Management Of Abdominal Pain In Pregnancy

Presented by: lama Shatat & Enas Omar
Supervised by: Dr Ismaiel Abu Mahfouz
Abdominal pain during pregnancy can be caused by a wide variety of diseases including disorders of the obstetric, gynecologic, gastrointestinal, hepatobiliary, genitourinary, and vascular systems. Some causes are unique to pregnancy, are exacerbated by pregnancy.

Abdominal pain in pregnancy may be difficult to be diagnosed.

A delay in the diagnosis of many of the causes of abdominal pain can be threatening to both the mother and the fetus.
Approach

History:
1. Patient Profile: A. Gestational age B. Fetal viability
2. Pain Analysis   A. Site   B. Onset
   C. Character:
   1. Intermittent or cramping pain (i.e. colic) = obstruction of a hollow viscous
   2. Continuous or constant pain (more common) = peritoneal inflammation or ischemia
E. Radiation or Referral: 1. Biliary pain 2. Pain of pancreatitis
   4. Change in bowel habi 5. pre-eclampsia symptoms (e.g. headache, visual change, frothy urine)
   6. Diarrhea (suggests gastroenteritis, IBD)
   7. Constipation (suggests intestinal obstruction)
   8. Urinary symptoms (suggest UTI)
G. Timing
H. Exacerbating & reliving factors
I. Severity
3. Any history of trauma (suggests placenta abruption, abdominal organs trauma)
4. Past and current obstetrical History
5. Past and current gynecological History
6. Past medical & surgical History (e.g. DKA, appendectomy)
Physical Examination:
1. General:
   A. Well or ill
   C. Blood pressure
2. Assess the pregnancy and uterus:
   A. Palpate uterus for:
      6. Fetal presentation
   B. Assess fetal wellbeing; including:
      1. Movements 2. heartbeat (by; auscultation, Doppler scan or cardiotocography “CTG”)
3. Abdominal examination
4. Vaginal and/or rectal examination (If Indicated)

Notes:
1. Never do vaginal examination if placenta previa is suspected (i.e. vaginal bleeding in the second half of a pregnancy) because it could cause a massive bleed
2. Suspected rupture of membranes requires sterile examination and should be done in an obstetric unit
3. For incomplete miscarriage with heavy bleeding examine the cervical os
4. Products in the cervical os may cause:
   A. Heavy bleeding B. Bradycardia/shock “due to vagal stimulation”
5. Remove products in the os (using sponge forceps) to reduce bleeding and pain
How Physical Examination During Pregnancy Is Different?

1. **Findings** may be less prominent; such as:
   A. Absent peritoneal signs (because of lifting and stretching of the anterior abdominal wall)
   B. The uterus can also obstruct & inhibit the movement of the omentum to an area of inflammation; distorting the clinical picture
   C. Rigid abdomen with rebound tenderness remains a valid indicator of peritonitis

2. Distinguish extraterine tenderness from uterine tenderness:
   A. Lie the patient on her side; thus displacing the uterus

3. It is essential to recall the **changing positions** of the intra-abdominal contents at different gestational ages & that delay in Diagnosis will increase in mortality & morbidity

4. Evaluate two patients at the same time (Mother & fetus):
   A. Monitor the presence or absence of fetal heart beats (by doppler)
   B. Monitor the fetal heart rate and uterine tone continuously throughout the period of evaluation
Laboratory Tests: “Done after a thorough history and physical examination, to narrow the differential diagnosis”
1. Complete blood count with differential
2. Urinalysis
3. Liver and pancreatic function tests (aminotransferases, bilirubin, amylase, lipase)
4. Rhesus blood group (if not known)
5. Clotting screen (if hemorrhage, placental abruption or liver disease suspected)
6. Sickle cell screen
7. Blood film (for evidence of hemolysis; if HELLP syndrome is suspected)
8. Blood and urine cultures (In the presence of fever or unstable vital signs)

