



# Acute Appendicitis in Pregnancy: Our Experience in Rural Area

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## Authors' contributions

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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## ABSTRACT

Acute appendicitis is the most prevalent non-obstetric surgical emergency in pregnant women. The diagnosis gets more challenging when the anatomical location of the appendix shifts due to the expansion of the gravid uterus. In cases of appendicular perforation, there is a higher risk of foeto-maternal morbidity and mortality, so prompt and accurate diagnosis and treatment are essential. The goal of this study is to look into the clinical signs and symptoms of acute appendicitis in pregnancy, as well as how to treat it.

*Keywords: Appendix; appendicitis; pregnancy; acute abdomen; appendectomy.*

## 1. INTRODUCTION

Acute appendicitis is suspected in 1 in 800 pregnancies in developed nations, and confirmed

in 1 in 800 to 1/1500 [1]. The second trimester is the most usual time for it to occur. Acute appendicitis during pregnancy can lead to major consequences for both the mother and the

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foetus. The best treatment therapy for pregnant women who are suspected of having acute appendicitis is still up for dispute. The goal of this cross-sectional study is to look into the clinical signs and symptoms of acute appendicitis in pregnancy, as well as how to treat it. We hope to share our experiences as appendicitis in pregnancy, as well as a review of the research, in this study.

## 2. METHODS

A total of 25 pregnant women who underwent appendectomy with the initial diagnosis of acute appendicitis in Department of General Surgery at Acharya Vinoba Bhave Rural Hospital which is affiliated to Jawaharlal Nehru Medical College, Sawangi (Meghe), Wardha in between July 2018 to June 2020 were analyzed.

Data about patients' age, gestational age, chief complaints, findings of physical examination, total leukocyte count, biochemical parameters, urine analysis, ultrasonography of abdomen and pelvis, type of surgical intervention, post-operative complications, and hospital stay were studied.

Relevant variables were analyzed using descriptive statistics. Fetal and maternal outcomes were stratified by surgical approach (open versus laparoscopic appendectomy) and final diagnosis (normal appendix, non-perforated appendicitis, and perforated appendicitis). Moreover, our patients were classified according to gestational age, namely first trimester (0-12 weeks), second trimester (13-27 weeks), and third trimester (28-42 weeks). Data was entered

on spreadsheet and analyzed. Scopus, PubMed and Cochrane libraries were searched for scientific articles with the term "appendicitis" and "pregnancy". Thorough analysis was done and data was used in this review.

## 3. RESULTS

During the 2 years period of July 2018 to June 2020, a total of 25 pregnant women underwent an appendectomy for suspected appendicitis. Median age of the patients was 22.9 years (20.2-28.3). On admission 2 of these cases presented in first trimester and 23 cases presented in second trimester. Median gestational age was 20 weeks. Out of these 25 patients, 20 were primigravida, 5 were multigravida. Demographic characteristics of study population are shown in Table 1.

On admission, mostly the patient complained of pain in abdomen, out of which 76% had Pain in the right lower quadrant, 20% had Pain in the right upper quadrant, 4 % had nonspecific pain in abdomen. The other nonspecific symptoms were low grade fever (100%), nausea (64%), vomiting (60%), anorexia (56%), dysuria (12%). Presenting symptoms of the entire study population shown in Table 2.

On physical examination, tenderness in right lower abdomen was seen in the majority of our study population (Table 3). 12 women showed rebound tenderness in lower right quadrant (48%), 10 women showed abdominal guarding (40%) and 10 women had Rectal tenderness (40%).

**Table 1. Demographic characteristic of the entire study population (n=25)**

<b>Patient characteristics</b>	<b>Median (range)</b>
Patient age (years)	22.9 (20.2-28.3)
Gestational age at the time of surgery (weeks)	20 (10-27)
<b>Parity</b>	
Primiparous	20
Multiparous	5

**Table 2. Presenting symptoms of the entire study population (n=25)**

<b>Abdominal pain</b>	<b>No of patients (%)</b>
RLQ	19 (76%)
RUQ	5 (20%)
Diffuse (Nonspecific)	1 (4%)
<b>Low grade fever</b>	25 (100%)
<b>Nausea</b>	16 (64%)
<b>Vomiting</b>	15 (60%)
<b>Anorexia</b>	14(56%)
<b>Dysuria</b>	3 (12%)

Abbreviations: RLQ – Right Lower Quadrant, RUQ – Right Upper Quadrant

**Table 3. Signs during physical examination of pregnant women suspected of having appendicitis (n=25)**

Signs	No of patients (%)
Tenderness in right lower abdomen	19 (76%)
Rebound tenderness in right lower abdomen	12 (48%)
Abdominal guarding	10 (40%)
Rectal tenderness	10 (40%)

Infective markers such as leucocyte count and c-reactive protein were raised in pregnant women suspected of having appendicitis (Table 4). Median leucocyte count was 12.39 cells/mm<sup>3</sup> (range is 9000 to 17500 cells/mm<sup>3</sup>). C-reactive protein was raised in 80% of the patients. Biochemical parameters were within normal limits in 20% of the patients. Hemoglobin was 8.2% in 4 patients and 1 patient had hyperglycemia.

