

Gestational diabetes: Its classification and optimal management

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Abstract

The classification of diabetes mellitus includes diabetes mellitus type I, diabetes mellitus type II, gestational diabetes and other specific types. Unfortunately, the incidence diabetes mellitus in pregnancy, or gestational diabetes, today ranging between 4 and 7%, has been globally on the rise in recent years, particularly among women over 32 years old. According to the International Association of the Diabetes and Pregnancy Study Groups (IADPSG), a pregnant woman can be at low, average or high risk of developing diabetes during pregnancy. A new strategy for the diagnosis of gestational diabetes has been proposed, focusing on the measurement of fasting glucose plasma level

to be performed during the 1st trimester of pregnancy. The management of women with gestational diabetes entails: a) treatment of the women, b) antepartum surveillance tests, c) appropriate timing and mode of delivery, d) postpartum follow - up. Management also includes monitoring after the birth, since the likelihood of developing Diabetes type II is 7 times greater in women with a history of gestational and the recurrence rate of gestational diabetes during a subsequent pregnancy is approximately 40%.

Key words: gestational diabetes; diabetes mellitus; pregnancy; management; follow - up; classification

The incidence of diabetes on a global scale has increased dramatically in recent years, with the biggest rise being recorded in ages over 65 years old, while a considerable increase is also seen in younger people up to the age of 44 years¹. The prevalence of all the types of diabetes mellitus (DM) during pregnancy (DM type I, DM type II and gestational diabetes) ranges from 4 to 7%. The largest percentage, approximately 88%, concerns diabetes appearing for the first time in the mother or diabetes diag-

nosed for the first time in pregnancy². This type of diabetes has markedly increased in recent years, according to recent diagnostic criteria³. This is mainly due to the increase of the mean age of reproduction as well as the ever rising percentage of overweight/obese women getting pregnant.

Today it is well established that the blood sugar levels in a pregnant woman are directly proportional to the perinatal and maternal outcome. Recent studies in a large number of pregnancies showed that

Table 1. Classification of diabetes during pregnancy

Diabetes mellitus type I	Destruction of cells in the pancreatic islets Diabetes in women <30 years old Family history of other autoimmune diseases
Diabetes mellitus type II	Decreased secretion of insulin or increased resistance to insulin Diabetes in women > 30 years old Coexistent with obesity Family history of DM type II
Gestational diabetes	Any kind of homeostasis imbalance of glucose detected or discovered for the 1 st time during the pregnancy
Other types	Diabetes due to endocrinopathy Diabetes due to drug administration or exposure to toxic substances

the higher the mother's blood sugar level (though not exceeding the normal physiological values), the higher the frequency of babies born above the 90th growth percentile, cesarean section, incidence of neonatal hypoglycemia and increased levels of C - peptide in the umbilical blood⁴⁻⁶.

Classification of diabetes mellitus in pregnancy

A pregnant woman with disorders in homeostasis of glucose and subsequent hyperglycemia could develop one of the following types of diabetes:

Diabetes mellitus type I. Destruction of pancreatic β -cells in these women is characteristic. These women are younger than 30 years of age and usually have a family history of autoimmune diseases.

Diabetes mellitus type II. Usually in obese women of 30 years of age or older diagnosed with inadequate insulin secretion or increased tissue resistance to insulin.

Gestational diabetes. This concerns diabetes appearing for the first time in the patient or diabetes diagnosed for the 1st time in pregnancy.

Diabetes associated with the incidence of an endocrinopathy, such as Cushing's syndrome or suprarenal glands hyperplasia, or due to drugs administration, such as corticosteroids, or due to exposure to toxic substances⁷. Every pregnant woman has a 2 - 17% risk (mean: 7%) of developing diabetes mellitus during pregnancy⁸. The term gesta-

tional diabetes concerns a heterogeneous group of women. It is not certain which women will need diet adaptation alone or a strict diet combined with insulin treatment or an oral antidiabetic tablet regimen. Furthermore, this term does not precisely define the severity of the disease (Table 1)⁸.

