia.

▶ Similar to the targets recommended by the American College of Obstetricians and Gynecologists, the ADA-recommended targets for women with type 1 or type 2 diabetes (the same as for GDM; described below) are as follows:

▶ ○ Fasting=<95 mg/dL (5.3 mmol/L) andeither

▶ ○ One-hour postprandial =<140 mg/dL(7.8 mmol/L) or

▶ ○ Two-hour postprandial =<120 mg/dL(6.7 mmol/L).

▶ In practice, it may be challenging for women with type 1 diabetes to achieve these targets without hypoglycemia, particularly women with a history of recurrent hypoglycemia or hypoglycemia unawareness.

A1C in Pregnancy

▶ Observational studies show the lowest rates of adverse fetal outcomes in association with A1C<6–6.5% (42–48 mmol/mol) early in gestation.

▶ Clinical trials have not evaluated the risks and benefits of achieving these targets, and treatment goals should account for the risk of maternal hypoglycemia in setting an individualized target of <6%(42 mmol/mol) to<7% (53 mmol/mol).

▶ Due to physiological increases in red blood cell turnover, A1C levels fall during normal pregnancy.

▶ although A1C may be useful ,it should be used as a secondary measure of glycemic control, after self-monitoring of blood glucose.

- In the second and third trimesters,A1C<6% (42mmol/mol) has the lowest risk of large-for-gestational-age infants ,**whereas** other adverse outcomes increase with A1C>6.5% (48 mmol/mol).

- Taking all of this into account, a target of 6–6.5%(42–48 mmol/mol) is recommended but<6% (42 mmol/mol) may be optimal as pregnancy progresses.

- These levels should be achieved without hypoglycemia, which,in addition to the usual adverse sequelae,may increase the risk of low birth weight.

Postpartum care

▶ We recommend that a 2-hour, 75-gOGTT should be undertaken 6 to 12 weeks after delivery in women with gestational diabetes to rule out prediabetes or diabetes.

▶ We suggest blood glucose-lowering medication should be discontinued immediately after delivery for women with gestational diabetes **unless** overt diabetes is suspected in which case the decision to continue such medication should be made on a case-by-case basis.

Thanks for attention