**Lecture 4: Bleeding in Pregnancy (Prenatal Hemorrhage) Nursing Care Plans**

complications of the [hemorrhage](https://nurseslabs.com/postpartum-hemorrhage-nursing-care-plans/).

**1-Risk for Bleeding**

Within the circulatory system, blood must flow normally and yet if vessels are damaged it must form a clot quickly to restrict excessive bleeding. Due to the competing demands of flow and hemostasis, the coagulation system is necessarily complex. Pregnancy results in increased levels of fibrinogen and bleeding factors. An altered fibrinolytic state is part of a normal physiological response to pregnancy due to increased fibrinolytic inhibitors and tissue plasminogen activators (Lefkou & Hunt, 2018).

**Nursing Diagnosis**

* [Risk for Bleeding](https://nurseslabs.com/risk-for-bleeding/)

**May be related to**

* Incomplete [abortion](https://nurseslabs.com/elective-termination-nursing-care-plans/)
* Ectopic pregnancy
* Premature cervical dilatation

**Possibly evidenced by**

* Changes in [fetal heart rate](https://nurseslabs.com/fetal-growth-assessment/)/activity
* Vaginal spotting
* Uterine [cramping](https://nurseslabs.com/diarrhea/)

**Desired Outcomes**

* The client will display normal vital signs and stable fetal heart rates.
* The client will have reduced or absence of vaginal spotting or bleeding.
* The client will exhibit self-precaution to avoid the recurrence of bleeding.

**Nursing Assessment and Rationales**

**1. Assess the client’s reproductive history.**A review of the menstrual history and prior ultrasonography if applicable can help establish gestational dating and determine whether the pregnancy location is known (Hendricks et al., 2019).

**2. Assess maternal vital signs.**Assess the client’s pulse, respiration, and blood pressure every 15 minutes and apply a pulse oximeter and automatic blood pressure cuff as necessary. This provides baseline data on maternal response to blood loss. With significant blood loss, the pulse rate and respiratory rate will start to increase as the heart attempts to compensate for the decreased circulatory volume and the [respiratory system](https://nurseslabs.com/respiratory-system/) increases gas exchange to better oxygenate the RBCs.

**3. Auscultate and report FHR; note bradycardia or tachycardia. Note change in hypoactivity or**[**hyperactivity**](https://nurseslabs.com/attention-deficit-hyperactivity-disorder-2/)**.**The initial response of a fetus to decreased oxygenation is tachycardia and increased movements. A further deficit will result in bradycardia and decreased activity. In placenta previa, the fetus or neonate may have [anemia](https://nurseslabs.com/anemia/) or hypovolemic shock because some of the blood loss may be fetal blood. Fetal hypoxia may occur if a large disruption of the placental surface reduces the transfer of oxygen and nutrients.

**4. Note expected date of birth (EDB) and fundal height.**This provides an estimate for identifying fetal viability. When a threatened abortion occurs, efforts are made to keep the fetus in utero until the age of viability. Termination of pregnancy after 20 weeks of gestation (age of viability) is called preterm [labor](https://nurseslabs.com/labor-stages-labor-induced-nursing-care-plan/). Abortion is the spontaneous or intentional termination of pregnancy before the age of viability.

**5. Monitor and record maternal blood loss and uterine contractions.**Excess maternal blood loss compromises placental perfusion. If uterine contractions are accompanied by cervical dilatation, bed rest and medications may not be effective in maintaining the pregnancy. The nurse documents the amount and character of bleeding and saves anything that looks like clots or tissue for [evaluation](https://nurseslabs.com/nursing-process/) by a pathologist. A pad count and an estimate of how saturated each is documented blood loss most accurately.

**6. Assess for signs of**[**hypovolemia**](https://nurseslabs.com/fluid-electrolyte-imbalances-nursing-care-plans/)**.**
The client should be assessed for signs and symptoms of hypovolemia. The increased blood volume of pregnancy allows more than normal blood loss before hypovolemic shock processes begin. Because “normal” blood pressure varies from client to client, it is important to know the baseline blood pressure of a pregnant woman when evaluating for hypovolemic shock. Signs and symptoms include tachycardia, tachypnea, hypotension, cold clammy skin, decreased urine output, dizziness, and decreased central venous pressure.

**Nursing Intervention and Rationales**

**1. Place the client in a lateral position.**The lateral position relieves pressure on the inferior vena cava and enhances placental circulation and oxygen exchange. Urge the client to rest in a left side-lying position to help prevent vena cava compression. If this is not possible, position her on her back, with a wedge under one hip to minimize uterine pressure on the vena cava and prevent blood from being trapped in the lower extremities ([supine](https://nurseslabs.com/patient-positioning/) hypotension syndrome).

**2. Schedule the client’s periods of rest and activities.**
The client may avoid strenuous activities for 24 to 48 hours to prevent a threatened abortion, assuming the threatened miscarriage involves a live fetus and presumed placental bleeding. Complete bed rest is usually not necessary as this may appear to stop the vaginal bleeding but only because blood pools vaginally. When the client does ambulate again, the vaginal blood collection will drain and bleeding will reappear.

**3. Avoid vaginal examinations.**
Omitting vaginal examinations prevent tearing of the placenta if [placenta previa](https://nurseslabs.com/placenta-previa/)is the cause of the bleeding.

**4. Obtain vaginal specimen for alkali denaturation test (APT test), or use Kleihauer-Betke test to determine maternal serum, vaginal blood, or products of gastric lavage.**When vaginal bleeding is present these tests differentiate maternal from fetal blood in amniotic fluid, provide a rough quantitative estimate of fetal blood loss, and indicate implications for fetal oxygen-carrying capacity, and maternal need for Rh immunoglobulin G (RhIgG) injections, once delivery occurs. The Kleihauer-Betke test is more sensitive and quantitatively accurate than the APT test, but is time-consuming and may be impractical if the specimen is sent to an outside laboratory (Fung, 2021).

**5. Carry out/repeat NST, as indicated.**Electronically evaluating the FHR response to fetal movements is useful in determining fetal well-being (reactive test) versus hypoxia (nonreactive). Additionally, this assesses whether labor and fetal status are still present. An external system avoids additional cervical trauma.

**6. Assist with ultrasonography and amniocentesis. Explain procedures.**Ultrasound is used to determine if the fetus is living and supplies information about placental and fetal well-being. Using an amniocentesis technique, an analysis of the lecithin/sphingomyelin (L/S) ratio in surfactant is a primary test of fetal maturity.

**7. Prepare client for appropriate procedures as indicated.**Cerclage, or suturing an [incompetent cervix](https://nurseslabs.com/incompetent-cervix/) that opens when the growing fetus presses against it, is successful in most cases of threatened abortion.