According to the International Association of the Diabetes and Pregnancy Study Groups (IADPSG), a woman can have a very low, high or intermediate risk of developing diabetes during pregnancy. Low - risk comprises women who belong to an ethnicity of low DM type II incidence, are aged 25 or younger, have a normal BMI before the pregnancy, do not show a complicated obstetric history and do not have a history of hyperglycemia of any kind. These women are in no need of testing for gestational diabetes via the fasting glucose tolerance test method (Table 2).

By contrast, high - risk includes women who have a history of gestational diabetes or of a pathological curve in their glucose tolerance test or increased levels of pre - meal glucose. Furthermore, they have a complicated obstetric history (intrauterine death, congenital fetal anomalies, miscarriages, births of neonates exceeding 4,500gr), are aged over 35 years and present with vascular lesions, symptoms of glycosuria and/or a family history of DM type II (Table 3)^{8,9}.

These women should be checked via a glucose curve at their first consultation at the start of pregnancy. A timely glucose tolerance test will thereby uncover women with DM type II. It is moreover

Table 2. Classification of diabetes risk in pregnancy according to the international association of diabetes and pregnancy study groups (IADPSG)

Risk	Clinical characteristics	Glucose tolerance test
Low (all the clinical characteristics are required)	Age <25 years Low - risk ethnicity Absence of diabetes in 1 st degree relatives Physiological BMI before the pregnancy Absence of glucose intolerance history Obstetric history with no complications	Not needed
High (at least one of the clinical characteristics is required)	History of gestational diabetes or pathological glucose levels before meals or irregular glucose curve in the tolerance test Obstetric history with complications (endometrial death, congenital fetal anomalies, abortions, obesity, baby born over 4,500gr) Age > 35 years Arterial defects Glycosuria Family history of DM type II	Immediately Repeat at 24 - 28 weeks of gestation, if gestational diabetes diagnosis has not been established

well known that DM II is responsible for congenital anomalies in the embryo at almost the same frequency as DM type I¹⁰.

The rest of the female population belongs to the intermediate - risk group and these women should undergo a glucose tolerance test between the 24th - 28th weeks of gestation.

A new strategy for the diagnosis of diabetes in pregnancy has been proposed. It involves measurement of the morning fasting glucose levels of the pregnant woman after the 1st visit. If the glucose levels are less than 92mg/dL, the woman will undergo a glucose tolerance test between the 24th - 28th weeks of gestation^{11,12}. If the glucose levels are found to be more than 126mg/dL, then the woman is definitely suffering from diabetes mellitus and should be monitored and treated as in the case of pre-existing diabetes mellitus in pregnancy. If the results are not diagnostic for diabetes mellitus type II and the glucose fasting plasma level is more than 92mg/dL, but less than 126mg/dL, then a diagnosis of gestational diabetes is almost certain (Table 3)^{11,12}.

The glucose tolerance test is carried out by administering 75gr of glucose. Prior to glucose administra-

tion, a blood sample is obtained, which reflects the fasting glucose level (time 0'). The blood sugar level measurement then follows at 1 hour and 2 hours after the glucose administration. The physiological range is up to 92mg/dL for the fasting glucose level (time 0'), up to 180mg/dL for the 1st hour measurement and up to 153mg/dL for the 2nd hour. In the event that one of the above measurements exceeds the cut - off point, the diagnosis of gestational diabetes is established¹².

Management of gestational diabetes

A basic question is if the therapy has a beneficial effect on the perinatal outcome, to which a recent systematic review and meta-analysis has provided a clear answer. It was found that upon completion of the therapy, perinatal and neonatal mortality decreased. Fewer macrosomic children were born, while the incidence of neonatal hypoglycemia, trauma during labor and the need for intensive care of neonates dramatically decreased¹³.

