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Appendicitis During Pregnancy: Diagnostic Challenges and Fetal Outcomes

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ABSTRACT

Background: Acute appendicitis is the most common non-obstetric surgical emergency during pregnancy, posing unique diagnostic and therapeutic challenges. **Objective:** To evaluate the clinical presentation, diagnostic accuracy of imaging modalities, and the maternal and fetal outcomes associated with appendicitis during pregnancy. **Methods:** This retrospective observational study was conducted at Department of Obstetrics and Gynaecology, DHQ Hospital Okara City, Okara, Pakistan, from Feb 2024 to Feb 2025. A total of 85 pregnant women who were diagnosed and treated for acute appendicitis during pregnancy were included in the study. Patients were identified from hospital surgical records, obstetric databases, and operative notes. Data were collected retrospectively using a standardized data abstraction form. Demographic variables including maternal age, parity, and gestational age at presentation were documented. Clinical presentation was analyzed based on symptoms including abdominal pain, nausea, vomiting, anorexia, and fever. **Results:** The majority of patients presented in the second trimester (43%). Abdominal pain was the most common symptom (100%), with right upper quadrant pain noted in 26.2% of cases. Ultrasound confirmed appendicitis in 67.2% of cases, while MRI showed higher diagnostic accuracy (83.3%). Laparoscopic surgery was performed in 63.1% of patients and was associated with fewer complications and shorter hospital stay compared to open surgery. Fetal loss occurred in 9.2% of cases, most commonly associated with appendiceal perforation and delayed diagnosis. Logistic regression identified perforated appendix (OR: 4.8, p = 0.004) and diagnostic delay >48 hours (OR: 3.9, p = 0.01) as significant predictors of fetal loss. **Conclusion:** It is concluded that early recognition and timely surgical intervention in appendicitis during pregnancy are essential to improving maternal and fetal outcomes. MRI should be considered when ultrasound is inconclusive. Perforation and diagnostic delay significantly increase the risk of fetal loss, emphasizing the need for prompt clinical evaluation and decision-making in pregnant patients presenting with abdominal pain.

INTRODUCTION

Acute appendicitis is the most common non-obstetric surgical emergency encountered during pregnancy, affecting approximately 0.04% to 0.2% of all pregnancies, with the highest incidence reported during the second trimester [1]. Though rare appendicitis during pregnancy remains a crucial clinical problem because it produces dangers for maternal along with fetal health [2]. Prolonged diagnosis without immediate intervention leads to dangerous complications that include appendiceal perforation together with peritonitis and septic shock and preterm labor and fetal death [3]. Speedy correct identification of the condition plays an essential role to achieve desirable results. The normal changes in the female body during pregnancy tend to conceal appendicitis indicators so physicians face difficulties in both diagnosis and appropriate treatment timing. People without pregnancy experience appendicitis symptoms through right lower quadrant abdominal pain combined with fever and anorexia along with nausea and vomiting [4]. The manifestation of these symptoms becomes more difficult to detect in pregnancy especially in later stages of gestation. During pregnancy the advancing uterus shifts the appendix into an upward position and to the side so that pain symptoms may manifest in either the right upper abdomen or flank area. The appearance of gastrointestinal symptoms that cause nausea and vomiting frequently happens during early pregnancy without justifying the

suspicion of appendicitis [5]. The shared characteristics of pregnancy symptoms together lead to uncertain diagnoses which delay necessary operations thus increasing the potential risks to both mother and fetus [6].

The identification of appendicitis becomes challenging for doctors who evaluate pregnant women because of restricted access to physical assessment techniques together with limited values from laboratory tests. During pregnancy leukocytosis is considered a typical physiologic change that happens independently of infection so it decreases the usefulness of white blood cell count as a diagnostic tool. The enlarged uterus can make it hard to evaluate abdominal tenderness and guarding because both signs will appear less noticeable [7]. Medical personnel should suspect appendicitis strongly because the symptoms require diagnostic imaging tools for proper diagnosis. The first choice diagnostic imaging tool for these cases is ultrasonography mainly because of its availability and safety orientation [8]. As pregnancy advances the detection of appendicitis with this method becomes more difficult because it encounters two challenges: displacement of anatomy and restrictions from either bowel gas or the gravid uterus. MRI provides valuable diagnostic accuracy as a substitute imaging method which avoids ionizing radiation exposure to the fetus. CT represents a very accurate imaging technique but professionals limit its applications to diagnostic cases with uncertain results because of their concern regarding fetal radiation exposure [9].