**Gestational Diabetes Mellitus Nursing Care Plans**

**Gestational**[**Diabetes Mellitus**](https://nurseslabs.com/diabetes-mellitus/)**(GDM)** is glucose intolerance with onset during pregnancy. In true GDM, glucose usually returns to normal by six weeks [postpartum](https://nurseslabs.com/postpartum-care/), although women with GDM have an increased risk of developing [type 2 diabetes mellitus](https://nurseslabs.com/diabetes-mellitus-nursing-care-plans/) later in life. The primary concern for any woman with this disorder is controlling the balance between [insulin](https://nurseslabs.com/insulin/) and [blood](https://nurseslabs.com/blood-anatomy-physiology/) glucose levels to prevent [hyperglycemia](https://nurseslabs.com/risk-unstable-blood-glucose-level/) or hypoglycemia. Women with gestational [diabetes](https://nurseslabs.com/diabetes-mellitus-nursing-care-plans/) are at an increased risk of complications during pregnancy and delivery.

**Nursing Care Plans**

The nursing care plan for gestational [diabetes mellitus](https://nurseslabs.com/diabetes-mellitus-type-1-juvenile-diabetes/) involves providing the client or couple with information regarding the disease condition, teaching insulin administration, achieving and maintaining normoglycemia, and evaluating the present client or fetal well-being.

**1-Risk for Unstable Blood Glucose Levels**

If a woman’s insulin production is insufficient, glucose cannot be used by the body cells. The cells register the need for glucose, and the liver quickly converts stored glycogen to glucose to increase the serum glucose level. However, because insulin is unavailable, the body cells still cannot use the glucose, so the serum glucose levels rise.

**Nursing Diagnosis**

* Risk for Unstable Blood Glucose Levels

**Risk factors may include**

* Decreased insulin production
* Increased resistance of cells to insulin
* Increased insulin breakdown

**Possibly evidenced by**

* *A risk diagnosis is not evidenced by signs and symptoms. Interventions are directed at prevention.*

**Desired Outcomes**

* Within 4 hours of nursing intervention, the patient will verbalize understanding of the individual treatment regiment and the need for regular glucose self-monitoring.
* Within 8 hours of nursing action, the patient will maintain fasting serum blood glucose levels between 60-100 mg/dl and 1-hour postprandial of no higher than 140 mg/dl and will be free of signs and symptoms of [diabetic ketoacidosis](https://nurseslabs.com/diabetic-ketoacidosis-nursing-care-plans/) (fruity-scented breath, excessive thirst, frequent urination, weakness, [confusion](https://nurseslabs.com/acute-confusion/)).

**Nursing Assessment and Rationales**

**1. Perform a prenatal screening test to identify gestational diabetes mellitus.**
Suppose the woman does not have preexisting diabetes mellitus. In that case, a prenatal screening test is routinely performed between 24 and 28 weeks gestation, but it may be done earlier if risk factors are present. The woman drinks 50g of an oral glucose solution, and a blood sample is taken 1 hour later and analyzed for glucose. If the blood glucose level is 130 to 140 mg/dL or higher, a more complex, 3-hour glucose tolerance test is done.

**2. Note signs of hyperglycemia (confusion, increased thirst, frequent urination, changes in visual acuity) or hypoglycemia (dizziness; tremors; lethargy; excessive sweating, pale, cool, moist skin).**
Observing these signs may alert the [nurse](https://nurseslabs.com/registered-nurse/) to developing hyperglycemia or hypoglycemia. If the woman cannot increase her insulin production, she will have periods of hyperglycemia as glucose accumulates in the blood. Because the fetus continuously draws glucose from the mother, maternal hypoglycemia can occur between meals and night.

**3. Monitor the client’s vital signs, uterine contractions, and fetal heart rate (FHR).**
Determine the client’s progress through monitoring and physical exam and inform her of signs of beginning [labor](https://nurseslabs.com/labor/). Increased FHR is a sign of possible fetal distress. Uterine contractions could mark the beginning of [preterm](https://nurseslabs.com/preterm-labor-nursing-care-plans/) [labor](https://nurseslabs.com/labor-stages-labor-induced-nursing-care-plan/).

**4. Assess understanding of the effect of stress on diabetes. Teach the client about stress management and relaxation measures.**
Hormones released during stress conditions (stress hormones) are counter-regulatory in glucose metabolism because they can induce hyperglycemia. During stress situations, insulin sensitivity is generally reduced, mainly due to signaling defects downstream of the insulin receptor that reduce glucose transport in insulin-sensitive tissues such as the liver, [muscle](https://nurseslabs.com/muscular-system-anatomy-physiology/), and fats. In contrast, glucose production is higher due to increased hepatic gluconeogenesis. (Marcovecchio & Chiarelli, 2012).

**Nursing Interventions and Rationales**

**1. Teach and demonstrate to the client how to monitor blood glucose levels using a finger-stick method.**
The pregnant diabetic woman may monitor her blood glucose levels several times a day as directed by the healthcare provider. The client can test their own blood glucose level in their homes. The client not only must be skilled in the techniques but also understand the results and how to incorporate them into the daily regimen. This means involving the entire healthcare team in ongoing supervision, demonstrations, and support. To ensure a successful pregnancy, the client must keep her blood glucose levels as close to normal as possible.

**2. Provide information regarding any required changes in diabetic management, e.g., use of human insulin only, changing from oral diabetic drugs to insulin, and self-monitoring of serum blood glucose levels at least twice a day (e.g., before breakfast and before dinner).**
Metabolism and maternal/fetal needs fluctuate during gestation, requiring close monitoring and adaptation. The dose and frequency of insulin injections are tailored to a woman’s individual needs. Insulin is often administered on a sliding scale, in which the woman varies her dose of insulin based on each blood glucose level. Two-thirds of daily insulin needs are given before breakfast and one-third before dinner. The client should eat immediately after injecting insulin to avoid hypoglycemia.

**3. Provide information regarding the signs, symptoms, and differences between hyperglycemia and hypoglycemia.**
The client who takes insulin may experience episodes of hypoglycemia or hyperglycemia. Therefore, she should be taught how to recognize and respond to each condition, and family members are also included in the teaching. *Symptoms and interventions include:*

* **Hypoglycemic** episodes occur most frequently in the first trimester, owing to continuous fetal drain on serum glucose and amino acids, and too low levels of human placental lactogen (HPL).  The blood glucose level that indicates hypoglycemia is usually <60 mg/dL. The client may feel excessive hunger; trembling; weakness; faintness; lethargy; headache; irritability; sweating, pale, cool, moist skin; and even loss of consciousness.
* **Hyperglycemia** results from inadequate insulin, reduced activity, excessive food intake, and infection during pregnancy. A blood glucose level of  >120 mg/dL indicates hyperglycemia. Signs of symptoms of hyperglycemia include [fatigue](https://nurseslabs.com/fatigue/); flushed, hot skin; dry [mouth](https://nurseslabs.com/digestive-system/); excessive thirst; [dehydration](https://nurseslabs.com/cholera/); frequent urination; [nausea](https://nurseslabs.com/nausea/) and vomiting; rapid, deep respirations; acetone odor of the breath (which indicates ketoacidosis); and depressed reflexes. To correct a hyperglycemic episode, teach the client to evaluate her food intake and emphasize the importance of honesty regarding her food intake to avoid inappropriately adjusting her insulin dose.

