

**ASSESSMENT OF VARIOUS DIAGNOSTIC PARAMETERS IN CASES OF ACUTE APPENDICITIS**

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**Abstract**

**Introduction:** Acute appendicitis is a common surgical emergency and appendectomy is one of the frequently done emergency surgical operations. Its diagnosis stills remain elusive due to its varying presentation. The use of valuable diagnostic parameters can aid in diagnosis. We in the present study tried to evaluate the usefulness of USG abdomen, TLC and S. Amylase levels in diagnosing Acute Appendicitis.

**Methods:** This cross-section and prospective study were done in the Department of General Surgery, Prathima Institute of Medical Sciences, Naganoor, Karimnagar. A total of n=50 patients were identified during the study period. USG abdomen, total WBC count, Serum Amylase was done for each case of suspected appendicitis. The specimen sent for histopathological examination and the reports analyzed. Accuracy of diagnosis by USG abdomen and TLC count confirmed with histopathological findings.

**Results:** In the present study a total of n=50 patients were included out of which n=30 were male and n=20 were female patients. In the study, the clinical signs were the presence of right iliac fossa pain and tenderness in n=50(100%) patients followed by the presence of fever in n=35(70%) of patients. USG was having 100% specificity and 77.7% sensitivity, the total leucocyte count was showing 80% specificity and 77.1% sensitivity for diagnosis and the serum amylase levels was having a sensitivity of 8% but specificity was 100%.

**Conclusion:** The investigations like USG, TLC may aid in the diagnosis of appendicitis. The role of serum amylase is very limited in the diagnosis since its values are not sensitive enough. Through clinical examinations with the basic investigations are enough in most of the cases for diagnosis of acute appendicitis instead of more sophisticated procedures like CT abdomen

**Keywords:** Acute appendicitis, diagnostic parameters, USG, TLC

## Introduction

The diagnosis of acute appendicitis remains a challenge even to the experienced surgeon because of its myriad presentation. The accuracy of the clinical examination has been reported to range from 71% to 97% and depends on the experience of the examiner. Since missed or ruptured appendixes cause serious morbidity and mortality the accepted rate of negative appendectomy is up to 20% - 30% [1]. It is estimated that approximately 6% of the population will suffer from acute appendicitis during their lifetime hence early diagnosis and intervention are crucial[2]. This effort has successfully lowered the mortality rate to less than 0.1% for non-complicated appendicitis, where there are gangrene and perforated cases 8%[3]. The laboratory values of acute appendicitis usually show 80-85% of patients with acute appendicitis will have a total WBC count of over 10,000/cu mm. Neutrophilia of >75% will occur in 78% patients. When TLC and neutrophil count are taken together less than 4% of patients with acute appendicitis will have normal values[4]. However, TLC is raised in 20-70% of patients with other causes of acute right iliac fossa pain. Leucocytosis increases with the duration of the disease process, but even a perforated appendix may present with a normal TLC of note is the observation of some that if TLC is repeated after a few hours, it tends to remain high in those with acute appendicitis but tends to fall in those without[5]. Others have observed that TLC and neutrophil count are particularly sensitive in children [6-8]. Thus although a raised WBC count is a highly sensitive test for acute appendicitis, it has low specificity and its value seems to be prompt in a patient with equivocal features of acute appendicitis[9]. Minimal albuminuria and some WBC in the urine are present in 20% of male patients with acute appendicitis [9]. X-ray examination is one of the important aids to the diagnosis of appendicitis it can show the presence of fluid levels localized to caecum to terminal ileum in some cases which indicates inflammation in the right lower quadrant of the abdomen. There may be increased soft tissue density or faecolith in the right iliac fossa may be seen depending on cases [10]. Real-time USG usage has increased for the diagnosis of appendicitis because of its ability to visualize a non-compressible appendix is sensitive for diagnosis[11]. A large set of appendiceal and periappendiceal criteria are used to diagnose acute appendicitis, with the most sensitive and specific being a diameter of 6mm or greater (sensitivity 98%, specificity 98%) lack of compressibility (sensitivity, 96%, specificity 98%) and inflammatory fat changes (sensitivity 91%, specificity 76%)[12]. Serum amylase levels are used for the diagnosis of acute perforated appendicitis. A serum amylase level of 46mg/dl has shown a sensitivity of 89% and specificity of 100% in the diagnosis of acute perforated appendicitis. It has been seen that serum amylase levels in perforated appendicitis are significantly higher compared to patients with non-perforated appendicitis[13]. With this background, we in the present study tried to evaluate different diagnostic values (USG abdomen, TLC and S. Amylase) in diagnosing Acute Appendicitis.