The general management of women with diabetes mellitus in pregnancy entails the conservation of physiological glucose levels in the mother's blood. In

Table 3. Determination and diagnosis of hyperglycemic disorders during pregnancy based on measurement of plasma fasting glucose levels in all women upon their 1st consultation at the start of pregnancy

If the plasma fasting glucose level is <92mg/dL	Perform a glucose tolerance test between 24 and 28 weeks of gestation with 75gr of glucose.
If the plasma fasting glucose is > 92mg/dL and <126mg/dL	The diagnosis of gestational diabetes is established
If the plasma glucose level is >126mg/dL	The diagnosis of diabetes mellitus type II is established

Table 4. Management of women with gestational diabetes

Treatment	Diet Exercise Insulin or antidiabetic tablets Daily monitoring of glucose levels
Careful observation of the pregnancy and the endometrial wellbeing of the fetus	Ultrasound NST
Appropriate time and mode of delivery	
Observation after delivery	OGTT*

*Oral glucose tolerance test with 75gr of glucose

this endeavor, diet, exercise, insulin or antidiabetic pill administration and the daily monitoring of glucose levels play a crucial role. Furthermore, the management includes strict overall observation of the pregnant woman and the endometrial wellbeing of the fetus, the appropriate time and mode of delivery and, of course, the management of the mother after delivery (Table 4)¹⁴.

The role of diet

Concerning diet, the majority of women should receive a dietary program in which calorie intake does not exceed 2,000 - 2,500 daily. The carbohydrate calorie intake should be limited to 33 - 40% of the total calorie requirements and should be preferably synthetic carbohydrates. On the other hand, low saturated fatty acids should cover less than 7% of the calorie requirements¹⁵. The American Diabetes Association recommends that women of BMI > 30 should limit their calorie intake by 30 - 33% during pregnancy¹⁶. However, the daily intake should not be lower than 1,500^{17,18}. The maternal and neonatal outcome is strongly de-

pendent on the recommended weight that the mother needs to attain during the pregnancy, while they also depend on the BMI of the woman before the pregnancy. The weight increase has to be minimal during the 1st trimester (0.5 - 2kg) to ensure that changes in the embryo and the maternal tissues are small. Meanwhile, during the 2nd and 3rd trimester, the weekly weight increase should be 0.35 - 0.50kg. Overweight women (BMI 26 - 29) should not increase their weight by more than 7 - 11.5kg, whereas obese women with BMI over 30 should gain no more than 5 - 9kg^{19,20}.

The effect of exercise

Mild exercise or walking for approximately 20 minutes daily helps with the improvement of glucose regulation in the female and her general wellbeing²¹.

Daily monitoring of glucose levels

This daily monitoring is of the utmost importance for women with gestational diabetes. Usually it is recommended to have 4 measurements per day (measurement of fasting glucose in the morning and 3 ensu-

ing measurements, once after each meal)^{22,23}. Some prefer to check the glucose levels 1 hour after meals or even 2 hours later. However, this slight difference in measurements does not affect the perinatal outcome²³. The objective is to keep the woman's glucose fasting levels between 60 - 90mg/dL by means of a controlled diet and daily exercise. Furthermore, it is required that the glucose levels do not exceed 140mg/dL 1 hour after a meal and also that they do not exceed 120mg/dL 2 hours after a meal^{24,25}.

The role of insulin

If the desired glucose levels before and after meals are not achieved by means of lifestyle changes, then the administration of insulin is deemed necessary. The quantity and type of insulin depends on the pre-meal and post - meal glucose levels. Insulin is also recommended for women who, even though successfully not exceeding the physiological upper glucose levels, have fetuses showing, in an ultrasound scan at 32 weeks of gestation, an abdominal circumference higher than the 75th percentile. The same applies to women who, despite their physiological glucose levels, exhibit hydramnios²⁶.