**4. Instruct the client on how to treat symptomatic hypoglycemia.**
During hypoglycemic periods, the client may drink an 8oz glass of milk or juice or eat a piece of fruit or two crackers to relieve the hypoglycemic episode. She may then repeat in 15 minutes if serum glucose levels remain below 70 mg/dl.Using plenty of simple carbohydrates to treat hypoglycemia causes serum glucose values to elevate. A combination of complex carbohydrates and protein maintains normoglycemia longer and helps maintain the stability of serum glucose throughout the day.

**5. Discuss the type of insulin, dosage, and schedule**.
Division of insulin dosage considers basal maternal needs and mealtime insulin-to-food ratio and allows more freedom in meal-scheduling. The total daily dosage is based on gestational, current maternal body weight, and serum glucose levels. Typically, insulin dosage may be reduced to avoid hypoglycemia in the first trimester. In the second trimester, increasing placental hormones increase insulin resistance, and the dosage of insulin may have to be increased. Insulin requirements may decrease again at 38 weeks gestation. Insulin Aspart and lispro are fast-acting insulins that are highly effective if given before meals.

**6. Monitor serum blood glucose levels (fasting blood sugar, 1-hour postprandial) on the first visit, and then as indicated by the client’s condition.**
The client should obtain fasting and 1-hour postprandial values four times a day, and goals include fasting numbers of 90 mg/dL and below and postprandial values less than 140 mg/dL. The client monitors her blood glucose levels by using a glucometer. The results should be documented by the client and presented to her healthcare provider to determine if any adjustments in her insulin or oral diabetic regimen are necessary.

**7. Obtain results of glycosylated hemoglobin** **(HbA1c) every 2-4weeks.**
The measurement of HbA1c, the amount of glucose attached to hemoglobin, is used to detect the degree of hyperglycemia present. Measuring HbA1c is advantageous not just because it offers a present value of glucose but because it reflects the average blood glucose level over the past 4 to 6 weeks.

**8. Administer**[**intravenous fluids**](https://nurseslabs.com/iv-fluids/)**and insulin additives or oral diabetic agents as prescribed.**
Correcting blood glucose is vital to both maternal and fetal well-being. Insulin therapy is needed by clients who cannot control their blood glucose levels with diet or oral therapy. Short-acting insulin may be used alone or with an intermediate type. The use of insulin pumps has also proved great value for glucose control in pregnant and nonpregnant clients with diabetes mellitus and reduces hypoglycemic events.

**9. Coordinate multispecialty care conferences as appropriate.**
Provides an opportunity to review the management of both pregnancy and diabetic conditions and plan for special needs during intrapartum and postpartum periods. A dietitian can determine foods to meet her needs and help find solutions to adhering to the diet. Referral to a diabetes management center can also be helpful. During birth, neonatal nurses and a neonatologist are often present.

**10. Prepare for hospitalization if diabetes is not controlled.**
Assist the client in transfer to the hospital unit. Infant morbidity is linked to maternal hyperglycemia-induced fetal hyperinsulinemia. Continuous monitoring is necessary to detect if uterine contractions and preterm birth were halted.

*Last full review/revision Jan 2022| Content last modified Jan 2022*

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**Postpartum depression is depressive symptoms that last > 2 weeks after delivery and meet criteria for major depression.**

Postpartum depression occurs in 10 to 15% of women after delivery. Although every woman is at risk, women with the following are at higher risk:

* Baby blues (eg, rapid mood swings, irritability, anxiety, decreased concentration, insomnia, crying spells)
* Prior episode of postpartum depression
* Prior diagnosis of [depression](https://www.msdmanuals.com/professional/psychiatric-disorders/mood-disorders/depressive-disorders)
* Family history of depression
* Significant life stressors (eg, marital conflict, stressful events in the last year, financial difficulties, parenting with no partner, partner with depression)
* Lack of support from partner or family members (eg, financial or child care support)
* History of mood changes temporally associated with menstrual cycles or oral contraceptive use
* Prior or current poor obstetric outcomes (eg, previous miscarriage, preterm delivery, neonate admitted to the neonatal intensive care unit, an infant with a congenital malformation)
* Prior or continuing ambivalence about the current pregnancy (eg, because it was unplanned or termination was considered)
* Problems with breastfeeding

The exact etiology of postpartum depression is unknown; however, prior depression is the major risk, and hormonal changes during the puerperium, sleep deprivation, and genetic susceptibility may contribute.

**Transient depressive symptoms** (baby blues) is very common during the first week after delivery. Baby blues differs from postpartum depression because baby blues typically lasts 2 to 3 days (up to 2 weeks) and is relatively mild; in contrast, postpartum depression lasts > 2 weeks and is disabling, interfering with activities of daily living.

**Symptoms and Signs of Postpartum Depression**

Symptoms of postpartum depression are similar to those of major [depression](https://www.msdmanuals.com/professional/psychiatric-disorders/mood-disorders/depressive-disorders) and may include

* Baby blues (eg, rapid mood swings, irritability, anxiety, decreased concentration, insomnia, crying spells)
* Extreme sadness
* Mood swings
* Uncontrollable crying
* Insomnia or increased sleep
* Loss of appetite or overeating
* Irritability and anger
* Headaches and body aches and pains
* Extreme fatigue
* Unrealistic worries about or disinterest in the baby
* A feeling of being incapable of caring for the baby or of being inadequate as a mother
* Fear of harming the baby
* Guilt about her feelings
* Suicidal ideation
* Anxiety or panic attacks

Typically, symptoms develop insidiously over 3 months, but onset can be more sudden. Postpartum depression interferes with women’s ability to care for themselves and the baby.

Women may not bond with their infant, resulting in emotional, social, and cognitive problems in the child later.

Partners may also be at increased risk of depression, and depression in either parent may result in relationship stress.

Without treatment, postpartum depression can resolve spontaneously or become chronic depression. Risk of recurrence is about 1 in 3 to 4.

**Postpartum psychosis** rarely develops; untreated postpartum depression and psychosis increase the risk of suicide and infanticide, which are the most severe complications.