Medical staff perform appendectomy through open surgery or laparoscopy to treat affected patients after timely intervention. Laparoscopy has surpassed other procedures because it results in reduced patient pain after surgery as well as short hospital stays and low chances of wound complications. Medical experts continue to care about pneumoperitoneum's effects on fetal oxygen supply and blood circulation to the uterus throughout the third trimester period [10]. Doctors should select surgical approaches based on gestational age in combination with their expertise as well as maternal-fetal condition status. When appendicitis goes untreated or when there is mismanagement of this condition during pregnancy significant consequences may occur. When appendiceal perforation develops from delays in treatment physicians note up to a 43% occurrence rate while fetal death risks remain between 20% and 35%. Non-perforated appendicitis cases still lead to maternal stress and systemic inflammation which spur premature contractions of the uterus. It is crucial to consider how surgery compares to failure of diagnosis in order to make proper medical decisions [11].

Objective

To evaluate the clinical presentation, diagnostic accuracy of imaging modalities, and the maternal and fetal outcomes associated with appendicitis during pregnancy.

METHODOLOGY

This retrospective observational study was conducted Department of Obstetrics and Gynaecology, DHQ Hospital Okara City, Okara, Pakistan, from Feb 2024 to Feb 2025. A total of 85 pregnant women who were diagnosed and treated for acute appendicitis during pregnancy were included in the study. Patients were identified from hospital surgical records, obstetric databases, and operative notes.

Inclusion criteria

- Pregnant women of any gestational age
- Confirmed diagnosis of acute appendicitis either clinically, radiologically, or intraoperatively
- Underwent surgical intervention (laparoscopic or open appendectomy)

Exclusion criteria

- Patients with incomplete medical records
- Pregnant women with other causes of abdominal pain without confirmed appendicitis
- Cases managed conservatively or in other institutions

Data Collection

Data were collected retrospectively using a standardized data abstraction form. Demographic variables including maternal age, parity, and gestational age at presentation were documented. Clinical presentation was analyzed based on symptoms including abdominal pain, nausea, vomiting, anorexia, and fever. The duration of symptoms before hospital admission was also recorded. Laboratory data such as white blood cell count and C-reactive protein levels were noted at admission. Operative data included the type of surgical approach (laparoscopic vs. open), intraoperative findings (simple, gangrenous, or perforated appendicitis), and histopathological confirmation of the diagnosis. Maternal outcomes such as length of hospital stay, postoperative complications, and need for intensive care admission were recorded. Fetal outcomes assessed included fetal loss (miscarriage or intrauterine demise), preterm labor, birth weight, Apgar scores, and need for neonatal intensive care unit (NICU) admission.

Data Analysis

Data were analyzed using SPSS v26. Descriptive statistics were used to summarize patient characteristics. Continuous variables such as age and hospital stay duration were presented as means with standard deviations or medians with interquartile ranges, depending on distribution normality. Categorical variables, such as type of appendicitis and imaging modality used, were expressed as frequencies and percentages. Statistical relationships between clinical variables (e.g., time to diagnosis, gestational age, type of appendicitis) and maternal or fetal outcomes were evaluated using chi-square. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 65 pregnant women diagnosed with acute appendicitis, the mean maternal age was 27.6 ± 4.8 years. Most cases occurred in the second trimester (43%), followed by the first trimester (35%) and third trimester (22%). A majority of the patients were multiparous (72.3%), and the median duration of symptoms before hospital presentation was 2.5 days (IQR: 1.5–4.0). Ultrasound was the most frequently used diagnostic modality, performed in 89.2% of cases, with a diagnostic confirmation rate of 67.2%. MRI was used in 27.7% of

