Diabetes mellitus in pregnancy: Screening and diagnosis

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Pre-pregnancy counselling

The aim of pre-pregnancy counselling is to achieve the best possible glycaemic control before pregnancy and to educate diabetic women about the implications of pregnancy. Advice includes:

- Optimization of glycaemic control to achieve an HbA1c of <42 mmol/mol
- High-dose folic acid (5 mg daily) to reduce the risk of neural tube defects.
- Planning periconception adjustments to other medications
- Poor glycaemic control is associated with a significantly increased risk of congenital anomalies, particularly neural tube defects and cardiac anomalies.
The most critical period for the embryo is therefore the period of organogenesis, which occurs in the first 42 days of pregnancy,

The level of HbA1c in early pregnancy also correlates with the risk of early fetal loss. An HbA1c of >85 mmol/mol is associated with a fetal loss during pregnancy of around 30%.

Prepregnancy care is associated with reduced rates of congenital malformation.

Targets for therapy pre-pregnancy are premeal glucose levels of 4–7 mmol/l.

Diabetic vascular complications are common in women of reproductive age
It is important that a plan for medication adjustment is made and women are counselled regarding the additional potential complications associated with diabetic microvascular disease ie Nephropathy.

There is also a risk that retinopathy can progress in pregnancy and during the postpartum period.
Maternal and fetal complications of types 1 and 2 diabetes mellitus

1. Congenital abnormality is an important cause of mortality and morbidity in diabetic pregnancies.

2. It is seen 2–4 times more often than in pregnancies without diabetes with a threefold excess of cardiac and neural tube defects.

3. Structural malformations, fetal macrosomia is a frequent complication associated with maternal diabetes and frequently contributes to a traumatic birth and shoulder dystocia.

4. Accelerated growth patterns are typically seen in the late second and third trimesters and are attributable to poorly controlled diabetes in the majority of cases.
5. Stillbirth, particularly in the third trimester, remains too common in pregnancies complicated by maternal diabetes, being five times higher than in the general population.

6. Increased incidence of infection, severe hyperglycaemia or hypoglycaemia, diabetic ketoacidosis and the complications that may arise from the increased operative delivery rate.

7. The risk of preeclampsia is increased 3X in women with diabetes, and particularly in those with underlying microvascular disease.
frequently prompt early term delivery in women with diabetes, which in turn increases the likelihood of neonatal unit admission and reduces breastfeeding rates.

In general, maternal morbidity in diabetic pregnancies is related to the severity of diabetic-related vascular disease preceding the pregnancy.

All women with diabetes should be offered low-dose aspirin from 12 weeks’ gestation to reduce the risk of preeclampsia.
Management of types 1 and 2 diabetes in pregnancy

- The primary goal is to optimize glycaemic control.
- Blood glucose monitoring is encouraged 7 times a day (before and 2 hour after meals) with targets of 4-6 mmol/l and 2-hour postprandial levels of <6-8 mmol/l
- Use of oral hypoglycaemic agents such as metformin and/or insulin where appropriate,
- Insulin resistance increases dramatically over the course of pregnancy and therefore women with type 1 and type 2 diabetes are usually required to increase their dose of insulin or metformin during the second half of pregnancy.
- A plan for the pregnancy should be set out in early pregnancy and should include renal and retinal screening, fetal surveillance and a plan for delivery.
- Women with diabetes should be offered a fetal anomaly scan at 19–20 weeks with an assessment of the cardiac outflow tracts.
- Serial growth scans are also recommended to assess fetal growth and diagnose macrosomia and polyhydramnios
If antenatal corticosteroids are indicated, additional insulin therapy is required to maintain normoglycaemia.

Timing and mode of delivery should be determined on an individual basis.

In general, provided the pregnancy has gone well, the aim would be to achieve a vaginal delivery at between 38 and 39 weeks.