**Diagnosis of Postpartum Depression**

* Clinical evaluation
* Criteria for major depression

Early diagnosis and treatment of postpartum depression substantially improve outcomes for women and their infant.

Postpartum depression (or other serious mental disorders) is diagnosed if women have ≥ 5 symptoms for > 2 weeks; symptoms include depressed mood and/or loss of interest or pleasure and

* Significant weight loss, loss of appetite, or weight gain
* Insomnia or hypersomnia
* Psychomotor agitation or retardation
* Feeling of worthlessness or guilt
* Diminished ability to concentrate
* Suicidal or homicidal thoughts (women should be asked specifically about such thoughts)

Because of cultural and social factors, women may not volunteer symptoms of depression, so health care providers should ask women about such symptoms before and after delivery. Also, women should be taught to recognize symptoms of depression, which they may mistake for the normal effects of new motherhood (eg, fatigue, difficulty concentrating).

All women should be screened at the postpartum visit for postpartum depression using a validated screening tool. Such tools include the [Edinburgh Postnatal Depression Scale](https://psychology-tools.com/epds/) and the Postpartum Depression Screening Scale ( [1](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/postpartum-care-and-associated-disorders/postpartum-depression#v48480132)).

Patients with hallucinations, delusions, or psychotic behavior should be evaluated for postpartum psychosis.

**Treatment of Postpartum Depression**

* Antidepressants
* Psychotherapy

Treatment of postpartum depression includes [antidepressants](https://www.msdmanuals.com/professional/psychiatric-disorders/mood-disorders/drug-treatment-of-depression) and psychotherapy. If a woman has significant anxiety, she may be treated with anxiolytics.

Women who have postpartum psychosis may need to be hospitalized, preferably in a supervised unit that allows the infant to remain with them. [Antipsychotic drugs](https://www.msdmanuals.com/professional/psychiatric-disorders/schizophrenia-and-related-disorders/schizophrenia#v1029264) may be needed as well as antidepressants.

**Key Points**

* **Baby blues is very common during the first week after delivery, typically lasts 2 to 3 days (up to 2 weeks), and is relatively mild.**
* **Postpartum depression occurs in 10 to 15% of women, lasts > 2 weeks, and is disabling (in contrast to baby blues).**
* **Symptoms are be similar to those of major depression and can also include anxiety.**
* **Postpartum depression may result in adverse effects on the child or in relationship stress.**
* **Teach all women to recognize the symptoms of postpartum depression, and ask them about symptoms of depression before and after delivery.**
* **Formally screen all women for mood disorders during their postpartum visit.**
* **For the best possible outcomes, identify and treat postpartum depression as early as possible.**

**[Anemia in Pregnancy](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/pregnancy-complicated-by-disease/anemia-in-pregnancy)**

*Last full review/revision Oct 2021*

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Normally during pregnancy, erythroid hyperplasia of the marrow occurs, and red blood cell (RBC) mass increases. However, a disproportionate increase in plasma volume results in hemodilution (hydremia of pregnancy): hematocrit (Hct) decreases from between 38% and 45% in healthy women who are not pregnant to about 34% during late single pregnancy and to 30% during late multifetal pregnancy. The following hemoglobin (Hb) and Hct levels are classified as anemic:

* 1st trimester: Hb < 11 g/dL; Hct < 33%
* 2nd trimester: Hb < 10.5 g/dL; Hct < 32%
* 3rd trimester: Hb < 11 g/dL; Hct < 33%

If Hb is < 11.5 g/dL at the onset of pregnancy, women may be treated prophylactically because subsequent hemodilution usually reduces Hb to < 10 g/dL. Despite hemodilution, oxygen-carrying capacity remains normal throughout pregnancy. Hct normally increases immediately after birth.

[Anemia](https://www.msdmanuals.com/professional/hematology-and-oncology/approach-to-the-patient-with-anemia/red-blood-cell-production) occurs in up to one third of women during the 3rd trimester. The most common causes are

* [Iron deficiency](https://www.msdmanuals.com/professional/nutritional-disorders/mineral-deficiency-and-toxicity/iron-deficiency)
* [Folate deficiency](https://www.msdmanuals.com/professional/nutritional-disorders/vitamin-deficiency%2C-dependency%2C-and-toxicity/folate-deficiency)

Obstetricians, in consultation with a perinatologist, should evaluate anemia in pregnant Jehovah's Witness patients (who are likely to refuse blood transfusions) as soon as possible.

**Symptoms and Signs of Anemia in Pregnancy**

Early symptoms of anemia are usually nonexistent or nonspecific (eg, fatigue, weakness, light-headedness, mild dyspnea during exertion). Other symptoms and signs may include pallor and, if anemia is severe, tachycardia or hypotension.

Anemia increases risk of

* [Preterm delivery](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/abnormalities-and-complications-of-labor-and-delivery/preterm-labor)
* Low birth weight
* Postpartum maternal infections

**Diagnosis of Anemia in Pregnancy**

* Complete blood count (CBC), followed by testing based on mean corpuscular value (MCV) value

Diagnosis of anemia begins with CBC; usually, if women have anemia, subsequent testing is based on whether the MCV is low (< 79 fL) or high (> 100 fL):

**LAB TEST**

Ferritin



* For **microcytic anemias:** Evaluation includes testing for iron deficiency (measuring serum ferritin) and [hemoglobinopathies](https://www.msdmanuals.com/professional/hematology-and-oncology/anemias-caused-by-hemolysis/overview-of-hemolytic-anemia%22%20%5Co%20%22Overview%20of%20Hemolytic%20Anemia) (using hemoglobin electrophoresis). If these tests are nondiagnostic and there is no response to empiric treatment, consultation with a hematologist is usually warranted.
* For **macrocytic anemias:** Evaluation includes serum folate and vitamin B12 levels.
* For **anemia with mixed causes:** Evaluation for both types is required.

**Treatment of Anemia in Pregnancy**

* Treatment to reverse the anemia
* Transfusion as needed for severe symptoms or fetal indications

Treatment of anemia during pregnancy is directed at reversing the anemia (see below).

Transfusion is usually indicated for any anemia if severe constitutional symptoms (eg, light-headedness, weakness, fatigue) or cardiopulmonary symptoms or signs (eg, dyspnea, tachycardia, tachypnea) are present; the decision is not based on the Hct.