## Material and methods

This cross-section and prospective study were done in the Department of General Surgery, Prathima Institute of Medical Sciences, Naganoor, Karimnagar. Institutional ethical committee

permission was obtained for the study according to an institutional protocol for ethical clearance on human subjects. Written consent was obtained from all the participants of the study. A total of n=50 patients were identified during the study period based on inclusion and exclusion criteria. Inclusion criteria were patients coming to the hospital with pain abdomen and diagnosed provisionally as acute appendicitis and are willing for surgery are included in the study. Exclusion criteria were pain abdomen along with distension of abdomen, pregnant females, previous history of any abdominal surgeries, Pancreatitis, patients not willing to undergo surgery. Depending on the individual presentation of signs and symptoms, USG abdomen, total WBC count, Serum Amylase was done for each case of suspected appendicitis. USG abdomen showing the following features were found non-compressible aperistaltic blind loop and increased vascularity of appendix and showing appendicular perforation with a peri-appendicular collection that cases were taken for surgery. USG Abdomen where the appendix was not visualized, but probe tenderness positive after excluding other diseases, was taken for surgery and correlated with HPE. TLC is increased in acute appendicitis cases and it may be normal due to antibiotic use, increased TLC and tenderness in RIF cases were taken for surgery and correlated HPE. Serum amylase levels slightly increased in only appendicular perforation cases, which were taken for surgery. The cases subjected to emergency surgery were adequately prepared. Whenever vomiting persisted, Ryle's tube aspiration was done. Parenteral fluids, electrolyte supplementation, broad-spectrum antibiotics were administered. Hourly temperature pulse and respiratory chart were maintained. When the diagnosis of acute appendicitis was certain, Surgery was done under general anesthesia or spinal anesthesia depending on the case and requirements a grid-iron incision was used. The right paramedian incision was used when the diagnosis was uncertain or when frank peritonitis was suspected. Before resection, the appendix was assessed. All the patients were continuously monitored post-operatively and sutures were removed on the 8th day. The specimen sent for histopathological examination and the reports analyzed. Accuracy of diagnosis by USG abdomen and TLC count confirmed with histopathological findings.

## Results

In the present study, a total of n=50 patients were included out of which n=30 were male and n=20 were female patients. The male to female ratio was 3:2. The most common age group affected by acute appendicitis appears to be 11- 20 years with n=23(46%) of patients the other demographic details are shown in table 1.

**Table 1:** Showing the demographic profile of the patients included in the study

Age in years	Male	Female	Total	Percentage
8-10	2	2	4	8
11-20	16	7	23	46
21-30	5	8	13	26
31-40	3	2	5	10
41-50	1	0	1	2
>50	3	1	4	8
Total	30	20	50	100

The most common symptom present in all n=50(100%) of the patients was abdominal pain followed by nausea and vomiting in n=36(72%) of patients the other symptoms and their frequency is shown in table 2.

**Table 2:** Showing the frequency of symptoms in the patients

Clinical features	Number	Percentage
<b>SYMPTOMS</b>		
Abdominal pain	50	100
Anorexia	28	56
Nausea/vomiting	36	72
Diarrhea	2	4
Constipation	6	12
Burning Micturition	6	12

In the study, the clinical signs were the presence of right iliac fossa pain and tenderness in n=50(100%) patients followed by the presence of fever in n=35(70%) of patients and rebound tenderness in n=34(68%) of patients. The other signs are shown in table 3.

**Table 3:** Showing the frequency of symptoms in the patients

Clinical features	Number	Percentage
<b>SIGNS</b>		
RIF –tenderness	50	100%
Rebound – Tenderness	34	68%
Fever	35	70%
Muscle Guarding	5	10%
Abdominal Rigidity	6	12%
Psoas sign	3	6%
Rovsing sign	4	8%
Hyperesthesia at Sherrens triangle	4	8%
Rectal tenderness	3	6%

The USG abdomen was found positive in n=35(70%) of cases and leucocytosis was found in n=33(66%) of patients and Increased serum amylase levels were found in n=4(8%) of patients. The details of the distribution are given in table 4.

**Table 4:** The results of various diagnostic tests on patients

Diagnostic tests	Male	Female
<b>USG abdomen</b>		
USG abdomen Positive (n=35)	21	14
USG Negative but probe Tenderness Positive (n=15)	6	9
<b>Total WBC Count</b>		
Increased(n=33)	20	13
Normal (n=17)	11	6
<b>S. Amylase</b>		
Increased (n=4)	2	2
Normal(n=46)	27	19

Out of n=50 patients in the study n=5(10%) were found to be normal appendixes and catarrhal appendicitis was found in 17(34%) of patients and suppurative appendicitis was found in n=24(48%) of patients (table 5).