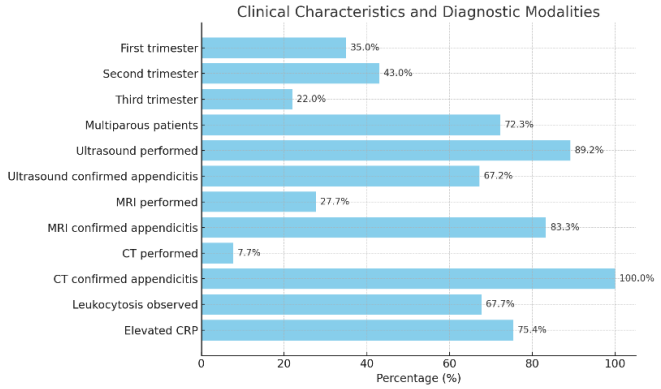
patients and showed a higher confirmation rate of 83.3%. CT was used in 7.7% of cases and confirmed appendicitis in all cases (100%). Laboratory results revealed that leukocytosis was observed in 67.7% of patients, and elevated C-reactive protein levels were found in 75.4%, supporting the presence of an inflammatory response in the majority of cases.

Table 1

Patient Demographics and Clinical Presentation

Parameter	Value
Mean maternal age (years)	27.6 ± 4.8
First trimester	23 (35%)
Second trimester	28 (43%)
Third trimester	14 (22%)
Multiparous patients	47 (72.3%)
Median duration of symptoms (days)	2.5 (IQR: 1.5–4.0)
Diagnostic modalities	
Ultrasound performed	58 (89.2%)
Ultrasound confirmed appendicitis	39 (67.2%)
MRI performed	18 (27.7%)
MRI confirmed appendicitis	15 (83.3%)
CT performed	5 (7.7%)
CT confirmed appendicitis	5 (100%)
Leukocytosis observed	44 (67.7%)
Elevated CRP	49 (75.4%)

Figure 1



Laparoscopic appendectomy was performed in 41 cases (63.1%), while open surgery was conducted in 24 cases (36.9%). Intraoperative findings revealed that 38 patients (58.5%) had simple, non-complicated appendicitis. Gangrenous appendicitis was observed in 14 patients (21.5%), and 13 patients (20%) presented with perforated appendicitis, indicating a significant proportion of complicated cases at the time of surgery.

Table 2

Intraoperative and Histopathological Findings

Parameter	Value
Laparoscopic appendectomy	41 (63.1%)
Open surgery	24 (36.9%)
Simple appendicitis	38 (58.5%)
Gangrenous appendicitis	14 (21.5%)
Perforated appendicitis	13 (20%)

The mean hospital stay for patients undergoing surgery for appendicitis during pregnancy was 4.1 ± 1.8 days. Postoperative complications were observed in 9 patients (13.8%), with 2 requiring ICU admission (3.1%). Among those who underwent laparoscopic surgery, 4 patients (9.7%) experienced complications, compared to 5 patients (20.8%) in the open surgery group, indicating a higher complication rate with the open approach. Fetal outcomes showed that fetal loss occurred in 6 cases (9.2%), while 8 patients (12.3%) experienced preterm labor. The mean gestational age at delivery was 36.4 ± 2.8 weeks. Low Apgar scores (less than 7 at 5 minutes) were noted in 5 neonates (7.7%), and 6 newborns (9.2%) required admission to the neonatal intensive care unit (NICU).

Table 3

Maternal and Fetal Outcomes

Parameter	Value
Mean hospital stay (days)	4.1 ± 1.8
Postoperative complications	9 (13.8%)
ICU admissions	2 (3.1%)
Complications after laparoscopy	4 (9.7%)
Complications after open surgery	5 (20.8%)
Fetal outcomes	
Fetal loss	6 (9.2%)
Preterm labor	8 (12.3%)
Mean gestational age at delivery (weeks)	36.4 ± 2.8
Low Apgar score (<7 at 5 min)	5 (7.7%)
NICU admissions	6 (9.2%)