**Pearls & Pitfalls**

|  |
| --- |
| * Transfusion decisions are not based on the Hct but on the severity of symptoms.
 |

**Key Points**

* **Hemodilution occurs during pregnancy, but oxygen-carrying capacity remains normal throughout pregnancy.**
* **The most common causes of anemia during pregnancy are iron deficiency and folate acid deficiency.**
* **Anemia increases risk of preterm delivery and postpartum maternal infections.**
* **If Hb is < 11.5 g/dL at the onset of pregnancy, consider treating women prophylactically.**
* **Treat the cause of the anemia if possible, but if patients have severe symptoms, transfusion is usually indicated.**

**Iron Deficiency Anemia in Pregnancy**

About 95% of anemia cases during pregnancy are [iron deficiency anemia](https://www.msdmanuals.com/professional/hematology-and-oncology/anemias-caused-by-deficient-erythropoiesis/iron-deficiency-anemia). The cause is usually

* Inadequate dietary intake (especially in adolescent girls)
* A previous pregnancy
* The normal recurrent loss of iron in menstrual blood (which approximates the amount normally ingested each month and thus prevents iron stores from building up) before the woman became pregnant

**Diagnosis of Iron Deficiency Anemia in Pregnancy**

* Measurement of serum iron, ferritin, and transferrin

Typically, Hct is ≤ 30%, and MCV is < 79 fL. Decreased serum iron and ferritin and increased serum transferrin levels confirm the diagnosis of iron deficiency anemia.

**Treatment of Iron Deficiency Anemia in Pregnancy**

* Usually ferrous sulfate 325 mg orally once a day

One 325-mg ferrous sulfate tablet taken midmorning is usually effective. Higher or more frequent doses increase GI adverse effects, especially constipation, and one dose blocks absorption of the next dose, thereby reducing percentage intake.

About 20% of pregnant women do not absorb enough supplemental oral iron; a few of them require parenteral therapy. The iron deficit may be calculated, and the iron can often be replaced over one or two infusions. Hct or Hb is measured weekly to determine response. If iron supplements are ineffective, concomitant folate deficiency should be suspected.

Neonates of mothers with iron deficiency anemia usually have a normal Hct but decreased total iron stores and a need for early dietary iron supplements.

**Prevention of Iron Deficiency Anemia in Pregnancy**

Although the practice is controversial, iron supplements (usually ferrous sulfate 325 mg orally once a day) are usually given routinely to pregnant women to prevent depletion of body iron stores and prevent the anemia that may result from abnormal bleeding or a subsequent pregnancy.

**Folate Deficiency Anemia in Pregnancy**

[Folate deficiency](https://www.msdmanuals.com/professional/nutritional-disorders/vitamin-deficiency%2C-dependency%2C-and-toxicity/folate-deficiency) increases risk of [neural tube defects](https://www.msdmanuals.com/professional/pediatrics/congenital-neurologic-anomalies/overview-of-congenital-neurologic-anomalies) and possibly [fetal alcohol syndrome](https://www.msdmanuals.com/professional/pediatrics/metabolic%2C-electrolyte%2C-and-toxic-disorders-in-neonates/fetal-alcohol-syndrome). Deficiency occurs in 0.5 to 1.5% of pregnant women; [megaloblastic macrocytic anemia](https://www.msdmanuals.com/professional/hematology-and-oncology/anemias-caused-by-deficient-erythropoiesis/megaloblastic-macrocytic-anemias) is present if deficiency is moderate or severe.

Rarely, severe anemia and glossitis occur.

**Diagnosis of Folate Deficiency Anemia in Pregnancy**

* Measurement of serum folate

Folate deficiency is suspected if CBC shows anemia with macrocytic indices or high RBC distribution width (RDW). Low serum folate levels confirm the diagnosis.

**Treatment of Folate Deficiency Anemia in Pregnancy**

* Folic acid 1 mg orally twice a day

Treatment is folic acid 1 mg orally twice a day.

Severe megaloblastic anemia may warrant bone marrow examination and further treatment in a hospital.

**Prevention of Folate Deficiency Anemia in Pregnancy**

For prevention, all pregnant women and women who are trying to conceive are given folic acid 0.4 to 0.8 mg orally once a day. Women who have had a fetus with spina bifida should take 4 mg once a day, starting before conception.

**Hemoglobinopathies in Pregnancy**

During pregnancy, hemoglobinopathies, particularly [sickle cell disease](https://www.msdmanuals.com/professional/hematology-and-oncology/anemias-caused-by-hemolysis/sickle-cell-disease), [Hb S-C disease](https://www.msdmanuals.com/professional/hematology-and-oncology/anemias-caused-by-hemolysis/hemoglobin-s-c-disease%22%20%5Co%20%22Hemoglobin%20S-C%20Disease), and beta- and alpha- [thalassemia](https://www.msdmanuals.com/professional/hematology-and-oncology/anemias-caused-by-hemolysis/thalassemias), can worsen maternal and perinatal outcomes. Genetic screening [genetic screening](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/prenatal-genetic-counseling-and-evaluation/genetic-evaluation#v55253250) for some of these disorders is available.

Preexisting **sickle cell disease,** particularly if severe, increases risk of the following:

* Maternal infection (most often, [pneumonia](https://www.msdmanuals.com/professional/pulmonary-disorders/pneumonia/overview-of-pneumonia), [urinary tract infections [UTIs]](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/postpartum-care-and-associated-disorders/postpartum-pyelonephritis), and [endometritis](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/postpartum-care-and-associated-disorders/postpartum-endometritis))
* [Pregnancy-induced hypertension](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/pregnancy-complicated-by-disease/hypertension-in-pregnancy)
* [Heart failure](https://www.msdmanuals.com/professional/cardiovascular-disorders/heart-failure/heart-failure-hf)
* [Pulmonary infarction](https://www.msdmanuals.com/professional/pulmonary-disorders/pulmonary-embolism-pe/pulmonary-embolism-pe#v915437)
* [Fetal growth restriction](https://www.msdmanuals.com/professional/pediatrics/perinatal-problems/small-for-gestational-age-sga-infant)
* [Preterm delivery](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/abnormalities-and-complications-of-labor-and-delivery/preterm-labor)
* [Low birth weight](https://www.msdmanuals.com/professional/pediatrics/perinatal-problems/small-for-gestational-age-sga-infant)

Anemia almost always becomes more severe as pregnancy progresses. Sickle cell trait increases the risk of UTIs but is not associated with severe pregnancy-related complications.

Treatment of sickle cell disease during pregnancy is complex. Painful crises should be treated aggressively. Prophylactic exchange transfusions to keep Hb A at ≥ 60% reduce risk of hemolytic crises and pulmonary complications, but they are not routinely recommended because they increase risk of transfusion reactions, hepatitis, HIV transmission, and blood group isoimmunization. Prophylactic transfusion does not appear to decrease perinatal risk. Therapeutic transfusion is indicated for the following:

* Symptomatic anemia
* Heart failure
* Severe bacterial infection
* Severe complications of labor and delivery (eg, bleeding, sepsis)

**Hb S-C disease** may first cause symptoms during pregnancy. The disease increases risk of pulmonary infarction by occasionally causing bony spicule embolization. Effects on the fetus are uncommon but, if they occur, often include fetal growth restriction.