Notes:
1. Women with hemodynamic instability should have blood sent for coagulation studies and type and crossmatch
2. Electrolytes and renal function tests can be useful in women who are vomiting or with loss of apatite
Imaging:
1. Ultrasound:
   A. The **first-line** modality for **diagnostic** imaging of the abdomen in pregnant women
   C. Uses:
      1. 1\textsuperscript{st} trimester:
         A. Importance:
            1. Confirm presence & location of pregnancy “intra-uterine or extra-uterine”
            2. Confirm viability of pregnancy
         B. Findings: 1. Gestational sac: From 5\textsuperscript{th} week 2. Fetal heartbeat: From 6\textsuperscript{th} week 3. Ectopic pregnancy: Free fluid in the pelvis
      2. 2\textsuperscript{nd} & 3\textsuperscript{rd} trimesters:
         B. Assist surgical diagnosis (e.g. acute appendicitis, ovarian cysts, gallstones

Notes:
1. When ultrasound findings are equivocal or uncertain; then the choice of the second-line modality depends on:
   A. Differential diagnosis
   B. Availability
   C. Diagnostic performance (i.e. sensitivity)
   D. Fetal radiation exposure
2. When indicated; use of magnetic resonance (MR) imaging is **preferable** to computed tomography (CT) because:
   A. It avoids ionizing radiation B. More sensitive for diagnosis of many disorders
Imaging Cont.:
2. Chest & Abdominal X-rays:
   A. Both are commonly used in evaluation of adults with abdominal pain
   B. The estimated fetal absorption:
      1. Per chest X-ray:  <0.01 mGy (i.e. <0.001 rad) \(\Rightarrow\) below doses that have been associated
         with any short- or long-term adverse effects
      2. Per abdominal X-rays is 1 to 4.2 mGy (i.e. 0.1 to 0.42 rad) \(\Rightarrow\) below doses that have been associated with short- or long-term adverse effects
3. Laparoscopy:
   A. Sometimes indicated in the evaluation of acute pelvic or abdominal pain; especially if:
      1. The diagnosis is not clear after less invasive evaluations
      2. The differential diagnoses include potentially life-threatening or organ-threatening disorders
   B. Time of usage: first, second & early third trimesters
<table>
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<th>Obstetric cause</th>
<th>Gynaecological causes</th>
<th>Surgical</th>
<th>Medical</th>
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<tr>
<td>#early pregnancy &lt;24 w</td>
<td>Adenxal mass (1) Adenxal torsion (2) Uterine leiomyomas Endometriosis</td>
<td>1) Appendicitis 2) Cholecystitis 3) Biliary colic 4) Acute pancreatitis 5) Peptic ulcer 6) Gall bladder stone</td>
<td>1) UTI 2) DKA 3) Peptic ulcer 4) GERD 5) Fatty liver</td>
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<td>1) Failed pregnancy</td>
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<td>2) Ectopic pregnancy</td>
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<td>3) Ligament stretching</td>
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<td>#late pregnancy &gt;24 w</td>
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<tr>
<td>1) Placental abruption</td>
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<td>2) Labor</td>
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<td>3) Uterine rupture</td>
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<td>4) Hellp syndrome</td>
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<td>5) Chorioamnionitis</td>
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Physiological Causes of Abdominal Pain:

1. Stretching of ligaments (i.e. Round Ligament pain):
   A. Time: 2nd trimester
   B. Mechanism: The muscles & ligaments that support the uterus stretch by the enlarging uterus (In 10-30% of pregnancies)
   C. Pain Features:
      1. Onset: Sudden
      2. Duration: intermittent “lasts for a few seconds”
      3. Location: Lower abdomen & right side of the pelvic area
      4. Patient Discerption: Shooting abdominal pain when performing sudden movements or physical exercise
   D. Treatment: (Essentially symptomatic)

Note:
Failure of the symptoms to respond to such treatment should prompt a review of the diagnosis
Physiological Causes of Abdominal Pain Cont.:
2. Braxton-Hicks uterine contractions (i.e. False Labor)
   A. Time: 2nd & 3rd trimesters
   B. Features:
      1. Irregular (in frequency and intensity) tightening of the uterine muscles
      2. Painless “sometimes painful”
      3. No preceding ‘show’ or cervical changes

Notes:
1. True labor contractions are regular coming every 5-10 minutes
2. If persistent: Rule out preterm Labor
3. Others:
   A. Gas and bloating
   B. The pressure of the growing uterus
   C. Constipation
   D. Heartburn
Obstetric Causes

During the first trimester of pregnancy, common causes of abdominal and pelvic pain include early pregnancy failure and ectopic pregnancy.