**Table 5:** The results of the histopathological examination of the specimen

Histopathology	Number	Percentage
Normal	5	10%
Appendicitis Catarrhal	17	34%
Appendicitis Suppurative	24	48%
Appendicitis Perforative	4	8%
Appendicitis Gangrenous	0	0%

USG was having 100% specificity and 77.7% sensitivity, the total leucocyte count was showing 80% specificity and 77.1% sensitivity for diagnosis and the serum amylase levels was having a sensitivity of 8% but specificity was 100% given in table 6.

**Table 6:** showing the sensitivity of USG, TLC and Serum amylase levels in the diagnosis of appendicitis

Diagnostic parameter	Appendicitis	Normal Appendix	Sensitivity	Specificity
USG				
Positive	35	0	77.7%	100%
Negative	10	5		
Total Leukocyte Counts				
Increased	32	1	71.1%	80%
Normal	13	4		
Amylase				
Increased	4	0	8%	100%
Normal	41	5		

The most common postoperative complication was wound infection in n=2(4%) of cases which was managed conservatively by debridement and antibiotics. Respiratory tract infection occurred in one patient who underwent the operation in GA was managed by 3rd generation cephalosporins. Laxatives were given for the patient who developed postoperative paralytic ileus.

**Table 7:** Post – Operative complications in the study

Post Complications	Number	%
Wound Infection	2	4%
Respiratory tract infection	1	2%
Paralytic ileus	1	2%

## Discussion

Though there are lots of advances in the diagnostic field with the invention of sophisticated investigations, a thorough clinical examination with basic investigations like USG, WBC count remains a cornerstone in the diagnosis of acute appendicitis[14]. In the present series, the males outnumbered females in the ratio of 3:2. The pain was the commonest presenting symptom and has been observed in all the cases (100%) in the present series. On clinical examination, tenderness at Mc Burney's point was the commonest sign (100%). Guarding was present in 20% of patients. Other studies in this area have also shown that the presence of pain is the common feature of appendicitis [15, 16]. Rovsing's sign was positive in 14%. This sign is seen whenever there is inflammation in the RIF. Psoas test was positive in 6% cases, whereas the obturator test was positive in 24% due to the retrocecal appendix. In USG Abdomen, out of 28 males, n=17 showed inflamed appendix and n=2 showed appendicular perforation with the peri-appendicular collection and out of 18 females, n=12 showed inflamed appendix, out of n=4 children n=2 children showed inflamed appendix and other n=2 children showed appendicular perforation and correlated with HPE. All these cases were operated to prevent complications which include gangrene or perforations. It is a general policy to open and see than wait for perforations to occur where the unnecessary operation is always better than unnecessary perforation [17]. USG abdomen is the most reliable and easy method to diagnose acute appendicitis as most surgeons rely on it as it can make out non-compressible inflamed appendix with increased vascularity<sup>43</sup>, based on which most of the cases are posted for appendectomy if the patient is willing. In this study, USG was having 100% specificity and 77.7% sensitivity, HS Fung et al; [18] have shown 75.9% sensitivity and 89.7% specificity in their study, similarly, D David et al; [19] have shown 85.5% sensitivity and 84.4% specificity. The Total Leucocyte Count was showing 80% specificity and 77.1% sensitivity for diagnosis. Studies have shown that neutrophilia > 75% will occur in 78% of cases of appendicitis. Marchand et al; [20] reported that neutrophil count is the single best test for the diagnosis of acute appendicitis with a sensitivity of 81 – 84%. Doraiswamy et al; [21] concluded that neutrophilia was very useful in the diagnosis of acute appendicitis in children. serum amylase levels were having a sensitivity of 8% but specificity was 100%. A study Swensson EE et al; [22] have also shown low sensitivity of serum amylase levels they concluded that hyperamylasemia or hyperamylasuria should not discourage the surgeons from early operation if other clinical features are suggestive of appendicitis.

## Conclusion

Within the limitations of the present study it can be concluded that investigations like USG, TLC may aid in the diagnosis of appendicitis. The role of serum amylase is very limited in the diagnosis since its values are not sensitive enough. Through clinical examinations with the basic investigations are enough in most of the cases for diagnosis of acute appendicitis instead of more sophisticated procedures like CT abdomen which may be reserved for cases in which diagnosis is difficult by routine methods.

