

# A Clinical Study and Ultrasonography Diagnosis in Clinically Suspected Cases of Acute Appendicitis

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## **ABSTRACT**

**Background:** Acute appendicitis is the most prevalent cause of acute abdomen and subsequent surgery. Misdiagnosis is a common and critical problem in general surgery because the diagnosis is primarily based on clinical grounds. Maximum incidence observed in the second and third decades of life, with male preponderance. Graded compression ultrasonography is one of the diagnostic procedures that has been shown to reduce the need for unfavourable surgical treatments, particularly in females. **Objectives:** Objectives of the study were to study the clinical features of acute appendicitis, Utility of USG in supporting the clinical diagnosis of acute appendicitis. **Methods:** This study included one hundred and Twenty Five patients with history of RLQ pain where clinical diagnosis of acute appendicitis was made. The study period was of 18 months between November 2019 to May 2021. Routine blood investigations and abdominal USG were done in all cases. All ultrasound positive cases were subjected to surgery. Some ultrasound negative cases were also taken to surgery on the high clinical suspicion of acute appendicitis. The ultrasound findings were compared with clinical findings and histopathological examination reports.

**Results:** There were 61 men and 39 women among the 100 patients. The number of patients (94%) reported right iliac fossa pain at the time of commencement. In 67 percent of patients, pain migrated from the umbilicus to the right iliac fossa. **Interpretation & Conclusions:** In clinically diagnosed cases of appendicitis, ultrasonography is a valuable examination. In the current investigation, the accuracy was 88 percent, the sensitivity was 96.5 percent, and the specificity was 83.33 percent based on statistical analysis. The overall positive predictive value was 97.7%, while the negative predictive value was 16.66%. USG's overall accuracy was 91.2 percent, with a sensitivity of 92% and a specificity of 83.3 percent. Positive predictive value of 97.9% and negative predictive value of 52.6 % When compared to abdominal CT, ultrasound examination of the abdomen is a more cost-effective investigation. Thus, a thorough physical examination and extensive history collection remain important in the diagnosis of acute appendicitis.

**Keywords:** *appendicitis, USG, .appendectomy, histopathological examination, abdominal USG.*

## **INTRODUCTION**

Acute appendicitis (AA) has been reported as one of the most common causes of abdominal pain among patients in emergency rooms, and appendectomy has been indicated as one of the most common emergency medical treatments performed worldwide. This syndrome is caused by intra-tubular obstruction, lymphoid hyperplasia, faecal matter accumulation, foreign item ingestion, tumours, and parasites. The prevalence of acute appendicitis (AA) in the general population has been found to be around 7%; however, females have a peak prevalence at the age of 10 to 14 years, and males have a peak prevalence at the age of 15 to 19 years[1]. Despite advancements in modern radiographic imaging and laboratory investigations, appendicitis diagnosis is ultimately clinical, requiring a combination of observation, clinical acumen, and surgical science. In an age when early and accurate preoperative diagnosis is expected, appendicitis remains an enigma and a reminder of the art of surgical diagnosis[2].

Delays in diagnosis may lead to increased morbidity and mortality, as well as consequences such as perforation, peritonitis, or sepsis. Following a physical examination, ultrasonography (USG) would be the first imaging investigation in patients with stomach pain. As the primary investigation of choice, USG has various benefits over other radiological investigations<sup>3</sup>.

The study's objectives were to investigate the clinical aspects of acute appendicitis, as well as the use of USG in supporting the clinical diagnosis of acute appendicitis in patients attending the emergency department at Govt Medical College & General Hospital, Nalgonda.

### **1. AIMS & OBJECTIVES OF THE STUDY:**

The aims and objectives of this study are:

1. To study the various clinical features of acute appendicitis
2. To study laboratory and ultrasonography findings in clinically suspected cases of acute appendicitis
3. To study the utility of ultrasonography in clinically diagnosed acute appendicitis

### **Materials and Methods:**

This was a prospective study. Material for this study was obtained from the patients admitted in the Department of General Surgery, in Govt Medical College & Hospital, Nalgonda who were clinically suspected of having Acute Appendicitis. The study was conducted for a period of 18 months, from November 2019 to May 2021. A total of 100 cases were taken for detailed study.

#### **Inclusion criteria**

1. All Patients above 18 years of age admitted with acute abdomen, clinically diagnosed as acute appendicitis with duration pain upto 48 hours.
2. Patients who underwent surgery were only taken for the study.

### Exclusion criteria

1. Patients admitted with hollow viscus perforation with peritonitis.
2. Patients proved to have other causes of pain in right iliac fossa like renal colic, PID, ovarian cyst, recurrent appendicitis, appendicular abscess and appendicular mass.
3. Patients not willing for admission or surgery.