During the second and third trimester, causes of pain include preterm labor and the less common, but more severe, complications of placental abruption and uterine rupture.
Pregnancy Related Pain

Early < 24w

Failed Pregnancy

Ectopic Pregnancy

Braxton-Hicks Contractions

Placental Absorption

Labor (preterm, term)

Uterine Rupture

PET, HELLP
Early Pregnancy Failure

Spontaneous abortion occurs in approximately 10–12% of known first trimester pregnancies.

Although the patient may be asymptomatic, spontaneous abortion commonly results in pain and vaginal bleeding.

Ultrasound is the initial diagnostic test of choice for a first trimester patient with pain and bleeding.

Ultrasound can confirm early pregnancy failure with high specificity if no fetal cardiac activity is detected by the time the embryo measures 5 mm in length or if the pregnancy is known to be 6.5 weeks without an embryo with a heartbeat.

When the ultrasound examination either shows worrisome features or is inconclusive, such as in cases with an embryo smaller than 5 mm without a heartbeat, follow-up ultrasound is indicated.

Follow-up ultrasound is typically performed 5–7 days later to allow measurable growth.

Correlating sonographic findings with maternal serum level of β-HCG can also help indicate whether early pregnancy failure has occurred. A gestational sac is expected to be visible when the β-HCG level is above 2,000 mIU/mL and the embryo when the β-HCG level is above 10,800 mIU/mL.
<table>
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<tr>
<th>Threatened abortion</th>
<th>Sonogram finding of viable pregnancy with vaginal bleeding sometimes accompanied with abdominal pain but no cervical dictation</th>
<th>Observation (85% of these pregnancy will continue to term)</th>
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<tr>
<td>Inevitable pregnancy</td>
<td>Vaginal bleeding and uterine cramps leading to cervical dilation but no poc has yet been passed</td>
<td>Emergency d and c if the bleeding is heavy If not conservative waiting sponge abortion or induce contraction with misoprostol PGE1</td>
</tr>
<tr>
<td>Incomplete abortion</td>
<td>Vaginal bleeding and uterine contraction and cervical dilation with some but not all poc having been passed</td>
<td>If heavy bleeding emergency d and c otherwise conservative</td>
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Ectopic pregnancy, which remains the most frequent obstetric cause of death in pregnancy, often presents with abdominal or pelvic pain in the first trimester.

The incidence of ectopic pregnancy has been increasing. This increased incidence correlates with an increase in the prevalence of risk factors for ectopic pregnancy including assisted reproductive techniques.

Ultrasound plays an instrumental role in ruling out an ectopic pregnancy if it can confirm an intrauterine pregnancy. Ultrasound reveals findings that are only suggestive of an ectopic pregnancy: an adnexal mass and pelvic free fluid. An adnexal mass is the most common sonographic finding in ectopic pregnancy, occurring in 65–84% of cases.

Diagnosis ***

If unruptured ectopic >> sonogram finding with quantitative bHCG

The diagnosis based on assumption that when normal IUP has progressed to where it can be seen on TVUS at 5 week of gestation the serum b HCG titer will exceed 1,500 mIU and abdominal US at 6 week of gestation the b HCG will be 6,500 mIU.

So failure to see intrauterine gestation when bHCG more then 1,500 mLU is diagnosis to ectopic pregnancy.
Premature separation of a normally situated placenta is abruption. This condition may present with abdominal pain, with or without vaginal bleeding. If all the blood remains behind the placenta with no revealed bleeding per vaginum, this is concealed hemorrhage and can cause a delay in diagnosis of the condition. Incidence of abruption is 0.6%.

Abruptio placenta can result in perinatal as well as maternal mortality.

Predisposing factors to placental abruption are hypertension or preeclampsia, preterm, premature membrane rupture, cigarette smoking, cocaine abuse, and anti-phospholipid antibodies.

Abruptio placenta can be clinically suspected when antepartum hemorrhage is accompanied by pain.

On clinical examination, the patient will be found to have a uterus which may be larger than the period of gestation and is tense and tender.

The fetal heart sounds on auscultation may show evidence of severe fetal distress or even absent fetal heart sounds.

In the vast majority of patients with this condition, expeditious delivery by the quickest possible route along with an artificial rupture of membranes to reduce thromboplastin release into circulation is performed.
Uterine rupture

Is complete separation of the wall of pregnant uterus with or without expulsion of the foetus.