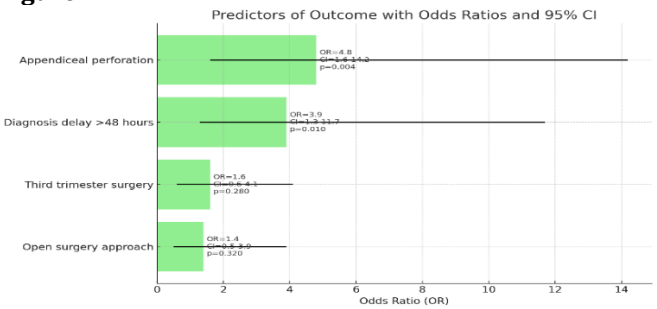
Multivariate logistic regression analysis identified appendiceal perforation as a significant independent predictor of fetal loss, with an odds ratio (OR) of 4.8 (95% CI: 1.6–14.2, p = 0.004). Similarly, a diagnosis delay exceeding 48 hours was associated with a significantly increased risk of fetal loss (OR: 3.9, 95% CI: 1.3–11.7, p = 0.01). In contrast, third trimester surgery (OR: 1.6, p = 0.28) and undergoing open surgery (OR: 1.4, p = 0.32) were not statistically significant predictors.

Table 4

Multivariate Logistic Regression Analysis of Predictors of Fetal Loss

Predictor Variable	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Appendiceal perforation	4.8	1.6 – 14.2	0.004
Diagnosis delay >48 hours	3.9	1.3 – 11.7	0.01
Third trimester surgery	1.6	0.6 – 4.1	0.28
Open surgery approach	1.4	0.5 – 3.9	0.32

Figure 2



DISCUSSION

The findings of this study underscore the complexities associated with diagnosing and managing acute appendicitis during pregnancy. Although relatively uncommon, the condition presents significant clinical concern due to the high risk of complications for both mother and fetus when diagnosis or treatment is delayed. The second trimester was the most frequent period for gestational appendicitis in 65 pregnant women in line with existing research demonstrating increased susceptibility [12]. The second pregnancy trimester appears to be most vulnerable to appendicitis possibly due to biological immune suppression along with appendix repositioning and diagnostic challenge throughout the pregnancy period. Patients in this research displayed the same set of common symptoms just like non-pregnant patients reported abdominal pain and nausea accompanied by vomiting [13]. The position of pain symptoms differed based on pregnancy stage since right upper quadrant pain developed in more than twenty-five percent of cases which demonstrates that appendix displacement affects diagnostic accuracy during advanced pregnancy. The clinical requirements demand doctors to stay vigilant about potential appendicitis diagnoses while using trimester-specific anatomic knowledge to guide their diagnostic approaches. Diagnostic imaging served as the essential method for evaluating appendicitis when it was suspected [14]. Ultrasound remains both available and safe for exams yet achieves poor detection rates of 67.2% during pregnancy especially in its advanced periods. MRI proved to be more dependable in confirming appendicitis during its use in 83.3% of medical situations matching other studies advocating MRI as the preferred secondary diagnostic tool. CT provided complete accuracy in its diagnoses but remained restricted to few instances because of radiation-related worries among clinicians. The results demonstrate why healthcare providers should create systematic diagnostic processes that send patients to MRI testing as soon as doctors cannot make a clear determination through ultrasound [15].

The recommended surgical care for treating appendicitis in pregnancy utilizes laparoscopic and open methods. Existing evidence on laparoscopy shows that use in 63.1% of cases yielded better fetal outcomes while decreasing occurrence of postoperative complications and shortening hospital stay for pregnant patients. Medical staff commonly chose open surgery when treating patients in their third trimester or when perforation was suspected because of worries about increased pressure inside the abdomen and fetal protection [16]. These findings highlight the importance of individualized surgical planning based on gestational age, surgeon experience, and disease severity. Importantly, fetal outcomes were significantly impacted by the severity and timing of the disease. The fetal loss rate in this study was 9.2%, with most losses occurring in cases of perforated appendicitis [17]. Preterm labor occurred in 12.3% of cases, often in association with systemic inflammation or peritoneal contamination. Logistic regression analysis identified appendiceal perforation and diagnostic delays beyond 48 hours as independent predictors of fetal loss. These associations emphasize the critical importance of early diagnosis and intervention. Neither the trimester of surgery nor the surgical approach emerged as statistically significant predictors of fetal demise in adjusted models, suggesting that disease severity rather than surgical method primarily influences fetal risk.

CONCLUSION

It is concluded that acute appendicitis during pregnancy remains a significant diagnostic and therapeutic challenge due to overlapping clinical symptoms with normal gestational changes and trimester-specific anatomical variations. Despite these complexities, timely diagnosis and appropriate surgical management can lead to favorable maternal outcomes and significantly reduce the risk of adverse fetal events.

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