**Sickle cell–beta-thalassemia** is similar to Hb S-C disease but is less common and more benign.

**Alpha-thalassemia** does not cause maternal morbidity, but if the fetus is homozygous, hydrops and fetal death occur during the 2nd or early 3rd trimester.

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**[Hypertension in Pregnancy](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/pregnancy-complicated-by-disease/hypertension-in-pregnancy)**

Recommendations regarding classification, diagnosis, and management of hypertensive disorders (including preeclampsia) are available from the American College of Obstetricians and Gynecologists (ACOG [ [1](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/pregnancy-complicated-by-disease/hypertension-in-pregnancy#v30784400)]).

(See also [Hypertension](https://www.msdmanuals.com/professional/cardiovascular-disorders/hypertension/hypertension).)

In 2017, the American College of Cardiology (ACC) and the American Heart Association (AHA) released new guidelines for the evaluation of high blood pressure (BP). They lowered the definitions for hypertension as follows:

* Normal: < 120/80 mm Hg
* Elevated: 120 to 129/< 80 mm Hg)
* Stage 1 hypertension: 130 to 139/80 to 89 mm Hg
* Stage 2 hypertension: ≥ 140/90 mm Hg

ACOG defines chronic hypertension as systolic BP ≥ 140 mm Hg or diastolic BP ≥ 90 mm Hg on 2 occasions before 20 weeks gestation. Data on the effect of hypertension as defined by the ACC/AHA during pregnancy are limited. Thus, pregnancy management is likely to evolve.

Hypertension during pregnancy can be classified as one of the following:

* **Chronic:** BP is high before pregnancy or before 20 weeks gestation. Chronic hypertension complicates about 1 to 5% of all pregnancies.
* **Gestational:** Hypertension develops after 20 weeks gestation (typically after 37 weeks) and remits by 6 weeks postpartum; it occurs in about 5 to 10% of pregnancies, more commonly in [multifetal pregnancy](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/abnormalities-and-complications-of-labor-and-delivery/multifetal-pregnancy).

Both types of hypertension increase risk of [preeclampsia and eclampsia](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/abnormalities-of-pregnancy/preeclampsia-and-eclampsia) and of other causes of maternal mortality or morbidity, including

* Hypertensive encephalopathy
* Stroke
* Renal failure
* Left ventricular failure
* HELLP syndrome (hemolysis, elevated liver enzymes, and low platelet count)

Risk of fetal mortality or morbidity increases because of decreased uteroplacental blood flow, which can cause vasospasm, growth restriction, hypoxia, and abruptio placentae. Outcomes are worse if hypertension is severe (systolic BP ≥ 160 mm Hg, diastolic BP ≥ 110 mm Hg, or both) or accompanied by renal insufficiency (eg, creatinine clearance < 60 mL/min, serum creatinine > 2 mg/dL [> 180 μmol/L]).

**CLINICAL CALCULATOR:**

Creatinine Clearance (measured)

**CLINICAL CALCULATOR:**

Glomerular Filtration Rate Estimate by the MDRD Equation

**Diagnosis of Hypertension in Pregnancy**

* Tests to rule out other causes of hypertension

BP is measured routinely at prenatal visits. If severe hypertension occurs for the first time in pregnant women who do not have a multifetal pregnancy or [gestational trophoblastic disease](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/gynecologic-tumors/gestational-trophoblastic-disease), tests to rule out other causes of hypertension (eg, [renal artery stenosis](https://www.msdmanuals.com/professional/genitourinary-disorders/renovascular-disorders/renal-artery-stenosis-and-occlusion), [coarctation of the aorta](https://www.msdmanuals.com/professional/pediatrics/congenital-cardiovascular-anomalies/coarctation-of-the-aorta%22%20%5Co%20%22Coarctation%20of%20the%20Aorta), [Cushing syndrome](https://www.msdmanuals.com/professional/endocrine-and-metabolic-disorders/adrenal-disorders/cushing-syndrome), [SLE](https://www.msdmanuals.com/professional/musculoskeletal-and-connective-tissue-disorders/autoimmune-rheumatic-disorders/systemic-lupus-erythematosus-sle), [pheochromocytoma](https://www.msdmanuals.com/professional/endocrine-and-metabolic-disorders/adrenal-disorders/pheochromocytoma%22%20%5Co%20%22Pheochromocytoma)) should be considered.

**Treatment of Hypertension in Pregnancy**

* For mild hypertension, conservative measures followed by antihypertensives if needed
* Methyldopa, beta-blockers, or calcium channel blockers tried first
* Avoidance of angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor blockers (ARBs), and aldosterone antagonists
* For moderate or severe hypertension, antihypertensive therapy, close monitoring, and, if condition worsens, possibly termination of pregnancy or delivery, depending on gestational age

Recommendations for chronic and gestational hypertension are similar and depend on severity. However, chronic hypertension may be more severe. In gestational hypertension, the increases in BP often occur only late in gestation and may not require treatment.

Treatment of mild to moderate hypertension without renal insufficiency during pregnancy is controversial; the issues are whether treatment improves outcome and whether the risks of drug treatment outweigh risks of untreated disease. Because the uteroplacental circulation is maximally dilated and cannot autoregulate, decreasing maternal BP with drugs may abruptly decrease uteroplacental blood flow. Diuretics reduce effective maternal circulating blood volume; consistent reduction increases risk of fetal growth restriction. However, hypertension with renal insufficiency is treated even if hypertension is mild or moderate.

For **mild to moderate hypertension** (systolic BP 140 to 159 mm Hg or diastolic BP 90 to 109 mm Hg) with labile BP, reduced physical activity may decrease BP and improve fetal growth, making perinatal risks similar to those for women without hypertension. However, if this conservative measure does not decrease BP, many experts recommend drug therapy. Women who were taking methyldopa, a beta-blocker, a calcium channel blocker, or a combination before pregnancy may continue to take these drugs. However, ACE inhibitors and ARBs should be stopped once pregnancy is confirmed.

For **severe hypertension** (systolic BP ≥ 160 mm Hg or diastolic BP ≥ 110 mm Hg), drug therapy is indicated. Risk of complications—maternal (progression of end-organ dysfunction, preeclampsia) and fetal (prematurity, growth restriction, stillbirth)—is increased significantly. Several antihypertensives may be required.

For **systolic BP > 180 mm Hg or diastolic BP > 110 mm Hg,** immediate evaluation is required. Multiple drugs are often required. Also, hospitalization may be necessary for much of the latter part of pregnancy. If the woman’s condition worsens, pregnancy termination may be recommended.