Uterine rupture can occur in a previously intact uterus when it is called primary rupture, or more frequently occurs in a previously scarred uterus when it is called secondary rupture. The scars may be due to surgery such as cesarean section or myomectomy.

Injury to the uterus may be due to prior curettage, or perforation, endometrial ablation, or hysteroscopy.

With the increase in cesarean section rates, secondary rupture is on the rise. Uterine rupture can be a cause for significant perinatal mortality and morbidity.

Uterine rupture causes abdominal pain only after there is significant hemoperitoneum.

The diaphragmatic irritation may cause the pain to be referred to the chest or the shoulder.

If uterine rupture occurs during the trial of labor after C-section, the early signs of rupture may be fetal heart recording showing variable decelerations followed by bradycardia. Frank uterine rupture with placental expulsion will cause fetal death, hemoperitoneum, loss of uterine contour, vaginal bleeding, fetal parts being felt superficially, and occasionally, hematuria.

Treatment includes immediate laparotomy along with fluid and blood resuscitation and repair of the uterine if the mom is stable, the patient unstable hysterectomy is performed.
An intraoperative image of uterine rupture at 23 weeks of gestation in a primigravida, showing the fetus lying outside the uterus (A).

The rupture at the fundus is clearly seen (B).

Repair of the uterus in two layers with absorbable sutures (C).
HELLP syndrome

HELLP syndrome refers to the condition characterized by hemolysis, elevated liver enzymes, and low platelets.

In patients with HELLP syndrome, the incidence of subcapsular liver hematoma and rupture is increased. These patients can present as acute abdomen with pain localized to right upper quadrant.

Other complications of HELLP syndrome include eclampsia (6%), placental abruption (10%), acute kidney injury (5%), and pulmonary edema (10%).

Most women with HELLP syndrome need termination of pregnancy. Hepatic hematomas can be diagnosed by MRI. Unless there is active hemorrhage, a conservative approach is indicated. Ongoing hemorrhage requires prompt surgical intervention.
Common gynecologic causes of pain during pregnancy include complications related to adnexal masses, ovarian torsion, and leiomyomas. Adnexal masses are often first detected at the time of a routine first trimester dating or second trimester anatomic survey ultrasound examination. Ovarian torsion and leiomyoma degeneration both have a higher incidence during pregnancy.
Adnexal masses occur in approximately 2% of all pregnancies. Adnexal masses are not a usual cause of pain, with 65% of these masses being asymptomatic and discovered incidentally on physical examination or sonography.

**Diffirintial diagnosis:**

1) **Functional cysts:**
The most common adnexal masses during pregnancy, on sonogram appear like fluid filled, enlarged ovaries.
Management: follow up exam in 6-8 weeks, if it was functional it should have spontaneously resolved, ocp's can be used to prevent further functional cysts. Surgical evaluation should be performed if the cyst >7 cm

2) **complex-appearing adnexal mass**
Dermoid cysts, hemorrhagic corpus luteum cyst, ovarian cystadenoma, and ovarian teratoma.
On u/s: Management: conservative cystectomy or oophorectomy: indicated for severe symptoms, in suspicion of malignancy

3) **Malignant adnexal masses**
Pain occurs when:
Rupture of an ovarian cyst (eg, corpus luteum cyst) or hemorrhage into an ovarian cyst may be associated with the sudden onset of unilateral lower abdominal pain.

The pain often begins during strenuous physical activity, such as exercise or sexual intercourse.

Rupture may be accompanied by severe bleeding into the pelvis and hemodynamic instability.
The presentation of ovarian torsion is similar in pregnant and nonpregnant women.

It typically presents with lateralized lower abdominal pain, frequently accompanied by nausea, vomiting, low grade fever, and/or leukocytosis.

It occurs in all three trimesters, most common in the 2nd trimester as the dr said
Risk factors include the presence of an ovarian cyst or mass and induction of ovulation, which can cause enlarged multicystic ovaries.

A presumptive diagnosis of torsion can be made with a fair degree of confidence in the presence of acute pelvic pain and an adnexal mass with a sonographic appearance (including Doppler studies) consistent with torsion and after exclusion of other conditions.

A definitive diagnosis requires direct visualization of a rotated ovary at the time of surgery for evaluation and treatment (untwisting of the ovary). In one study, 7 of 41 pregnant women who underwent untwisting of the ovary had recurrent torsion in the same pregnancy.
The majority of fibroids remain asymptomatic in pregnancy. Degeneration may occur, and is more common with leiomyomas >5 cm in diameter.

