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Diagnosis and Therapeutic Management of Acute Appendicitis During Pregnancy: A Contemporary Narrative Review

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ABSTRACT

Acute appendicitis (AA) remains the most common non-obstetric cause of surgery in pregnant women. Although significant advances have been made in diagnostic imaging and surgical techniques in recent years, there are no clear-cut treatment algorithms for suspected AA in pregnant women. This study aimed to analyze the current literature on the diagnosis and treatment of AA in pregnant women by summarizing publications published over the last five years. Ultrasound is the primary diagnostic test, although its diagnostic value decreases as pregnancy progresses. Magnetic resonance imaging (MRI) is increasingly used for diagnosis, as it is safer for pregnant women than computed tomography (CT). Appendectomy remains the primary treatment method, but clear scientific evidence regarding whether it should be open or laparoscopic has not yet been published. Further research is needed to develop a diagnostic and therapeutic algorithm for suspected AA in pregnant women.

Keywords: acute appendicitis, pregnancy, laparoscopic appendectomy, open appendectomy

1. INTRODUCTION

Acute abdomen is a sudden, severe abdominal pain that lasts no longer than 24 hours and may require urgent surgical intervention. It is uncommon in pregnancy, but due to the need for rapid diagnosis, it constitutes a significant clinical problem. The physiological, anatomical, morphological, functional, hemodynamic, and biochemical changes that occur during pregnancy make diagnosis challenging. Acute abdominal pain in pregnancy is observed in approximately 1 in 500–635 pregnancies per year, and the most common non-obstetric cause is acute appendicitis (AA), which occurs in 65.6% of all non-traumatic cases requiring surgical intervention in pregnant women. The condition occurs in 1 in 700 to 1 in 4000 pregnancies, with the highest incidence in the second trimester.

The prognosis for AA is influenced, among other factors, by the time from symptom onset to diagnosis and the gestational week (Kumar et al., 2024). In cases

where complications occur, the risk of preterm birth is 11%, and the risk of fetal death is 6%. When complications do not occur, these rates are lower, at 6% and 2%, respectively (Aptilon Duque and Maines, 2026).

The aim of this review is to present the current state of knowledge regarding the diagnosis and treatment of acute appendicitis in pregnant women.