However, the development of macrosomia or maternal complications such as pre-eclampsia, together with the rate of failed induction, is such that the caesarean section rate amongst diabetic women often is as high as 50%.
Effects of pregnancy on diabetes

- Nausea and vomiting, particularly in early pregnancy.
- Greater importance of tight glucose control.
- Increase in insulin dose requirements in the second half of pregnancy.
- Increased risk of severe hypoglycaemia.
- Risk of deterioration of pre-existing retinopathy.
- Risk of deterioration of established nephropathy.
Effects of diabetes on pregnancy

- Increased risk of miscarriage.
- Risk of congenital malformation.
- Risk of macrosomia.
- Increased risk of pre-eclampsia.
- Increased risk of stillbirth.
- Increased risk of infection.
- Increased operative delivery rate.
Historically, the term "gestational diabetes" has been defined as onset or first recognition of abnormal glucose tolerance during pregnancy.
Pregnancy is accompanied by insulin resistance

Due placental secretion of diabetogenic hormones including growth hormone, corticotropin-releasing hormone, placental lactogen prolactin (Insulin antagonists).

Pregnancy is an insulin resistance condition, with changes exacerbated in the 3rd trimester.

Pancreas will secret more insulin normally.

GDM develops during pregnancy in women whose pancreatic function is insufficient to overcome the insulin resistance associated with the pregnant state.

Glucose crosses the placenta so fetal glucose follows maternal level normally.
GDM

- GDM complicates 10–15% of pregnancies depending on the diagnostic criteria used.

- Screening for diabetes in pregnancy is designed to detect previously undiagnosed type 2 diabetes and diabetes developing during pregnancy.

- Women who develop GDM are at increased risk of type 2 diabetes in later life, and education about diet and lifestyle during pregnancy can have important implications for future health.

- No single screening method has been shown to be perfect in terms of sensitivity and specificity for GDM.

- Screening is generally targeted at high-risk groups.
Screening involves a glucose tolerance test (NICE) guidelines (2015) recommend a diagnosis of GDM with a fasting glucose ≥5.6 mmol/l and/or a 2 hour (post-75 g glucose load) of 7.8 mmol/l.

The WHO guidelines (2013) recommend a diagnosis with a fasting glucose of 5.1 mmol/l and/or a 1 hour (post 75 g glucose load) of 10.0 mmol/l or 2 hour of 8.5 mmol/l.

The principles of management during pregnancy are the same as for women with pre-existing diabetes.

Women are educated regarding the risks and are encouraged to maintain capillary blood (fingerprick) glucose levels <5.3 mmol/l before meals and postprandial levels <7.8 mmol/l 1 hour after meals.

Women unable to achieve this level of glycemic control with changes to diet and lifestyle are treated with metformin and/or insulin as necessary.

Screening with a fasting glucose / HbA1c should be offered 6–13 weeks after childbirth.
Factors associated with poor pregnancy outcome in diabetes

- Maternal social deprivation.
- No folic acid intake pre-pregnancy.
- Suboptimal approach of the woman to managing her diabetes.
- Suboptimal preconception care.
- Suboptimal glycemic control at any stage.
- Suboptimal maternity care during pregnancy.
- Suboptimal fetal surveillance of big babies.
Significance

Several adverse outcomes have been associated with gestational diabetes mellitus

- Preeclampsia, gestational hypertension
- Polyhydramnios
- Macrosomia and large for gestational age infant
- Maternal and infant birth trauma
- Operative delivery (cesarean, instrumental)
- Perinatal mortality
- Fetal/neonatal hypertrophic cardiomyopathy
- Neonatal respiratory problems and metabolic complications (hypoglycemia, hyperbilirubinemia, hypocalcemia, polycythemia)
In addition, if the mother is hyperglycemic during organogenesis, such as women with known or unknown overt diabetes, the risks of miscarriage and congenital anomalies are increased.

Women with GDM are at increased risk of developing type 2 diabetes as well as type 1 diabetes and cardiovascular disease.

Their adolescent and adult offspring appear to be at risk of long-term sequelae, such as obesity, abnormal glucose tolerance, hypertension, or metabolic syndrome.