Most patients have only localized pain, although mild leukocytosis, fever, peritoneal signs, and nausea and vomiting can occur. Pedunculated fibroids are at risk of torsion; symptoms are similar to those with degeneration.

Fibroids are readily identified on ultrasound examination. Pain after ballottement by the abdominal ultrasound probe directly over the fibroid supports the diagnosis.
Medical causes
During pregnancy, urinary tract changes predispose women to infection. Ureteral dilation is seen due to compression of the ureters from the gravid uterus.

Hormonal effects of progesterone also may cause smooth muscle relaxation leading

Organisms causing UTI in pregnancy are the same uropathogens which commonly cause UTI in non-pregnant patients. *Escherichia coli* is the most common organism isolated.

Signs and symptoms of a UTI include:

- burning or **painful urination**
- pelvic or **lower back pain**
- **frequent urination**
- **fever**
- **nausea or vomiting**
Acute Pyelonephritis

This is a UTI involving the upper urinary tract with systemic findings.

This is one of the most common serious medical complications of pregnancy.

Symptoms. Include shaking chills, anorexia, nausea, vomiting, and flank pain. Signs. Include high fever, tachycardia, and costovertebral angle tenderness (R>L)

- Preterm labor and delivery can occur. Severe cases are complicated by sepsis, anemia, and pulmonary dysfunction, sometimes requiring ICU care, including intubation.

Diagnosis.

Confirmed with a positive urine culture showing >100 K CFU of a single organism. Treatment. Hospital admission, generous IV hydration, parenteral antibiotics e.g., ceftriax-one, and tocolysis as needed.
Diabetic ketoacidosis in pregnancy (DKP) is a serious complication. It develops because of relative or absolute insulin deficiency and the simultaneous increase in counter-regulatory hormones. It occurs when the body starts breaking down fat at a rate that is much too fast. The liver processes the fat into a fuel called ketones, which causes the blood to become acidic.

- Nausea or vomiting
- Abdominal pain
- Polyuria or polydipsia
- Blurred vision
- Muscle weakness
- Drowsiness
- Lethargy
- Change in mental status
- Hyperventilation (Kussmaul breathing)/pear drop odour
- Tachypnoea
- Hypotension
- Tachycardia
- Coma
- Shock
- Abnormal fetal heart tracing
Investigation for diabetic ketoacidosis in pregnancy (DKP)

**

Positive serum/urine ketones
Lab glucose hyperglycaemia (≥ 11.0 mmol), but DKP can occur at lower glucose levels
Low serum bicarbonate (<15 mEq/l)
Arterial pH ≤7.30
Anion gap >12
Elevated base deficit ≥4 mEq/l
Potassium level may be falsely normal/elevated
Peptic ulcer

Peptic ulcer disease and its complications are usually not common in pregnancy. Possible mechanisms involve reduced gastric secretion along with increased placental histaminase secretion. In the majority of cases, remission occurs with diet modification, histamine receptor antagonists, or proton pump inhibitor.

Life-threatening complications of peptic ulcer are perforation and bleeding.

The diagnosis of perforation is predominantly clinical, with signs of guarding, rigidity, and tachycardia.

Plain erect radiographs are valuable in detecting free intraperitoneal air. CT may be more sensitive to detect free air. A timely diagnosis of perforation within the first 6 hours carries excellent prognosis, while a delay of 12 hours or more is linked with poorer outcomes. Perforation requires laparotomy.

Surgical intervention can prevent maternal and fetal mortality. In cases of massive peptic ulcer hemorrhage, endoscopic control should be attempted initially, and if this fails, laparotomy should be performed without delay.
Acute fatty liver

This is a rare life-threatening complication of pregnancy that usually occurs in the third trimester. Prevalence is 1 in 15,000. Maternal mortality rate is 20%.

It is thought to be caused by a disordered metabolism of fatty acids by mitochondria in the fetus, caused by deficiency in the long-chain 3-hydroxyacyl-coenzyme A dehydrogenase (LCHAD) enzyme.