Positive signs indicative of appendicitis on abdominal ultrasonography were seen in 24 patients. MRI was done in one patient where ultrasonography was inconclusive and there was strong clinical suspicion for appendicitis. 22 patients had open appendectomy under spinal anesthesia and 3 patients underwent laparoscopic appendectomy under general anesthesia. All open cases were done using Lenz incision. In 2 cases of open appendectomy, intra-operative findings were suggestive of localized perforative peritonitis. Radiological and biochemical co-relation was present in both of these cases of perforative peritonitis. Post-operative period was uneventful for all the

patients except 2 who had perforative peritonitis. Histopathological findings were consistent with acute appendicitis in all the operated cases. None of the patients had developed any surgical site infection. Both the patients of perforated appendicitis were conservatively treated for a postoperative ileus and both the patients delivered prematurely. Table 5 shows maternal and fetal outcome related to type of surgical intervention, patient delay until appendectomy and final diagnosis. Maternal or fetal loss did not occur in this study. 23 patients were discharged within 6 days and 2 patients were discharged on 10<sup>th</sup> day.

**4. DISCUSSION**

Acute appendicitis is the most common surgical cause of acute abdomen in pregnancy. It's also the most common reason for emergency surgery in pregnancy that isn't obstetric [1-5]. The incidence rate varies between 0.05 and 0.07 percent. It is comparable to the non-gravid population, with a modest increase in the second trimester [5,6]. The diagnosis of appendicitis is

**Table 4. Laboratory findings in women suspected of having appendicitis (N=25)**

Laboratory values	Median (range)
Leucocyte count	12.9/mm <sup>3</sup> (9000-17,500/mm <sup>3</sup> )
C-reactive protein	20 mg/dl (7 – 45 mg/dl)

**Table 5. Maternal and fetal outcome related to type of surgical intervention, delay until presentation and appendectomy and final diagnosis**

Type of surgical intervention	Uncomplicated	Maternal complication	Fetal complication
Laparoscopic appendectomy	3	0	0
Open appendectomy	22	2	0
<b>Delay until presentation and appendectomy</b>			
< 72 hours	23	0	0
> 72 hours	2	2	2
<b>Final diagnosis</b>			
Normal appendix	0	0	0
Appendicitis	23	0	0
Perforated appendicitis	2	2	2

generally delayed during pregnancy because to changes in physiological and anatomical factors, and there is a heightened fetomaternal risk associated with it [7] It is most frequent during the second and third decade of life [7,8].

Overall incidence of acute appendicitis is similar to that seen in normal population [1,9] but as per the registry study done in Sweden, 778 patients who underwent appendectomy in pregnancy were compared with non-pregnant women on age matched control basis. Pregnant women are less likely to get appendicitis, according to research [1,9]. 1 in every 800 pregnancies is suspected to have appendicitis in developed countries. According to Kim et al it is most commonly seen in 1st trimester while Joe et al indicated that it is most common in third trimester [7]. However, Lee et al suggested that there is not much difference in between trimesters [7,8]. In our study, most of the patients were seen in second trimester. As per the study done in 908 pregnant women by flexor SM et al, Appendicitis is associated with increased risk of poor fetomaternal outcome. The list included low birth weight (LBW), small for gestational age (SGA), and preterm labour. SGA and LBW were associated with increased fetal mortality [7,10] Fetal mortality is 1.5% with uncomplicated appendicitis while it increases to 37 % with perforative appendicitis [7,11].

In our experience, we had 2 cases of perforative appendicitis. Both the patients of perforative appendicitis were conservatively treated for a postoperative ileus and both had delivered prematurely. Early detection and surgical intervention may help to reduce mortality [7,12].

Abdominal pain is the most common symptom of appendicitis, which starts in the periumbilical area and radiates to the right lower quadrant, where the inflammatory process is active [5,13,14]. There may be associated anorexia and vomiting following pain. Fever and leukocytosis may develop subsequently [5,13] However, because the position of appendix migrates a few centimeters cranially with growing uterine capacity, the traditional signs and symptoms of appendicitis may not be visible during pregnancy and pain in the third trimester may be found in the right upper quadrant or right flank [5,15,16]. Because the inflamed appendix is not in close touch with the peritoneum, abdominal guarding is less sensitive owing to diminished tenderness [5,17]. The gravid uterus may impede contact between the inflamed appendix and the

omentum, increasing the risk of diffuse peritonitis [5,17]. Although guarding and rebound tenderness is seen in 70% of the patients, this may not be the diagnostic finding in the pregnancy due to relaxation of abdominal muscles [7]. Nausea, vomiting and loss of appetite can be physiological in pregnancy hence they may not be diagnostic of acute appendicitis. Hence, abdominal tenderness is the most reliable diagnostic sign in appendicitis in pregnancy [7,9]. The most prevalent complaint in our survey was right lower quadrant discomfort on examination with tenderness in the right lower abdomen, which is consistent with the literature.