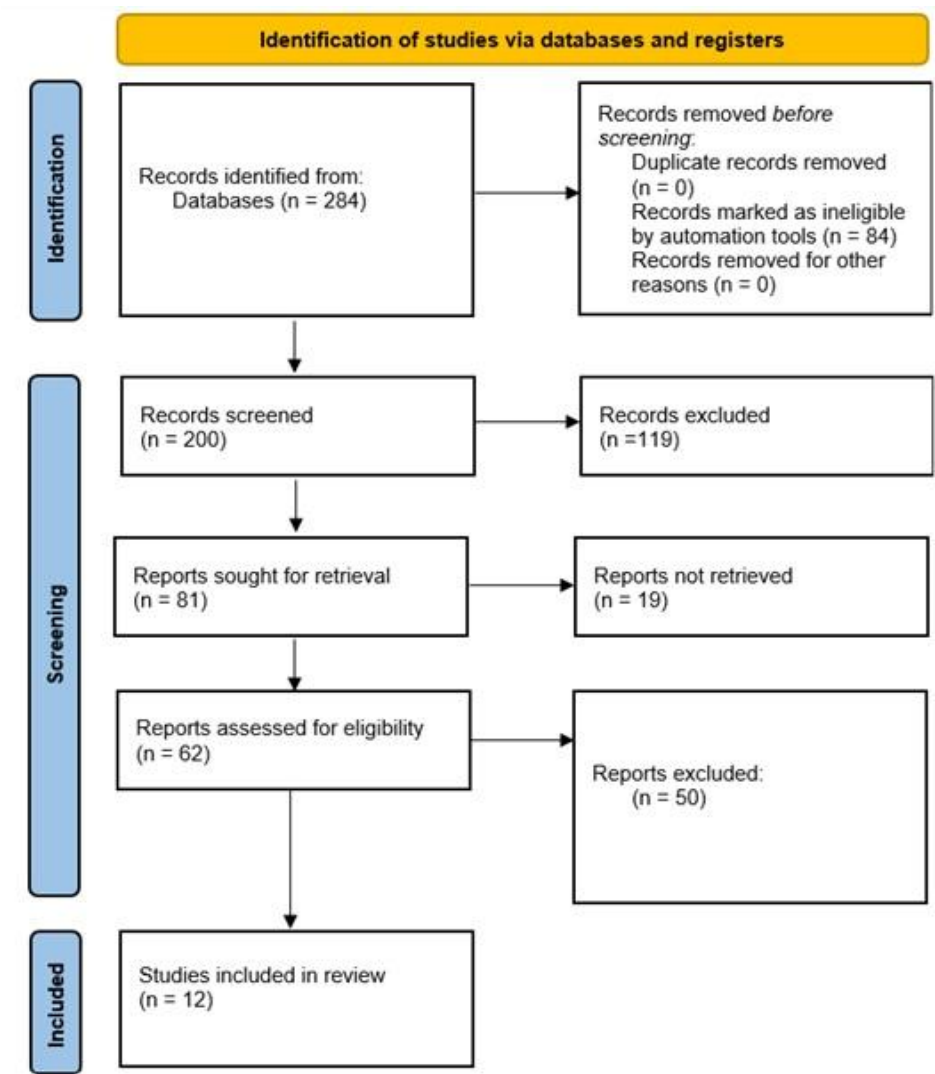


Figure 1. PRISMA flow diagram of the study selection.

2. REVIEW METHODS

For this review, we searched the PubMed database using the keywords "acute appendicitis and pregnancy." We were only interested in literature from the last 6 years (January, 2021 – June, 2026). Figure 1 illustrates the selection process. The initial search yielded 284 results. We excluded studies that were not fully freely accessible. We then systematically reviewed the remaining results and excluded those that did not address pregnancy or acute appendicitis, those that only addressed conditions that masked acute appendicitis, and those that did not meet the inclusion criteria. After careful review of the remaining studies, we selected 12 for review.

3. RESULTS AND DISCUSSION

Pathophysiology of acute appendicitis in pregnant women

The pathophysiology of acute appendicitis in pregnant women is similar to that observed in the general population. The most common cause is appendiceal obstruction, which is caused by typical factors: lymphatic hyperplasia, parasitic infections, fecal impaction, or

neoplastic lesions. As a result of appendiceal obstruction, mucus begins to accumulate, and pressure increases within the appendix. This leads to impaired venous and lymphatic drainage and impaired arterial perfusion. Subsequently, the appendix undergoes ischemia and, over time, necrosis.

As a result of these processes, bacteria multiply in the lumen of the appendix. In the initial phase of inflammation, these are mainly aerobic bacteria, but later a mixed flora develops, with both aerobic and anaerobic bacteria present. *Escherichia coli*, *Bacteroides* spp., *Peptostreptococcus* spp., and *Pseudomonas* spp. predominate. With the duration of inflammation, the risk of perforation of the appendix increases and, consequently, the development of a peri-appendiceal abscess or generalized peritonitis. Typically, the first manifestation of appendicitis is poorly localized visceral pain. The pain is localized in the right iliac fossa only in cases of irritation of the parietal peritoneum or when there is a perforation of the appendix. Because the growing uterus in pregnant women changes the position of anatomical structures in the abdominal cavity, peritoneal irritation may not occur (Aptilon Duque and Maines, 2026). Analysis of available publications indicates that pregnancy is not associated with an increased risk of appendicitis, but the changes occurring during pregnancy make the diagnosis of this disease difficult.

Clinical Presentation

In pregnant women, the clinical picture described above is less common than in the general population. Tenderness in the right iliac fossa, muscular guarding, or symptoms of peritoneal irritation are observed only occasionally. Analysis of the available literature suggests that the clinical picture may vary by trimester of pregnancy. During the first trimester of pregnancy, when the uterus has not yet significantly enlarged, symptoms may be indistinguishable from those observed in the general population. A case report by Mashauri et al., (2025) describes a patient at 11 weeks’ gestation who had maximum pain located in the right iliac fossa. In addition, she presented with nausea, vomiting, and a positive Rovsing’s sign.