Treatment of gestational diabetes mellitus can reduce the risk of some pregnancy complications (eg, preeclampsia) and adverse neonatal outcomes (eg, macrosomia).
Risk factors

Pregnant women with any of the following characteristics appear to be at increased risk of developing gestational diabetes mellitus; the risk increases when multiple risk factors are present:

- Personal history of impaired glucose tolerance, or gestational diabetes mellitus in a previous pregnancy.
- Ethnic groups, Hispanic American, African American, Native American, South or East Asian
- Family history of diabetes, especially in first-degree relatives
- Pre-pregnancy weight ≥110 percent of ideal body weight or BMI >30 kg/m²
- Older maternal age (>30 years of age).
- Previous unexplained perinatal loss or birth of a malformed infant.
- Glycosuria at the first prenatal visit.
- Previous birth of an infant ≥4000 or 4500 g
- Medical condition such as metabolic syndrome, polycystic ovary syndrome, current use of glucocorticoids, hypertension or cardiovascular disease, acanthosis nigricans.
- Multiple gestation.
SCREENING AND DIAGNOSTIC TESTING

One-step and two-step approaches

Two-step approach

The two-step approach is the most widely used approach for identifying pregnant women with GDM. The first step is a 50-gram one-hour glucose challenge test (GCT) without regard to time of day/previous meals.

Screen-positive patients go on to the second step, a 100-gram, three-hour oral glucose tolerance test (GTT), which is the diagnostic test for gestational diabetes mellitus.

One-step approach

The one-step approach omits the screening test and simplifies diagnostic testing by performing only a 75-gram, two-hour oral GTT but requires an overnight fast.
Timing of screening/testing

- While there are no proven benefits to screening/testing for diabetes in early pregnancy, testing can be performed as early as the first prenatal visit if there is a high degree of suspicion that the pregnant woman has undiagnosed type 2 diabetes.

- History of gestational diabetes mellitus have a 48% RR.

- In the absence of early testing or if early testing is negative, universal screening is performed at 24 to 28 weeks of gestation.
The diagnosis of gestational diabetes mellitus is based on results of an oral GTT.

- fasting glucose level before administering the GTT.

If a 75-gram two-hour GTT is planned and the fasting glucose level is \( \geq 92 \text{ mg/dL (5.6 mmol/L)} \), then the diagnosis of gestational diabetes mellitus is made and the GTT is cancelled.

This approach requires asking the patient to have blood drawn for her fasting glucose level and then wait for the results before proceeding with the GTT later on the same day (and remain fasting).
Criteria for a positive two-hour 75-gram oral glucose tolerance test for the diagnosis of gestational diabetes

Two-hour 75-gram oral glucose tolerance test

- Fasting ≥ 92 mg/dL (5.6 mmol/L)
- One hour ≥ 180 mg/dL (10.0 mmol/L)
- Two hour ≥ 153 mg/dL (8.5 mmol/mol)

The diagnosis of gestational diabetes is made at 24 to 28 weeks of gestation when one or more plasma glucose values meets or exceeds the above values.
Patients unable to tolerate oral hyperosmolar glucose

Serial glucose monitoring

Obtaining periodic fasting and one- or two-hour postprandial blood glucose tests is a monitoring option for women at high risk for gestational diabetes mellitus who are unable to tolerate an oral glucose load.

Obtaining a periodic fasting glucose and A1C is a similar option.
### Range of diagnostic criteria for gestational diabetes

<table>
<thead>
<tr>
<th>Approach</th>
<th>Fasting mg/dL</th>
<th>One-hour mg/dL</th>
<th>Two-hour mg/dL</th>
<th>Three-hour mg/dL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two step (75-gram load)</td>
<td>92 (5.6mmol/L)</td>
<td>180 (10.0 mmol/L)</td>
<td>153 (8.5 mmol/L)</td>
<td></td>
</tr>
</tbody>
</table>
CONSEQUENCES OF GDM