In normal pregnancy, the total leucocyte count is usually about 12,000/mm<sup>3</sup>, which may increase as the pregnancy progresses. Key matter indicated that when total leucocyte count goes higher than 16,000/mm<sup>3</sup> there should be suspicion of appendicular perforation. In our study, median of total leucocyte count was 12.39 cells/mm<sup>3</sup>. In 2 cases of perforative appendicitis it was higher than 16,000/mm<sup>3</sup>. There is increase in C-reactive protein in appendicitis although it's a non-specific sign of inflammation. Classical signs of abdominal pain from peri-umbilical region migrating to right lower quadrant associated with tenderness, nausea and vomiting are strongly suggestive towards clinical diagnosis of acute appendicitis [5,18].

Whenever there is atypical presentation of acute appendicitis, imaging studies in the form of ultrasonography is recommended owing to its easy applicability and reproducibility. Non-compressible blind ending tubular structure is the chief finding in ultrasonography [5,19,20] Inability to compress the uterus, obesity and high BMI, intestinal gas and operator dependency are the disadvantages of ultrasonography and the sensitivity ranges from 67% - 100% and specificity of 83% - 96% as compared with the sensitivity of 86% and specificity of 96% in general population [5,21].

MRI (magnetic resonance imaging) is the best investigation to rule out the acute appendicitis in pregnant female where clinical findings and ultrasonography are inconclusive. It is non-invasive and safe in pregnancy with higher sensitivity (91%) and specificity (98%) [5,22]. CT (computed tomography) is not advisable as radiation exposure carries risk for the fetus [7,23]. In our study, MRI (magnetic resonance imaging) was used only in one case where ultrasonography was inconclusive. It yielded accurate result

consistent with intra-operative findings. When the patients of acute appendicitis are treated with conservative management, the recurrence rate is 30% [7,11]. Conservative approach to acute appendicitis in pregnancy has been seen to increase maternal mortality and fetal loss [7,24].

In our study, after confirmation of acute appendicitis we treated all the patients surgically. Conventional open appendectomy through Lenz incision was done in 22 patients and Laparoscopic appendectomy was done in 3 patients. Recent data suggests that laparoscopic appendectomy has many advantages over conventional appendectomy in decreasing wound site infection and there is no increase in risk of preterm labor, miscarriage and maternal complications [7,9,25].

## 5. DIFFERENTIAL DIAGNOSIS

When we suspect an acute appendicitis, we must consider a variety of pathologies that have occurred in both non-pregnant and pregnant women as a differential diagnosis. In addition, pregnancy-related causes of abdominal pain, fever, leukocytosis, nausea-vomiting, and changes in bowel function must be taken into account. When the patient present with pain in right lower quadrant or right upper quadrant or right flank with positive pregnancy test, the possibility of an ectopic pregnancy must be excluded. Both appendicitis and the early stages of pregnancy are known to cause nausea and vomiting, as well as malaise with or without bowel irregularity/indigestion. Nausea and vomiting are usually worsened following the beginning of pain in acute appendicitis, but nausea and vomiting in the early stages of pregnancy are never accompanied with pain. Many time, round ligament can cause light pain in right lower quadrant in early pregnancy, but it is non progressive in nature and not associated with other symptoms [26] Pregnant women are more likely than non-pregnant women to have pyelonephritis. A pregnant woman with right-sided abdominal discomfort, fever, leukocytosis, and leukocyturia may be diagnosed with pyelonephritis, causing the proper diagnosis of acute appendicitis to be delayed [26]. Pre-eclampsia and HELLP syndrome can be ruled out of acute appendicitis in the second part of pregnancy because to their relationship with hypertension, along with other symptoms such as nausea, vomiting, and epigastric/upper right quadrant pain. They have an unusual association with fever and leukocytosis [26]. Premature

placental separation and uterine rupture are linked to lower abdominal discomfort on the medial or lateral sides. Both illnesses are frequently linked with vaginal bleeding, changes in fetal heart rate, and a considerable increase in uterine tonus (stiffness), unlike appendicitis [26].

## 6. CONCLUSION

One of the most prevalent causes of acute abdomen in pregnant women is acute appendicitis. The fetomaternal outcome is determined by the intensity of inflammation. According to this study, postponing surgical treatment for perforated appendicitis during pregnancy increases the risk of maternal complications and preterm delivery. Imaging investigations are required when diagnosis becomes complicated owing to a gravid uterus. In cases where clinical findings and ultrasonography are inconclusive, MRI (magnetic resonance imaging) is the investigation of choice. To avoid complications, I have experienced that it's important to get a diagnosis and treatment as soon as possible, especially for the patients in rural area. Surgical management is the sole option for a successful cure throughout any gestational time. I suggest that every obstetrician/gynecologist and general physician should keep in mind the possibility of acute appendicitis when treating the acute abdomen in pregnancy.

## CONSENT

It is not applicable.

## ETHICAL APPROVAL

It is not applicable.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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