### Methodology

The study included 100 individuals who were admitted with a clinical suspicion of acute appendicitis. Following hospitalisation, all patients got a comprehensive physical examination as well as normal laboratory tests. The clinical diagnosis was made prior to the ultrasound based on the medical history, physical examination, and laboratory findings. After a clinical diagnosis was made, junior residents did a real-time, high resolution (5 MHz, 7.5 MHz) graded compression ultrasonic examination. Following the ultrasound scan, a final choice on therapy was reached. The presence of a non-compressible appendix with anteroposterior dimensions greater than 6mm was a major criterion for appendicitis diagnosis. Other criteria included peri-appendiceal fluid collection, faecolith presence, compressibility, and target sign. Sonographic films were made, and the results were recorded. All patients' surgical outcomes were recorded separately. Histopathological investigation was used to get the final diagnosis.

The following are the surgical indications for patients with suspected acute appendicitis.

- Definite clinical signs of appendicitis with positive USG for acute appendicitis.
- Equivocal clinical signs and symptoms with positive ultrasound scans.
- Definite clinical and laboratory evidence with negative ultrasound scans.

### Statistical analysis

Data were analysed using SPSS version 14.0 software (SPSS Inc., Chicago, IL). Categorical variable was compared using Pearson's Chi-square test and Fisher exact probability test. Mann-Whitney U test was used for ordinal data. The sensitivity, specificity, Positive predictive value (PPV) and Negative predictive value (NPV) were calculated for individual investigation and investigations in combination. Pvalue of <0.05 was considered significant for all tests.

### **OBSERVATIONS AND RESULTS:**

In this prospective study, analysis of the 100 patients with acute appendicitis who underwent surgery was studied. The clinical diagnosis was correlated with USG abdomen and histopathology findings.

**Table No.1: Age distribution of the patients**

Age (Yrs)	Number of patients	Percentage
18-20	17	17
21-30	51	51
31-40	19	19

41-50	7	7
>50	6	6

In this present study the incidence of clinically diagnosed appendicitis was maximum among 21-30 years of age (2<sup>nd</sup> and 3<sup>rd</sup> decade) and least incidence was in 5<sup>th</sup> decade (7%) as illustrated and shown.

**Table No.2: Sex distribution of the patients:**

Gender	Number of patients	Percentage
Male	61	61
Female	39	39

The total number of male in the study group is 61 and female is 39. The male to female ratio is 3:2. Mean age and 94% confidence interval for the mean.

**Table No.3: Clinical Symptomatology:**

Symptoms	Number of patients	Percentage
RLQ Pain	73	73
Vomiting	68	68
Anorexia	92	92
Fever	89	89
Burning micturition	06	6
Diarrhoea	4	XIII <sub>4</sub>

Pain abdomen was present in all the patients in the study and it was first symptom followed by anorexia, fever and vomiting,

Other Symptoms: There were 4 % of patients with history of diarrhoea and 6% of patients were suffering from burning micturition; none of them had constipation.

**Table No.4: Duration of pain abdomen at presentation**

Duration (Hrs)	Number of Patients	Percentage
0 - 24 hrs	62	62
24 -48 hrs	38	38

Majority of the patients in the study presented to emergency with in 24 hrs. Those presented late had findings of early mass formation and gangrenous changes. **So early diagnosis and early initiation of treatment prevents complications.**

**Table No.5: Distribution of Site of Pain at Onset**

Site of pain at onset	Number of Patients	Percentage
Right iliac fossa	94	94
Umbilicus	67	67
Lumbar	2	2
Hypogastric	1	1
Migration of Pain		
Present	58	58
Absent	42	42

In this study majority of the patients (94 %) presented with right iliac fossa pain at the time of onset. Classical migration of pain from umbilicus to right iliac fossa was elicited in 67% of patients.

**Table No.6: Clinical Signs**

Signs	Number of patients	Percentage
Tenderness in RIF	65	65
Rebound tenderness	75	75
Guarding	38	38
Rovsing's sign	5	5
Mean temperature (38.7 <sup>0</sup> C)	84	84
Total count (>10000/cumm)	89	89

Right iliac fossa (RIF) tenderness was present in all of the cases. Rebound tenderness was present in 65% of cases, in these cases there was presence of local peritoneal inflammation and guarding was present. Mean temperature of 38.7<sup>0</sup>C and total count >10000/cumm was noticed in 84% and 89% respectively

### **Investigations:**

Haemoglobin estimation ranges from 8.5 to 14gms %. The average was 11gms %. The total count varied between 5600 to 27700 /cumm. Among histologically proved cases of acute appendicitis, total count was more than 10,000 cumm was found in 87% and neutrophilia of more than 75% was found in 74% of patients.

Urine analysis: WBC count of more than 5 per HPF was found in 10% patients. Plain X-ray abdomen: was done in all patients to rule out hallow viscus perforation. There was no evidence of air under diaphragm or faecolith.