Short-term:

1. Large for gestational age (LGA) infant and macrosomia (WT=90th centile for gestational age) and macrosomia (birth weight ≥4.5Kg) risk increased if
   i. maternal hyperglycemia
   ii. excessive maternal weight gain (>40 lbs [18 kg]) doubles the risk

Macrosomia complications

- operative delivery (cesarean or instrumental vaginal)
- adverse neonatal outcomes, such as shoulder dystocia and its associated complications: brachial plexus injury, fracture,

Truncal asymmetry (disproportion in the ratio of the size of the shoulder- or abdomen-to-head) in infants of diabetic mothers also appears to increase these risks
2. Preeclampsia & gestational hypertension

3. Polyhydramnios - The etiology in GDM is unclear, fetal polyuria.

4. Stillbirth. This risk appears to be related primarily to poor glycemic control

5. Neonatal morbidity increased risk of multiple, often transient, morbidities, including
   - hypoglycemia
   - hyperbilirubinemia
   - hypocalcemia
   - Hypomagnesemia
   - Polycythemia
   - respiratory distress
   - and/or cardiomyopathy

   These risks are related to maternal hyperglycemia.
GDM may affect the offspring’s risk of developing

- obesity
- impaired glucose tolerance
- or metabolic syndrome

GDM is also a strong marker for maternal development of type 2 diabetes, including diabetes-related vascular disease
Approach to patients

- **Glucose monitoring and control** — Glucose monitoring, medical nutritional therapy, exercise, and the use of insulin and anti-hyperglycemic agents

- **Antenatal fetal testing**

- **Women on insulin or oral anti-hyperglycemic drugs or with poor glycemic control**
  - twice weekly CTG plus an amniotic fluid index beginning at 32 weeks of gestation in women who need insulin or an oral antihyperglycemic agent to achieve good glycemic control,
  - and in all women with poor glycemic control, we generally recommend that these women typically undergo periodic antenatal testing, usually initiated at approximately 32 weeks of gestation.
Women euglycemic on nutritional therapy alone — therefore, omitting antenatal fetal surveillance (nonstress testing or biophysical profile scoring) is a reasonable approach for these women.

Assessment of fetal growth Identification of accelerated fetal growth before delivery may be useful to identify maternal-fetal pairs who may benefit from scheduled cesarean delivery to avoid trauma from shoulder dystocia.
Timing of delivery

main question in GDM is whether to induce labor and, if so, why?
- avoidance of late stillbirth
- delivery-related complications of continued fetal growth, such as shoulder dystocia or cesarean delivery.

The potential disadvantages are the risks of induction
- longer labor
- increased tendency for intervention
- increased neonatal morbidity if induction is before 39 weeks.
- Increasing evidence suggests that induction of labor in women with GDM does not lead to higher cesarean delivery rates than expectant management
• pregnancies of women who remain euglycemic with nutritional therapy and exercise alone these patients should not be electively delivered prior to 39 weeks of gestation Timing of induction between 39+0 and 41+0 weeks is more controversial.

• women with GDM whose glucose levels are medically managed with insulin or oral agents we recommend induction of labor at 39 weeks of gestation.
Scheduled cesarean delivery

to avoid birth trauma is typically offered to women with GDM and estimated fetal weight ≥4500 grams.

Labor and delivery

- During labor, periodic assessment of maternal glucose levels
- Transient hypoglycemia can be caused by intrapartum maternal hyperglycemia, which induces an acute rise in fetal insulin
- Insulin requirements usually decrease during labor,
- Women with GDM who were euglycemic without use of insulin or oral antihyperglycemic drugs during pregnancy do not normally require insulin during labor and delivery, and thus do not need their blood glucose levels checked hourly.
- Women with GDM who used insulin or oral antihyperglycemic drugs to maintain euglycemia occasionally need insulin during labor and delivery to maintain euglycemia. The Endocrine Society suggests target glucose levels of 72 to 126 mg/dL (4.0 to 7.0 mmol/L)
- Check blood glucose measurements every two hours during labor
- For women undergoing scheduled cesarean delivery, insulin or antihyperglycemic drugs are withheld the morning of surgery and the woman is not allowed any oral intake after midnight.
POSTPARTUM MANAGEMENT AND FOLLOW-UP

Women with gestational diabetes mellitus (GDM) should be able to resume a normal diet postpartum. After delivery, the hyperglycemic effects of placental hormones dissipate rapidly. Thus, most women revert back to their pre-pregnancy glycemic status almost immediately.