All women with chronic hypertension during pregnancy should be taught to self-monitor BP, and they should be evaluated for target organ damage. Evaluation, done at baseline and periodically thereafter, includes

* Serum creatinine, electrolytes, and uric acid levels
* Liver function tests
* Platelet count
* Urine protein assessment
* Usually funduscopy

Maternal echocardiography should be considered if women have had hypertension for > 4 years. After initial ultrasonography to evaluate fetal anatomy, ultrasonography is done monthly starting at about 28 weeks to monitor fetal growth; [antenatal testing](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/normal-labor-and-delivery/management-of-normal-labor#v1071599) often begins at 32 weeks. Ultrasonography to monitor fetal growth and antenatal testing may start sooner if women have additional complications (eg, renal disorders) or if complications (eg, growth restriction) occur in the fetus. Delivery should occur by 37 to 39 weeks but may be induced earlier if preeclampsia or fetal growth restriction is detected or if fetal test results are nonreassuring.

**Drugs**

First-line drugs for hypertension during pregnancy include

* Methyldopa
* Beta-blockers
* Calcium channel blockers

Initial methyldopa dose is 250 mg orally twice a day, increased as needed to a total of 2 g a day unless excessive somnolence, depression, or symptomatic orthostatic hypotension occurs.

The most commonly used beta-blocker is labetalol (a beta-blocker with some alpha-1 blocking effects), which can be used alone or with methyldopa when the maximum daily dose of methyldopa has been reached. Usual dose of labetalol is 100 mg twice or 3 times a day, increased as needed to a total maximum daily dose of 2400 mg. Adverse effects of beta-blockers include increased risk of fetal growth restriction, decreased maternal energy levels, and maternal depression.

Extended-release nifedipine, a calcium channel blocker, may be preferred because it is given once a day (initial dose of 30 mg; maximum daily dose of 120 mg); adverse effects include headaches and pretibial edema. Thiazide diuretics are only used to treat chronic hypertension during pregnancy if the potential benefit outweighs the potential risk to the fetus. Dose may be adjusted to minimize adverse effects such as hypokalemia.

Several classes of antihypertensives are usually avoided during pregnancy:

* **ACE inhibitors** are contraindicated because risk of fetal urinary tract abnormalities is increased.
* **ARBs** are contraindicated because they increase risk of fetal renal dysfunction, lung hypoplasia, skeletal malformations, and death.
* **Aldosterone antagonists** (spironolactone and eplerenone) should be avoided because they may cause feminization of a male fetus.

**Key Points**

* **Both chronic and gestational hypertension increase risk of preeclampsia, eclampsia, other causes of maternal mortality or morbidity (eg, hypertensive encephalopathy, stroke, renal failure, left ventricular failure, HELLP syndrome), and uteroplacental insufficiency.**
* **Check for other causes of hypertension if severe hypertension occurs for the first time in a pregnant woman who does not have a multifetal pregnancy or gestational trophoblastic disease.**
* **If drug therapy is necessary, start with methyldopa, a beta-blocker, or a calcium channel blocker.**
* **Do not use ACE inhibitors, ARBs, or aldosterone antagonists.**
* **Consider hospitalization or termination of pregnancy if BP is > 180/110 mm Hg.**

**[Infectious Disease in Pregnancy](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/pregnancy-complicated-by-disease/infectious-disease-in-pregnancy)**

Most common maternal infections (eg, urinary tract infection [UTIs], skin and respiratory tract infections) are usually not serious problems during pregnancy, although some genital infections (bacterial vaginosis and genital herpes) affect labor or choice of delivery method. Thus, the main issue is usually use and safety of antimicrobial drugs.

However, certain maternal infections can damage the fetus, as may occur in the following:

* [Congenital cytomegalovirus infection](https://www.msdmanuals.com/professional/pediatrics/infections-in-neonates/congenital-and-perinatal-cytomegalovirus-infection-cmv)
* [Neonatal herpes simplex virus infection](https://www.msdmanuals.com/professional/pediatrics/infections-in-neonates/neonatal-herpes-simplex-virus-hsv-infection)
* [Congenital rubella](https://www.msdmanuals.com/professional/pediatrics/infections-in-neonates/congenital-rubella)
* [Congenital toxoplasmosis](https://www.msdmanuals.com/professional/pediatrics/infections-in-neonates/congenital-toxoplasmosis)
* [Neonatal hepatitis B](https://www.msdmanuals.com/professional/pediatrics/infections-in-neonates/neonatal-hepatitis-b-virus-hbv-infection)
* [Congenital syphilis](https://www.msdmanuals.com/professional/pediatrics/infections-in-neonates/congenital-syphilis)

[HIV infection](https://www.msdmanuals.com/professional/pediatrics/human-immunodeficiency-virus-hiv-infection-in-infants-and-children/human-immunodeficiency-virus-hiv-infection-in-infants-and-children) can be transmitted from mother to child transplacentally or perinatally. When the mother is not treated, risk of transmission at birth is about 25 to 35%.

[**Listeriosis**](https://www.msdmanuals.com/professional/infectious-diseases/gram-positive-bacilli/listeriosis) is more common during pregnancy. Listeriosis increases risk of

* [Spontaneous abortion](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/abnormalities-of-pregnancy/spontaneous-abortion)
* [Preterm labor](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/abnormalities-and-complications-of-labor-and-delivery/preterm-labor)
* [Stillbirth](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/abnormalities-of-pregnancy/stillbirth)

[Listeriosis](https://www.msdmanuals.com/professional/pediatrics/infections-in-neonates/neonatal-listeriosis) can be transmitted from mother to child transplacentally or perinatally.

[**Bacterial vaginosis**](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/vaginitis%2C-cervicitis%2C-and-pelvic-inflammatory-disease-pid/bacterial-vaginosis-bv) and possibly [**genital chlamydial infection**](https://www.msdmanuals.com/professional/infectious-diseases/sexually-transmitted-infections-stis/chlamydial%2C-mycoplasmal%2C-and-ureaplasmal-mucosal-infections) predispose to

* [Premature rupture of the membranes](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/abnormalities-and-complications-of-labor-and-delivery/prelabor-rupture-of-membranes-prom)
* Preterm labor

Tests for these infections are done during routine prenatal evaluations or if symptoms develop.

[**Genital herpes**](https://www.msdmanuals.com/professional/infectious-diseases/herpesviruses/genital-herpes) can be transmitted to the neonate during delivery. Risk is high enough that cesarean delivery is preferred in the following situations:

* When women have visible herpetic lesions
* When women who have a known history of infection develop prodromal symptoms before labor
* When herpes infection first occurs during the late 3rd trimester (when cervical viral shedding at delivery is likely)

If visible lesions or prodrome is absent, even in women with recurrent infections, risk is low, and vaginal delivery is possible. If women are asymptomatic, serial antepartum cultures do not help identify those at risk of transmission. If women have recurrent herpes infections during pregnancy but no other risk factors for transmission, labor can sometimes be induced so that delivery occurs between recurrences. When delivery is vaginal, cervical and neonatal herpesvirus cultures are done. Acyclovir (oral and topical) appears to be safe during pregnancy.