These symptoms resemble the clinical picture seen in the general population, and it is difficult to distinguish whether they were caused by pregnancy or progressive acute appendicitis. In the case of the patient described by Thanasa et al., (2024), at 15 weeks of gestation, abdominal pain was most severe in the epigastrium. No nausea or vomiting was observed. In the case of the woman in the third trimester of pregnancy described by Zapletal et al., (2025), the pain was localized to the right side of the abdomen, and—as with the patient in the second trimester—neither nausea nor vomiting was observed.

The presented cases indicate that as pregnancy progresses, the location of pain becomes less clear, and symptoms of peritoneal irritation become less frequent. This situation can complicate the diagnosis and delay diagnosis, increasing the risk of complications for both the mother and the fetus. Table 1 presents a comparison of symptoms in non-pregnant women and in trimesters I, II, and III.

Table 1. Comparison of symptoms of acute appendicitis in non-pregnant women and in women in the first, second, and third trimesters of pregnancy

Symptom	Non- pregnant women	I trimester	II trimester	III trimester
Location of abdominal pain	Initially around the navel, later in the right iliac fossa	Right iliac fossa and lower abdomen	Diffuse pain, mainly in the epigastrium	On the right side of the abdomen
Nausea, vomiting	Usually, present	Current	Usually none	Usually none
Peritoneal signs	Usually, present	Usually none	Usually none	Usually none
Temperature	Usually below 38 degrees Celsius	Within normal limits	Within normal limits	Within normal limits

Laboratory Findings

The most frequently studied parameters of inflammation are the White Blood Cell (WBC) count and C-reactive protein (CRP). In about two-thirds of individuals in the general population diagnosed with AA, leukocytosis exceeds 10,000 cells/mm³. CRP is elevated in most of these patients. In pregnant women, an increase in WBC and CRP does not necessarily indicate active inflammation; an elevated white blood cell count during pregnancy is a physiological phenomenon. Regarding laboratory parameters that may be used in the

future to diagnose AA in pregnant women, studies have suggested that the neutrophil-to-lymphocyte ratio (NLR) and the platelet-to-lymphocyte ratio (PLR) may be significant (Aptilon Duque and Maines, 2026).

Imaging Studies

Ultrasound (US) is the method of first choice for patients with acute abdominal pain. It is often chosen because of its availability, speed, and non-invasive nature. Findings supporting a diagnosis of appendicitis on ultrasound include an appendix diameter greater than 6 mm, the presence of fecal stones in the appendix, and increased echogenicity of the fatty tissue surrounding the appendix. The examiner should keep in mind that ultrasound examinations can yield false results. These results depend, for example, on the examiner's experience. In obese individuals, an additional challenge is the increased adipose tissue, which makes the appendix more difficult to visualize. (Aptilon Duque and Maines, 2026). The case reports and literature data we reviewed confirm that ultrasound is the first-line examination for pregnant women with suspected appendicitis. Undoubtedly, the greatest advantages of US are its easy availability and lack of exposure to ionizing radiation, which is particularly important for the developing fetus. However, the test's reliability depends on several variables. AA in pregnant women is detected by ultrasound in 50–78% of cases, and the more advanced the pregnancy, the lower the diagnostic sensitivity of this test, as shown in Table 2 (Kahana et al., 2024). Due to the enlarging uterus, the appendix changes its position, and visualizing it can be problematic. In the cases analyzed, although the symptoms suggested AA, the ultrasound findings did not always confirm it. In such cases, other imaging studies should be performed to avoid delays in diagnosis.