- **Contraception** — While any type of contraception is acceptable, as long as the usual medical contraindications to use are absent, we recommend long-acting reversible contraception (LARC; eg, intrauterine device, contraceptive implant) because of the minimal risk of unplanned pregnancy with these methods.

- **Breastfeeding** — Breastfeeding should be encouraged, as it benefits both mother and child.

Breastfeeding improves maternal glucose metabolism and thus may reduce the glucose levels obtained during a postpartum glucose tolerance test.
## Biophysical profile

<table>
<thead>
<tr>
<th>Test</th>
<th>Requirement</th>
<th>Failure Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>NST/Reactive FHR</td>
<td>At least two accelerations in 20 minutes</td>
<td>Less than two accelerations to satisfy the test in 20 minutes</td>
</tr>
<tr>
<td>US: Fetal breathing movements</td>
<td>At least one episode of &gt; 30s or &gt;20sin 30 minutes</td>
<td>None or less than 30s or 20s</td>
</tr>
<tr>
<td>US: Fetal activity / gross body movements</td>
<td>At least three or two movements of the torso or limbs</td>
<td>Less than three or two movements</td>
</tr>
<tr>
<td>US: Fetal muscle tone</td>
<td>At least one episode of active bending and straightening of the limb or trunk</td>
<td>No movements or movements slow and incomplete</td>
</tr>
<tr>
<td>US: Qualitative AFV/AFI</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
THROMBOCYTOPENIA

- Immune thrombocytopenia (ITP)
- Drug-induced thrombocytopenia
- Preeclampsia
- HELLP syndrome
- Disseminated intravascular coagulation
- Acquired, autoimmune thrombotic thrombocytopenic purpura (TTP)
- Hereditary TTP
- Complement-mediated thrombotic microangiopathy (C-TMA)
Thrombocytopenia is defined as a platelet count below the lower limit of the normal range (typically, <150,000/microL). In most uncomplicated pregnancies, platelet counts remain within the normal range (150,000 to 450,000/microL). Platelet counts are slightly lower in women with twin compared with singleton pregnancies.

Mean platelet counts during uncomplicated pregnancy

<table>
<thead>
<tr>
<th></th>
<th>Uncomplicated singleton pregnancies</th>
<th>Uncomplicated twin pregnancies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-pregnant</td>
<td></td>
<td>273,000/microL</td>
</tr>
<tr>
<td>First trimester</td>
<td>251,000/microL</td>
<td>240,000/microL</td>
</tr>
<tr>
<td>Second trimester</td>
<td>230,000/microL</td>
<td>221,000/microL</td>
</tr>
<tr>
<td>Third trimester</td>
<td>225,000/microL</td>
<td>217,000/microL</td>
</tr>
<tr>
<td>Delivery</td>
<td>217,000/microL</td>
<td>202,000/microL</td>
</tr>
<tr>
<td>Postpartum (seven weeks)</td>
<td>264,000/microL</td>
<td>-</td>
</tr>
</tbody>
</table>
Gestational thrombocytopenia (GT)

Also called incidental thrombocytopenia of pregnancy

- Benign
- self-limited
- requires no additional evaluation or treatment
- GT accounts for the vast majority of cases of thrombocytopenia discovered during pregnancy
- GT may occur during the first trimester, but it becomes more common as gestation progresses
- the highest frequency at the time of delivery, when the frequency is 5 to 10 percent
- Most common at delivery, but can occur at any time during pregnancy.
- Mild thrombocytopenia. (In 99 percent of women, the platelet count is ≥100,000 /microL.)
- No increased bleeding or bruising.
- No associated abnormalities on complete blood count (CBC).
- No fetal or neonatal thrombocytopenia.
The mechanism(s) of GT has not been documented, but it may be assumed to be