**Antibacterials**

It is important to avoid giving antibacterials to pregnant patients unless there is strong evidence of a bacterial infection. Use of any antibacterial during pregnancy should be based on whether benefits outweigh risk, which varies by trimester (see [Drugs With Adverse Effects During Pregnancy](https://www.msdmanuals.com/professional/cardiovascular-disorders/arrhythmias-and-conduction-disorders/drugs-for-arrhythmias) for specific adverse effects). Severity of the infection and other options for treatment are also considered.

**Aminoglycosides** may be used during pregnancy to treat pyelonephritis and chorioamnionitis, but treatment should be carefully monitored to avoid maternal or fetal damage.

**Cephalosporins** are generally considered safe.

**Chloramphenicol**, even in large doses, does not harm the fetus; however, neonates cannot adequately metabolize chloramphenicol, and the resulting high blood levels may lead to circulatory collapse (gray baby syndrome). Chloramphenicol is rarely used in the US.

**Fluoroquinolones** are not used during pregnancy; they tend to have a high affinity for bone and cartilage and thus may have adverse musculoskeletal effects.

**Macrolides** are generally considered safe.

**Metronidazole** use during the 1st trimester used to be considered controversial; however, in multiple studies, no teratogenic or mutagenic effects were seen.

**Nitrofurantoin** is not known to cause congenital malformations. It is contraindicated near term because it can cause hemolytic anemia in neonates.

**Penicillins** are generally considered safe.

**Sulfonamides** are usually safe during pregnancy. However, long-acting sulfonamides cross the placenta and can displace bilirubin from binding sites. These drugs are often avoided after 34 weeks gestation because neonatal kernicterus is a risk.

**Tetracyclines** cross the placenta and are concentrated and deposited in fetal bones and teeth, where they combine with calcium and impair development (see table [Drugs With Adverse Effects During Pregnancy](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/drugs-in-pregnancy/drugs-in-pregnancy#v26436056)); they are not used from the middle to the end of pregnancy.

**Key Points**

* **Most common maternal infections (eg, UTIs, skin and respiratory tract infections) are usually not serious problems during pregnancy.**
* **Maternal infections that can damage the fetus include cytomegalovirus infection, herpes simplex virus infection, rubella, toxoplasmosis, hepatitis B, and syphilis.**
* **Give antibacterials to pregnant patients only when there is strong evidence of a bacterial infection and only if benefits of treatment outweigh risk, which varies by trimester.**

**[Urinary Tract Infection in Pregnancy](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/pregnancy-complicated-by-disease/urinary-tract-infection-in-pregnancy)**

[Urinary tract infection](https://www.msdmanuals.com/professional/genitourinary-disorders/urinary-tract-infections-utis/introduction-to-urinary-tract-infections-utis) (UTI) is common during pregnancy, apparently because of urinary stasis, which results from hormonal ureteral dilation, hormonal ureteral hypoperistalsis, and pressure of the expanding uterus against the ureters. Asymptomatic bacteriuria occurs in about 15% of pregnancies and sometimes progresses to symptomatic [cystitis](https://www.msdmanuals.com/professional/genitourinary-disorders/urinary-tract-infections-utis/bacterial-urinary-tract-infections#v1052826) or [pyelonephritis](https://www.msdmanuals.com/professional/genitourinary-disorders/urinary-tract-infections-utis/bacterial-urinary-tract-infections#v1052843). Frank UTI is not always preceded by asymptomatic bacteriuria.

Asymptomatic bacteriuria, UTI, and pyelonephritis increase risk of

* [Preterm labor](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/abnormalities-and-complications-of-labor-and-delivery/preterm-labor)
* [Premature rupture of the membranes](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/abnormalities-and-complications-of-labor-and-delivery/prelabor-rupture-of-membranes-prom)

**Diagnosis of UTI in Pregnancy**

* Urinalysis and culture

Urinalysis and culture are routinely done at initial evaluation to check for asymptomatic bacteriuria. Diagnosis of symptomatic UTI is not changed by pregnancy.

**Treatment of UTI in Pregnancy**

* Antibacterial drugs such as cephalexin, nitrofurantoin, or trimethoprim/sulfamethoxazole
* Proof-of-cure cultures and sometimes suppressive therapy

Treatment of symptomatic UTI is not changed by pregnancy, except drugs that may harm the fetus are avoided (see table [Some Drugs With Adverse Effects During Pregnancy](https://www.msdmanuals.com/professional/gynecology-and-obstetrics/drugs-in-pregnancy/drugs-in-pregnancy#v26436056)). Because asymptomatic bacteriuria may lead to pyelonephritis, it should be treated with antibiotics similar to an acute UTI.

Antibacterial drug selection is based on individual and local susceptibility and resistance patterns, but good initial empiric choices include the following:

* Cephalexin
* Nitrofurantoin
* Trimethoprim/sulfamethoxazole

**Nitrofurantoin** is contraindicated in pregnant patients at term, during labor and delivery, or when the onset of labor is imminent because hemolytic anemia in the neonate is possible. Pregnant women with G6PD (glucose-6-phosphate dehydrogenase) deficiency should not take nitrofurantoin. Incidence of neonatal jaundice is increased when pregnant women take nitrofurantoin during the last 30 days of pregnancy. Nitrofurantoin should be used during the 1st trimester only when no other alternatives are available.

**Trimethoprim/sulfamethoxazole** (TMP/SMX) can cause congenital malformations (eg, neural tube defects) and kernicterus in the neonate. Folic acid supplementation may decrease the risk of some congenital malformations. TMP/SMX should be used during the 1st trimester only when no other alternatives are available.

After treatment, proof-of-cure cultures are required.

Women who have pyelonephritis or have had more than one UTI may require suppressive therapy, usually with TMP/SMX (before 34 weeks) or nitrofurantoin, for the rest of the pregnancy.

In women who have bacteriuria with or without UTI or pyelonephritis, urine should be cultured monthly.

**Key Points**

* **Asymptomatic bacteriuria, UTI, and pyelonephritis increase risk of preterm labor and premature rupture of the membranes.**
* **Initially treat with cephalexin, nitrofurantoin, or trimethoprim/sulfamethoxazole.**
* **Obtain proof-of-cure cultures after treatment.**
* **For women who have had pyelonephritis or more than one UTI, consider suppressive therapy, usually with trimethoprim/sulfamethoxazole (before 34 weeks) or nitrofurantoin.**