Antidiabetic tablets

Researchers have recently embraced the use of antidiabetic tablets orally for the control of hyperglycemia in women with gestational diabetes. The most commonly used is metformin. In a comparative study between 363 women who tried metformin and 370 who tried insulin, no substantial difference was found in the perinatal outcome²⁷. A large clinical study also concludes that metformin is a safe and effective treatment, alternative to insulin treatment in women with gestational diabetes, without any adverse effects on the maternal or perinatal outcome²⁸. Nevertheless, some researchers are skeptical regarding this new alternative treatment, since it has been observed that 46% of women who took metformin needed either additional insulin or exclusively insulin for the successful management and regulation of glucose⁸.

Monitoring of the pregnancy and the wellbeing of the fetus

As in all pregnancies, a measurement of the Crown-Rump Length of the fetus should be carried out for the exact determination of its age and vitality. The measurement of nuchal translucency should be carried out between the 11th and 14th week for the detection of possible chromosomal abnormalities in the embryo. The fetal anatomy ultrasound scan should be carried out between the 20th and 22nd week. Furthermore, a monthly ultrasound check is strongly advised for monitoring of fetal wellbeing and growth as well as for the evaluation of amniotic fluid. An ultrasound scan should be also performed in the 38th week of gestation. The endometrial assessment of the fetus is completed with the NST test or with the biophysical profile. In women with good glucose control via diet alone and who do not show complications, the aforementioned tests may not be necessary on a monthly basis. They are, however, mandatory and should be done in between 32 to 34 weeks. Particularly in women with complications, as well as in those who take insulin, scans should be done twice per week^{7,29}.

Appropriate timing and mode of delivery

There are many protocols concerning the time and mode of delivery in women with gestational diabetes. The American Diabetic Association suggests that the delivery be carried out during the 38th week, unless the obstetric parameters indicate delivery should be induced sooner²⁹. According to the American College of Obstetricians and Gynecologists, the time of delivery is always under discussion. If there are no complications present, no signs of fetal distress and the glucose levels are satisfactory, the delivery may take place at the 40th week of gestation. Cesarean section is preferred in cases where the baby's weight is estimated to be larger than 4,500gr³⁰. According to the National Institute for Health of the United Kingdom, delivery either by cesarean section or vaginally should occur after the 38th week. That being said, glucose levels should be constantly monitored during the pregnancy so that they are maintained between

73 - 126mg/dL (4 - 7mmol/L) for the full duration of the pregnancy³⁰.

Postpartum observations

After delivery, the mother does not need particular regulation of glucose levels. She should, however, be submitted to a glucose tolerance test. The trial is done with 75gr of glucose 6 - 12 weeks after labor. The purpose of this test is to identify women with clinical diabetes mellitus or with a pathological glucose curve³¹. Women diagnosed with clinical diabetes should be referred to a diabetic clinic. According to the American Diabetes Association, women with normal results from the glucose tolerance test should be screened every 3 years and those with pathological results yearly³⁰. The same approach is proposed by the American College of Obstetricians and Gynecologists, with the addition of the administration of metformin to blood glucose fasting levels between 120 - 126mg/dL, as well as in women with a pathological glucose curve^{30,31}.

Future risk

The risk of developing gestational diabetes is approximately 41% for women with a history of the disease by contrast to only about 4% for those women with no previous diagnosis of it. The probability of developing diabetes is even greater in the 3rd pregnancy of women who showed signs of the disease in their previous two pregnancies (Table 4)^{32,33}.

The risk of developing diabetes mellitus type II, as shown by a recent systematic review and meta-analysis of 643,588 patients, is 7 times greater in those who showed signs of gestational diabetes compared to those who didn't³⁴. In another study involving observation of 11,270 women with a history of gestational diabetes over a span of 10 years and 185,416 women with a history of normal uncomplicated pregnancy, it was shown that in this time span 15.7% of the women of the 1st category and only 1% of those of the 2nd were diagnosed with diabetes mellitus type II³⁵. ■

Conflict of interest

All authors declare no conflict of interest.

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