Table 2. Comparison of imaging studies in pregnant women for the diagnosis of acute appendicitis

	US	MRI	CT
Sensitivity	I trimester- 69% II trimester- 63% III trimester- 51%	About 92%	>95%
Exposure to ionizing radiation	No	No	Yes
Recommendations	First-line method	When the US result is inconclusive	When the US result is inconclusive, and MRI is unavailable

MRI

Magnetic resonance imaging (MRI) is the second-preferred imaging modality—after ultrasound—used in pregnant women for the diagnosis of acute appendicitis. MRI is a valuable diagnostic tool due to its high sensitivity and specificity. The disadvantages of this test include high costs and limited availability. For this reason, MRI is performed only in patients who do not wish to be exposed to ionizing radiation. In the diagnosis of acute appendicitis in pregnant women with clinical symptoms suggestive of the condition, MRI has a sensitivity of 91.8% and a specificity of 97.9% (Aptilon Duque and Maines, 2026).

In a study conducted by Kahan et al., (2024), the diagnosis of acute appendicitis was confirmed based on intraoperative and histopathological findings in all pregnant women who had previously been suspected of having the condition based on MRI results. Thanks to the high sensitivity and specificity of MRI, it is possible to avoid unnecessary invasive treatment in patients with a misdiagnosis of acute appendicitis, as well as potential complications from unnecessary surgery. The published literature suggests that MRI is useful, especially when ultrasound results are equivocal. It is preferred over CT because it does not involve exposure to ionizing radiation. It should be noted, however, that MRI scans are not readily available, and their high cost limits their use.

CT

CT scanner of the abdomen and pelvis has a very high diagnostic accuracy of over 95% in diagnosing AA. Characteristic features of AA include enlargement of the appendix, thickening of its wall, inflammatory infiltration around it, enhancement of its wall after contrast administration, and the presence of soft tissue at the base of the appendix, separating it from the cecum (Aptilon Duque and Maines, 2026). The main limitation of performing a CT is exposure to ionizing radiation, so it should only be used when the benefits outweigh the potential risk to the developing fetus.

Thanks to its high diagnostic accuracy, in cases of uncertainty it is possible to avoid unnecessary surgery and potential complications for both the patient and the unborn child. In the case described by Ahmed et al., (2022), CT allowed for the exclusion of AA. When ultrasound findings are inconclusive and magnetic resonance imaging is unavailable in pregnant women, CT scanning is permissible, as confirmed by case reports in the literature.

Treatment

The standard recommended treatment for appendicitis (AA) is open appendectomy (OA) or laparoscopic appendectomy (LA). In recent years, there have also been publications on antibiotic treatment. However, the results regarding the effectiveness of this therapy remain inconclusive (Doleman et al., 2024). When surgery is necessary, the choice of treatment is clear-cut; however, when conservative treatment is an option, the decision may be more difficult.

There are few publications in the available literature comparing conservative and surgical treatment of AA in pregnant women. In one of the few publications on this topic, Candrawinata et al., (2023) noted that patients treated solely with antibiotics had a lower risk of preterm delivery but a higher risk of complications compared to women treated with antibiotics. While publications demonstrate that antibiotic therapy is an effective treatment for AA, these results do not apply to the general population. The effectiveness of this method has not been confirmed in pregnant patients. Kumar et al., (2024) state that due to the higher incidence of peritonitis, fetal death, shock, and venous thromboembolism compared to surgery, antibiotic therapy is not recommended. Due to the limited data, further studies are necessary to assess the basis for qualifying pregnant patients for conservative treatment and whether it is even safe. After analyzing the available literature, it is evident that routine antibiotic therapy is not currently recommended for the treatment of AA. If, however, the doctor decides to perform it for any reason, it should be carried out under close observation.

Currently, there are too few randomized trials to definitively determine which method—open surgery or laparoscopy—is the better choice for pregnant women with suspected AA. This is primarily due to the difficulty in conducting studies in the pregnant population. When performing laparoscopic procedures in pregnant women, several technical modifications are recommended to increase maternal and fetal safety. After the 20th week of pregnancy, the patient is positioned with a slight tilt to the left; the open technique is used when inserting the first trocar to minimize the risk of damaging the enlarged uterus; intra-abdominal pressure is maintained below 12 mmHg; and the laparoscopic ports are placed taking into account the height of the uterine fundus.