**Conflict of interest:** None

**Source of support:** Nil



## References

1. Andersson RE. Meta-analysis of the clinical and laboratory diagnosis of appendicitis. *Br J Surg*. 2004; 91(1):28–37.
2. DJ Humes. Acute Appendicitis. *BMJ* 2006; 333(7567): 530–34.
3. Sartelli, Gian L. Baiocchi, Salomone Di Saverio et al. Prospective Observational Study on acute Appendicitis Worldwide (POSAW) *World Journal of Emergency Surgery* 2018; 13:19.
4. Harold E, Nathanson LK. Appendix and Appendectomy. 10th Edn. In: Maingot's Abdominal operation, Zinner MJ, Schwartz SI. Harold E, Eds. Connecticut: A Simon and Schuster company 1997; 2:1192-02.
5. Fitz RH. Perforation inflammation of the vermiform appendix: with special reference to its early diagnosis and treatment. *AM J. Med. Sci* 1886; 92:321-346.
6. Coleman C, Thompson J, Bennion R, Schmit P. White blood cell count is a poor predictor of severity of disease in diagnosis of appendicitis. *Am Surg* 1998;64(10):983-85.
7. Swasso RD, Hanna EA, Moore DL. Leukocytic and neutrophilic counts in the acute appendicitis. *Am J Surg* 1970; 120:563-36.
8. English DC, Allen W, Coppala ED, Sher A. Excessive dependence on the leucocytosis clue in diagnosis appendicitis. *Am J Surg* 1977;43:399-02.
9. Bolton JP, Craven ER, Croft RJ, Menzies – Grow N. An assessment of the white cell count in the management of suspected acute appendicitis. *Br J Surg* 1975; 62:906-08.
10. RK Jain, M Jain, CL Rajak, S Mukherjee, PP Bhattacharyya, Mr. Shah. Imaging in Acute Appendicitis: A Review *Ind J Radiol Imag* 2006; 16:4:523-32.
11. Puylaert J.B. Acute appendicitis: US evaluation using graded compression. *Radiology* 1986; 158:335-60.
12. Kessler N, Cyteval C, Gallix B, et al. Appendicitis: evaluation of sensitivity, specificity, and predictive values of US, Doppler, Doppler US, and laboratory findings. *Radiology* 2004; 230:472-78.
13. Pacheco RC, Nishioka Sde A, de Oliveria LC. Validity of serum amylase and lipase in the differential diagnosis between acute/acute chronic pancreatitis and other causes of acute abdominal pain. *Arq Gastroenterol* 2003; 40(4):233-38. [Article in Portuguese]
14. Frederick Thurston Drake, David Reed Flum. Improvement in the diagnosis of appendicitis. *Adv Surg* 2013; 47:299-28.
15. Laurell H, Hansson LE, Gunnarsson U. Manifestations of acute appendicitis: a prospective study on acute abdominal pain. *Dig Surg* 2013;30(3):198-206.
16. John H, Neff U, Kelemen M. Appendicitis diagnosis today: Clinical and ultrasonic deductions. *World J Surg* 1993; 17:243-49.
17. Amir M. Shami IH. Analyze of early appendectomies for suspected acute appendicitis; A Prospective Study. *Jr Surg PIMS* 1992 ;3:25-28
18. HS Fung, S Lau, JCW Siu, CM chan, SCH chan. Audit of ultrasonography for the diagnosis of acute appendicitis retrospective study. *J HK Coll Radiol* 2008; 11:108-11.

19. JA Worrell, LF Drolshagen TC Kelly. DW Hunton, GR Durmon, AC Fleischer. Graded compression ultrasound in the diagnosis of appendicitis. A comparison of diagnostic criteria. *Journal of Ultrasound in Medicine* 1990;9(3):145-50.
20. Marchand A. Van Lente F, Galen RS. The assessment of laboratory tests in the diagnosis of acute appendicitis. *Am J ClinPathol* 1983; 80(3):369-74.
21. Doraiswamy NV. Leucocyte counts in the diagnosis and prognosis of acute appendicitis in children. *Br J Surg* 1979;66:782.
22. Swensson EE, Maull KI. Clinical significance of elevated serum and urine amylase levels in patients with appendicitis. *Am J Surg.* 1981; Dec;142(6):667-70.

**How to cite the article:** AbbadiVenkat Mohan Reddy, Khan M I. Assessment of various diagnostic parameters in cases of acute Appendicitis. *Perspectives in Medical Research* 2019; 7(3): 87-94

**Sources of Support:** Nil, **Conflict of interest:** None declared