- a physiologic adaptation of pregnancy related to the increased plasma volume,
- pooling or consumption of platelets in the placenta,
- The placenta has many vascular characteristics in common with the spleen, a major site of physiologic platelet sequestration
GT is a diagnosis of exclusion. The diagnosis of GT is accepted if the woman has mild thrombocytopenia (platelet count 100,000 to 150,000/microL), especially during late pregnancy and at delivery, with no other associated findings on CBC or physical examination.

- GT resolves postpartum, usually
- A history of mild thrombocytopenia during a previous pregnancy supports the diagnosis of GT because the risk of recurrent GT is 14-fold greater
- GT requires no treatment and no change of normal prenatal care and management of delivery.
- No diagnostic testing is necessary because a platelet count >100,000/microL causes no risk for the mother or the fetus.
Immune thrombocytopenia (ITP)

- 1 -3 in 10,000 pregnancies
- only a minimal number have platelet counts <50,000/microL
- This is approximately 10-fold greater than ITP in the general population,
- ITP may occur during any trimester or the diagnosis may be known prior to the pregnancy.
- The severity of thrombocytopenia is variable and may change during the pregnancy.
- Most deliveries were vaginal, and one-fourth of the infants had thrombocytopenia.
- ITP is an autoimmune condition in which antiplatelet autoantibodies interfere with platelet production and cause destruction of circulating platelets.
- The diagnosis of ITP is based only on the exclusion of other causes of thrombocytopenia. Therefore, in a pregnant woman with mild thrombocytopenia (platelet count 100,000 to 150,000/microL), GT and ITP cannot be distinguished.
- The diagnosis of GT is much more likely than ITP in such patients because the frequency of GT is 100-fold greater than the frequency of ITP during pregnancy.
Preeclampsia with severe features/HELLP

"HELLP syndrome" hemolytic anemia, elevated liver function tests, and low platelet count)

- Both terms ("preeclampsia with severe features" and "HELLP") describe a pregnant woman who is acutely ill with thrombocytopenia and who requires delivery to halt the disease process.
- There is substantial overlap between these syndromes, but it is possible to have HELLP without hypertension and it is also possible to have preeclampsia with severe features without all of the manifestations of HELLP.

Preeclampsia –5 % of pregnant women.

- Preeclampsia is associated with thrombocytopenia in approximately 15 %, and with severe thrombocytopenia (platelet count <50,000/microL) in under 5 %, with the likelihood of thrombocytopenia correlating with the severity of disease.
Disseminated intravascular coagulation (DIC)

Is a systemic process in which coagulation and fibrinolysis become activated within the vasculature, often massively.

- This can lead to depletion of clotting factors and platelets
- severe bleeding and/or diffuse oozing
- as well as increased risk of thrombosis.
- There is always an underlying cause that initiates systemic activation of the clotting cascade.
Causes of DIC in pregnancy include
- abruptio placentae
- retained dead fetus
- amniotic fluid embolism
- septic abortion
- others.

Management of DIC involves identifying and treating the underlying cause. Transfusions may be needed while bleeding is being controlled.
Acute fatty liver of pregnancy

- Acute fatty liver of pregnancy (AFLP) is a form of liver injury that typically occurs in the third trimester.
- The major clinical findings relate to fatty infiltration of the liver and include nausea, vomiting, and abdominal pain.
- The platelet count may be decreased.
- If liver function is severely impaired, the PT and aPTT will be prolonged, and the fibrinogen may be low.
TTP  Thrombotic thrombocytopenic purpura (TTP)

A significant proportion of patients with hereditary TTP have their first presentation of disease during pregnancy, acquired TTP is more common than hereditary TTP and thus more likely in a pregnant patient without a family history of TTP.