**Findings.**

Symptom onset is gradual, with nonspecific flu-like symptoms including nausea, vomiting, anorexia, and epigastric pain.
- Jaundice and fever may occur in as many as 70% of patients
- Hypertension, proteinuria, and edema can mimic preeclampsia
- This may progress to involvement of additional systems, including acute renal failure, pancreatitis, hepatic encephalopathy, and coma.

**Laboratory findings may include:**

- Moderate elevation of liver enzymes (e.g., ALT, AST, GGT), hyperbilirubinemia, DIC
- Hypoglycemia and increased serum ammonia are unique laboratory abnormalities

**Management.**

Intensive care unit stabilization with acute IV hydration and monitoring is essential. Prompt delivery is indicated. Resolution follows delivery if mother survives.
Most pregnant women have symptoms of gastroesophageal reflux disease (GERD), especially heartburn, at some point. These symptoms may start at any time during a pregnancy. And they often get worse throughout the pregnancy. Heartburn is common when you are pregnant. That's because hormones cause the digestive system to slow down. The muscles that push food down the esophagus also move more slowly when you are pregnant. And as the uterus grows, it pushes on the stomach. This can sometimes force stomach acid up into the esophagus.

GERD symptoms are common during pregnancy. But they rarely cause complications, such as inflammation of the esophagus (esophagitis). Most of the time, symptoms of heartburn improve after the baby is born.

Change eating habits.
It's best to eat several small meals instead of two or three large meals.

The medicines listed below are generally safe during pregnancy

Acid reducers, such as cimetidine (for example, Tagamet) or ranitidine (for example, Zantac)

Proton pump inhibitors, such as omeprazole (for example, Prilosec) or lansoprazole (for example, Prevacid)
Surgical causes
Appendicitis is the most common cause of the acute surgical abdomen during pregnancy.

The most common symptom of appendicitis, ie, right lower quadrant pain, occurs within a few centimeters of McBurney's point in the vast majority of pregnant women, regardless of the stage of pregnancy.

Most common sx is anorexia (there is no appendicitis if there is no anorexia)

The clinical diagnosis should be strongly suspected in pregnant women with classic findings: abdominal pain that migrates to the right lower quadrant, right lower quadrant tenderness, nausea/vomiting, fever, and leukocytosis with left shift.

With a nonclassical presentation, which often happens in pregnancy, imaging is indicated.

Graded compression ultrasonography is the first-line modality. The primary goal of imaging is to reduce delays in surgical intervention due to diagnostic uncertainty. A secondary goal is to reduce, but not eliminate, the negative appendectomy rate.
Risk of appendicitis is the same in all trimesters.

Once necessary, never postpone appendicectomy.

in pregnancy the appendix position is atypical so its confused with right ovarian torsion.

Incidence of appendicitis for pregnant is the same for the non-pregnant.
Pregnancy predisposes to formation of gallstone (cholelithiasis). The presentation of gallstone disease during pregnancy is not significantly different than in the nonpregnant state.

Affected patients typically complain of deep and gnawing pain that is occasionally sharp, colicky, and severe. The pain is localized in the right upper quadrant or epigastrium.

There is often a history of fatty food ingestion one hour or more before onset of pain. As the gallbladder relaxes, the stones often fall back from the cystic duct. As a result, the attack reaches a crescendo over a number of hours and then resolves completely.
Acute cholecystitis refers to a syndrome of right upper quadrant pain that is steady and severe, fever, tachycardia, and leukocytosis associated with gallbladder inflammation, which is usually related to gallstone disease. Murphy’s sign is variably positive.

Ultrasonography is the most reliable method for making the diagnosis of gallstones and acute or chronic cholecystitis. The white blood cell count and alkaline phosphatase level are normally elevated in pregnancy, which reduces the diagnostic usefulness of these tests.

However, significant elevations of the transaminases and alkaline phosphatase or direct bilirubin should raise the possibility of a common bile duct stone, cholangitis, or the Mirizzi syndrome.
Acute pancreatitis is a rare complication of pregnancy; most cases are related to gallstone disease. Almost all patients have acute and persistent upper abdominal pain, which may radiate to the back, may be relieved with leaning forward, and may be accompanied by fever and postprandial nausea and vomiting.

The range of normal serum amylase and lipase levels are similar in healthy pregnant and nonpregnant women; significantly elevated values should be considered pathologic. Ultrasound can be used to look for choledocholithiasis and pseudocyst formation. If further imaging is needed, MR may be helpful.