During an OA procedure, a transverse incision is made at the site where the pain is most severe. If the diagnosis is uncertain, a vertical incision along the midline of the lower abdomen may be used. This provides better access to the abdominal cavity and allows for the possible diagnosis and treatment of other surgical conditions that may clinically resemble AA (Aptilon Duque and Maines, 2026). OA surgery unrelated to obstetric conditions is performed very rarely, in only 1–2 cases per 1,000 pregnant women. The safest time for surgery is the beginning of the second trimester. This is associated with a lower risk of complications than in the first and third trimesters (Alsadery et al., 2023).

When choosing a surgical approach, the patient's clinical condition, gestational age, and the experience of the facility caring for the patient should be considered. If the facility lacks appropriate equipment or expertise in obstetrics, anesthesiology, or neonatology, transferring the patient to a facility with a higher level of expertise should be considered.

Current guidelines indicate that laparoscopic appendectomy is the method of choice for pregnant women because it is considered safer. Analysis of the literature does not allow for a definitive statement regarding which appendectomy method is the better choice for pregnant women. Both OA and LA have their advantages and disadvantages.

The advantages of LA include a shorter hospital stay (Aptilon Duque and Maines, 2026) and a lower rate of complications associated with the treatment of appendicitis compared to the OA method (Zhang et al., 2021). According to Kumar et al., (2024), other advantages of LA over OA include: fewer deliveries during the same hospitalization, fewer readmissions, and a lower risk of sepsis.

In the same study, Kumar et al., (2024) also noted that LA is associated with a higher rate of cesarean delivery, more frequent neonatal intensive care unit admissions, and a higher risk of pregnancy loss. Aptilon Duque and Maines (2026) agree that LA is associated with a slightly higher rate of fetal loss. According to Zhang et al., (2021), the risk is twice that of OA. At the same time, the latter two authors found that the incidence of preterm birth and cesarean delivery was comparable in both groups. Özdemir et al., (2025) presented a different view. They found that no preterm births occurred in patients who underwent LA, whereas in the open surgery group, preterm births occurred in 10 women.

According to Kumar et al., (2024), laparoscopic appendectomy (LA) should be performed when the highest point of the uterine body is below the umbilicus; however, if the fundus of the uterus is above the umbilicus, the decision is left to the surgeon. The experts

emphasize, however, that this recommendation is based on their own opinion. Further studies are needed to establish a clear position on the management of acute appendicitis in pregnant women, which will allow for a more detailed assessment of the impact of both techniques – open appendectomy (OA) and laparoscopic appendectomy (LA) – on obstetric outcomes. Regardless of the treatment method chosen, patients should be informed of the advantages and disadvantages of each option. Early diagnosis and appropriate treatment are crucial because, like any other disease, AA is associated with complications. When choosing a treatment method, the surgeon's experience, gestational age, and the patient's clinical condition should be considered.

4. CONCLUSION

Acute appendicitis remains the most common non-obstetric indication for surgery during pregnancy. The diagnosis is complicated by the anatomical and physiological changes that occur during pregnancy, as well as by the often-nonspecific clinical presentation. Early diagnosis of AA is crucial for reducing the risk of complications for both the mother and the fetus. In cases of suspected AA in pregnant women, ultrasonography remains the first-line examination. When the results of the ultrasound examination are inconclusive, the second-choice method is magnetic resonance imaging, which offers high sensitivity and avoids exposure of the mother and fetus to ionizing radiation. Computed tomography should only be used when the results of other methods do not allow a diagnosis to be established or when those methods are unavailable. Appendectomy remains the primary treatment for AA. However, there is still insufficient evidence to definitively determine which method is the better option—OA or LA. Therefore, the choice of diagnostic and therapeutic approach should be tailored to the patient's clinical condition, gestational age, laboratory and imaging test results, and the treating team's experience. Further well-designed studies are needed to establish a definitive diagnostic algorithm and to evaluate the safety and effectiveness of the available treatment strategies.

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Informed consent

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Conflict of interest

The authors declare that they have no conflicts of interest, competing financial interest or personal relationship that could have influenced the work reported in this paper.

Data and materials availability

All data associated with this study will be available based on reasonable requests to the corresponding author.

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