Features suggestive of TTP include

- Thrombocytopenia and schistocytes combined with severe neurologic findings (although half of patients with TTP have no or only minor neurologic abnormalities).
- Absence of features of DIC (eg, absence of coagulation abnormalities).
- TTP can occur during any trimester or postpartum.
DETERMINING THE LIKELY CAUSE(S)

our approach to the evaluation takes into account the severity of thrombocytopenia, clinical presentation, and trimester

Helpful information includes the following:

► Course of the pregnancy so far, including presence or absence of complications
► Symptoms of infection such as fever and chills
► New daily medications within the past three weeks, or occasional medications taken immediately before symptoms occurred
► Personal or family history of excessive bleeding, bruising, pregnancy complications, or known thrombotic microangiopathy (TMA) syndrome
► Systemic lupus erythematosus (SLE) or other autoimmune disorder
► History of liver disease
► Timing of the drop in platelet count (which trimester, how rapidly)
► Presence of anemia more severe than expected for the stage of pregnancy
► Abnormalities of the peripheral blood smear, such as abnormal white blood cells or nucleated red blood cells
Treatment of bleeding or severe thrombocytopenia

The risk of severe bleeding due to thrombocytopenia only increases substantially with platelet counts below 50,000/microL.

For women with platelet counts of 50,000 to 100,000/microL, increased bleeding may occur with invasive procedures, but will not occur spontaneously.

For women with platelet counts < 50,000 and severe bleeding (bleeding into a closed space, bleeding requiring transfusion, bleeding that will not stop) or bleeding that is expected to become severe, platelet transfusion should be given immediately, regardless of the underlying cause of thrombocytopenia.

Platelet transfusions are not appropriate for women without active bleeding, unless surgery and/or delivery is imminent.
The platelet count threshold for a non-bleeding pregnant woman nearing delivery or a procedure depends on the expected mode of delivery or type of procedure. In the absence of bleeding, we use the following thresholds:

- **Vaginal delivery** – Transfuse to a platelet count of 30,000/microL
- **Cesarean delivery** – Transfuse to a platelet count of 50,000/microL
Need for urgent/emergency delivery

Conditions treated by delivery — Thrombocytopenic conditions that are treated by delivery include the following, management of which is discussed in detail separately:

- **Preeclampsia with severe features or HELLP syndrome**
- **Disseminated intravascular coagulation (DIC)** (when due to retained dead fetus or intra-amniotic infection)
Conditions not treated by delivery — Conditions that are not treated by delivery include:

- Thrombotic thrombocytopenic purpura (TTP)
- Complement-mediated thrombotic microangiopathy (C-TMA)
- Drug-induced thrombocytopenia
- DIC (when due to a non-obstetric cause such as malignancy or extrauterine infection)
SUMMARY AND RECOMMENDATIONS

Platelet counts decrease 15 to 20 percent during the course of uncomplicated pregnancies

- Mild thrombocytopenia (platelet count 100,000 to 150,000/microL) is most often due to gestational thrombocytopenia (GT) and does not require further evaluation
- GT is by far the most common cause of thrombocytopenia in pregnancy and is the presumptive diagnosis in a woman with a platelet count between 100,000 and 149,000/microL, provided there are no other abnormal findings. GT is a diagnosis of exclusion; it is a benign, physiologic condition seen in 5 to 10 percent of pregnant women that requires no evaluation or treatment.
- Platelet counts <100,000/microL occur in only 1 percent of women with GT
Immune thrombocytopenia (ITP) is an autoimmune condition in which autoantibodies interfere with platelet production and cause destruction of circulating platelets. ITP can precede pregnancy or can occur at any stage of the pregnancy or postpartum. ITP is a diagnosis of exclusion.