**Table No.7: Alvarado scoring in study patients**

Alvarado Score	Number of Patients	Percentage
>7	67	67
5-6	22	22
<5	11	11

Based on clinical evaluation, out of 100 patients, 67 patients were diagnosed as suspected to have acute appendicitis. **Then the entire study cohort was subjected to USG examination.**

**Table No.8: Ultrasonography Findings**

USG Diagnosis	Number of patients	Percentage
Acute Appendicitis (AA)	79	79
AA with early mass formation	5	5
Ovarian cyst	3	3
Pelvic inflammatory disease	2	2
Not visualized	11	11
Total	100	100

Ultrasonography was performed in all the patients. Appendix size varied from 5mm to 18.6 mm with an average size of 8.5 mm. Features suggestive of acute appendicitis were noted in 106 patients (79%). In 19 patients (11 %) acute appendicitis was not confirmed.

**Table No.9: Final clinical diagnoses following ultrasound performance**

Diagnosis	Number of Patients	Percentage
Clinical signs of appendicitis with positive USG	88	88
Clinical and laboratory evidence with negative USG	10	10
Equivocal clinical signs and symptoms with positive USG	2	2

Out of 100 patients, in 88 patients with definitive clinical signs of acute appendicitis, USG showed features suggestive of acute appendicitis, whereas in 10 patients, 2 USG was negative for acute appendicitis. Three patients with equivocal clinical signs, USG showed positive for acute appendicitis.

**Management:**

All the patients received preoperative antibiotics, injection TT and xylocaine test dose. All the patients underwent emergency open appendicectomy under spinal anaesthesia with MacBurney's incision, as emergency laparoscopic appendicectomy was not performed routinely in our institute. Post operatively antibiotics continued for 3-5 days. Drainage tube was removed after 2-3 days. The sutures removed between 7<sup>th</sup> and 10<sup>th</sup> day.

**Table No.10: Position of Appendix**

Position	Number of patients	Percentage
Retrocaecal	55	55
Pelvic	28	28
Paracolic	4	4
Sub caecal	2	2
Pre-ileal	1	1
Total	90	100

In this study retrocaecal appendix was most common (55%) site, followed by pelvic position (28%).

**Table No.11: Histopathological Report.**

Histopathological Report	Number of patients	Percentage
Acute Appendicitis confirmed	89	89
Normal study	11	11

After appendicectomy all the specimens of the appendix was sent for histopathological examination. The histopathological examination confirmed the diagnosis of acute appendicitis in 89 cases. The appendix was found to be normal in 11 cases.

**Table No.12: Post operative complications**

Complications	Number of patients	Percentage
Wound infection	19	19
Retention of urine	5	5
Prolonged ileus	3	3
Urinary tract infection	2	2

Faecal fistula	0	0
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In this study most common complication following emergency appendicectomy was wound infection followed by retention of urine.

**Table No. 13: Comparison of clinical diagnosis and biopsy result of acute appendicitis.**

Clinical diagnosis	Biopsy Results		Total
	Positive	Negative	
Positive	85	2	87
Negative	3	10	13
Total	88	12	100

On statistical analysis performance of clinical diagnosis in present study, the accuracy was 88 %, sensitivity was 96.5% and specificity was 83.33%. An overall positive predictive value was 97.7% and Negative predictive value was 16.66%.

The overall **accuracy of USG was 91.2%** with a **sensitivity of 92%** and **specificity of 83.3%** **Positive predictive value of 97.9%** and **negative predictive value of 52.6%**. Analysis of false negative reports by ultrasound revealed that nine out of nineteen cases of USG negative were operated and had retrocaecal appendix and they were not picked up by USG. The error in USG may be due to the position of the appendix, obese patient, un-cooperative patients and the frequency of the USG used (3 MHz).

### **DISCUSSION:**

This prospective study was carried out in the hospitals that are affiliated with the Government Medical College in Nalgonda from May 2019 all the way through November 2021. During this time period, 100 patients who were clinically suspected of having acute appendicitis underwent emergency appendicectomy, which was then verified by a report from the histopathologist.

#### **Age distribution:**

Appendicitis is typically a condition that affects people in their younger years. In this particular study, the ages of the patients ranged from 18 to 85 years old. The age range of 18–30 years old had the highest incidence of acute appendicitis (66.4 percent). According to the findings of a study conducted by Oguntola AS et al 4, the highest incidence was observed in people's second and third decades of life. The findings of the present study are comparable to and in line with the findings of a previous study by Naveen K et al 5 that found that acute appendicitis is more likely in those between the ages of 16 and 30. (51 percent).

#### **Distribution by gender:**

Before the onset of puberty, the proportion of males and females who experience appendicitis is comparable. The ratio of males to females reaches a high of 3:21 among adolescents and young adults. According to the findings of our research, acute appendicitis is more prevalent in males (61 percent) than it is in females (39 percent).