The majority of pregnant women with relatively mild or incidentally discovered thrombocytopenia (platelet count between 100,000 and 150,000/microL) without other cytopenias or major clinical findings will have GT. It is not possible or necessary to distinguish GT from mild ITP because both are diagnoses of exclusion and neither requires therapy.
Comparison of typical clinical features and specific management of disorders associated with a platelet count <80,000/microL occurring after 20 weeks gestation

<table>
<thead>
<tr>
<th>Clinical feature</th>
<th>Preeclampsia/HELLP</th>
<th>TTP</th>
<th>C-TMA</th>
<th>ITP</th>
<th>Hemorrhage/DIC</th>
<th>Sepsis/DIC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Incidence</strong></td>
<td>100 in 10,000 pregnancies</td>
<td>1 in 10,000 pregnancies</td>
<td>Unknown. May be similar to TTP.</td>
<td>3 in 10,000 pregnancies</td>
<td>2 in 10,000 pregnancies</td>
<td>1 in 10,000 pregnancies</td>
</tr>
<tr>
<td><strong>Time of occurrence</strong></td>
<td>By definition, occurs after 20 weeks of gestation; more common near term and within three days postpartum</td>
<td>May occur throughout pregnancy, but most common near term and several weeks postpartum</td>
<td>May occur throughout pregnancy, but most common postpartum</td>
<td>Any time during pregnancy</td>
<td>Most commonly at delivery and postpartum</td>
<td>May be similar to TTP</td>
</tr>
<tr>
<td><strong>Vital signs</strong></td>
<td>Hypertension, by definition, BP &gt;160/110</td>
<td>Normal BP, fever may be present but is rare</td>
<td>Hypertension due to AKI</td>
<td>Normal, unless hypotension and tachycardia from bleeding</td>
<td>Hypotension, tachycardia (may have been transient)</td>
<td>Fever, hypotension, tachycardia</td>
</tr>
<tr>
<td><strong>Neurologic abnormalities</strong></td>
<td>Headache, vision changes. Less commonly eclamptic seizures, PRES, stroke.</td>
<td>Severe in 41% (transient focal defects, seizure, stroke); minor in 30%</td>
<td>None</td>
<td>None</td>
<td>Probably none</td>
<td>Probably none</td>
</tr>
<tr>
<td><strong>Microangiopathic hemolysis/schistocytes</strong></td>
<td>Moderate</td>
<td>Severe</td>
<td>Moderate</td>
<td>None</td>
<td>Variable</td>
<td>Variable</td>
</tr>
<tr>
<td><strong>Kidney injury</strong></td>
<td>Usually mild, but severe AKI is possible. Dialysis is rarely required.</td>
<td>Usually mild or absent; severe AKI requiring dialysis in &lt;5%</td>
<td>Severe, typically dialysis is required</td>
<td>None</td>
<td>Severe ATN, reversible</td>
<td>May have ATN, reversible</td>
</tr>
<tr>
<td><strong>Liver function tests: ALT, AST</strong></td>
<td>From normal to markedly increased</td>
<td>Normal or slightly increased</td>
<td>Normal</td>
<td>Normal</td>
<td>May be markedly increased</td>
<td>May be increased</td>
</tr>
<tr>
<td><strong>Typical course following delivery</strong></td>
<td>Stabilization or improvement within 48 hours</td>
<td>No stabilization or improvement within 48 hours</td>
<td>Increasing serum creatinine</td>
<td>Most unchanged, but may improve after delivery</td>
<td>Recovery after source of hemorrhage corrected</td>
<td>Recovery after appropriate treatment</td>
</tr>
<tr>
<td><strong>Specific management</strong></td>
<td>Delivery of infant is curative</td>
<td>Plasma exchange, immunosuppression if acquired autoimmune TTP suspected. If hereditary TTP is strongly suspected, plasma infusion is sufficient</td>
<td>Anti-complement agent</td>
<td>Glucocorticoids, IVIG, and maybe additional immunosuppressive agents</td>
<td>Identify and correct source of hemorrhage. May require additional laparotomy.</td>
<td>Antibiotics</td>
</tr>
</tbody>
</table>