Male to female ratio is 1.7:1. The study by Al-Omran et al.<sup>6</sup> found that men are more likely to suffer from appendicitis than women. The ratio of male to female death rates, adjusted for age, was 1.4 to 1.

**Symptoms:**

A painful abdomen was experienced by the majority of patients (73 percent), and it was the initial sign of the condition. It was shown that 52.8 percent of patients had the usual history of pain migrating from the periumbilical region to the right lower quadrant. The next most common symptom was vomiting, which was experienced by 68 percent of patients. Anorexia was prevalent in 92 percent of patients. According to the findings of the Nshuti R, et al.<sup>7</sup> study, the primary presenting symptoms were pain in the right iliac fossa (95 percent of patients), anorexia (80 percent of patients), and vomiting (73 percent of patients), with 63 percent of patients, which is comparable to our current study.

**Signs:**

In the current study, sixty-five percent of patients had a heart rate that was greater than ninety beats per minute, and eighty-nine percent of them also had low-grade fever. RIF soreness was present in all patients, making it the most consistent aspect of the clinical examination. This was followed by rebound tenderness and guarding as the next most consistent features. In the study that Kalan M. and colleagues<sup>8</sup> carried out, it was somewhere around 95 percent, and in the study that George Mathews and colleagues<sup>8</sup> carried out, it was 99 percent. 9 In 88 percent

of the histologically confirmed cases, a total count of more than 10000/cumm was discovered, and in 76 percent of the patients, neutrophilia was determined to be greater than 75 percent. The present study demonstrates that clinical diagnosis has a sensitivity of 88 percent and a specificity of 83.33 percent, according to the statistical evaluation. In their study, Halbhavi S. et al.<sup>10</sup> looked at 150 people who were suffering from acute appendicitis. In his study, the sensitivity of clinical diagnosis was found to be 97%, while its specificity was found to be 90%. 138 patients were subjected to an examination by Sonawane R et al.<sup>11</sup>. The sensitivity of his series was found to be 97%, while the specificity was found to be 80%. Therefore, the overall sensitivity and specificity of this study is comparable to that of the studies that were previously discussed. In the current study, out of 100 patients with a clinical diagnosis of acute appendicitis, 88 individuals had their diagnosis confirmed histologically to have acute appendicitis. When compared to the previous studies stated above, the negative appendicectomy rate was 13%. The results of an ultrasonography investigation are very dependent on the operator. As a result, different sensitivity and specificity values might be found throughout the literature. The findings of the present study compare favourably to those of other regional, national, and international investigations. In 79 of the 100 cases of acute appendicitis that were clinically diagnosed, an ultrasound was able to confirm the presence of acute appendicitis. There was a range of appendix sizes, from 5mm to 18.6 millimetres in width, with an average size of 8.5 millimetres. 106 patients were found to have symptoms that were consistent with acute

appendicitis (79 percent ). In 19 individuals, or 11 percent of the total, the diagnosis of acute appendicitis could not be made. As a result, the clinical diagnosis continues to play a very essential role in the process of identifying acute appendicitis. Therefore, doing an appendectomy in clinically positive instances is acceptable even if an ultrasound reveals that the appendix is normal.

The overall rate of negative appendectomy was 11 percent, according to the present study. The use of ultrasound is helpful in the diagnosis of a variety of conditions, including ureteric colic, pelvic inflammatory disease (PID), ovarian cysts, and others.

### **CONCLUSION:**

The primary symptoms of acute appendicitis include pain in the right iliac fossa, anorexia, nausea/vomiting, and fever. Tenderness in the right iliac fossa and rebound tenderness

were the most prevalent symptoms. The clinical diagnostic' sensitivity and specificity were

96.5 percent and 83.33 percent, respectively. Clinical diagnosis is still correct in the majority of cases of acute appendicitis. USG accuracy was 91.2 percent, with 92 percent sensitivity and 83.3 percent specificity. The positive predictive value is 97.9 percent, and the negative predictive value is 52.6 percent. It is more helpful in female patients who have concomitant pelvic disease, in youngsters, and in obese people who have acute appendicitis. Acute appendicitis is primarily diagnosed clinically. Although radiological, biochemical, and pathological evaluations are useful, the history, clinical examination, and Alvarado score are more important in treating and managing acute appendicitis cases. Clinical characteristics provide a much higher diagnostic accuracy than ultrasonography in the diagnosis of acute appendicitis. As a result, it is recommended that radiological tests should be used solely to confirm the diagnosis of clinically suspected instances of acute appendicitis rather than to diagnose it. We believe that combining clinical features with ultrasonography as an assisting tool would help to further reduce the unfavourable appendectomy rate.

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### **Conflict of Interest**

None

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Nil

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