

**Correlation between Clinical Features and Histopathology in Acute Appendicitis and Assessment of Negative Appendectomy Rate in a Multispeciality Hospital in Central Eastern India.**

<sup>1</sup>L K Verma, <sup>2</sup>Debasis Naik, <sup>3</sup>Dhirendra Nath Soren, <sup>4</sup>Gouranga Charan Prusty

<sup>1</sup>L K Verma, Department of Surgery, Heritage Institute of Medical Sciences, Varanasi, Uttar Pradesh, India.

<sup>2</sup>Debasis Naik, Department of Surgery, VIMSAR, Burla, Odisha, India.

<sup>3</sup>Dhirendra Nath Soren, Department of Surgery, VIMSAR, Burla, Odisha, India.

<sup>4</sup>Gouranga Charan Prusty, PRM MCH, Baripada, Odisha, India.

**Corresponding Author:** Dhirendra Nath Soren, Department of Surgery, VIMSAR, Burla, Odisha, India.

**Type of Publication:** Original Research Paper

**Conflicts of Interest:** Nil

**Abstract**

**Aim:** Appendectomy is the most commonly performed emergency abdominal surgery. An accurate and timely diagnosis of acute appendicitis remains a challenge. This study was conducted with the aim to analyze the clinical features of Acute appendicitis and to correlate it with the histopathological finding and thereby assess the negative appendectomy rate.

**Methods:** This prospective study was conducted on 100 patients with acute right lower abdominal pain, diagnosed with appendicitis either clinically or on ultrasound of abdomen. A detailed history, clinical examination and ultrasound abdomen, was done in all cases. All ultrasound positive cases were subjected to surgery along with some negative cases based on clinical suspicion. The clinical features, ultrasound abdomen findings, Alvarado score, operative findings were all correlated with the histopathological findings.

**Results:** Out of a total of 100 patients, 62 were male and 38 were female (male-female ratio of 3.1:1.9). Most of them were in 3rd decade of life with the mean age being 24 years, while the most common symptom was abdominal pain. Ultrasonography showed 88%

sensitivity and 88% specificity in diagnosing acute appendicitis. 87% of males and 94.7 % of females had Alvarado score of  $\geq 7$ . Three patients were managed conservatively. Appendicitis was confirmed in 88.65 % (86 out of 97) on histopathological examination. The present study showed a negative appendectomy rate of 16.7% in females and 8.19 % in males.

**Conclusion:** Alvarado scoring system combined with ultrasound can be used as a cheap and inexpensive way of confirming acute appendicitis, thereby reducing the negative appendectomy rate.

**Keywords:** Appendicitis, Alvarado scoring system, Negative appendectomy, Ultrasound abdomen.

**Introduction**

Appendicitis is the most common intra-abdominal condition requiring emergency surgery with a lifetime risk of six percent. The diagnosis of acute appendicitis is predominantly based on clinical findings[1]. In spite of over hundreds of years of experience and remarkable headway in present-day imaging and research, the precise diagnosis of appendicitis still dodges the specialists.

The incidence rate of "negative" appendectomy, ranges from 15% to 20%[2, 3]. The term 'Negative appendectomy' is utilized for appendectomy done in a case of suspected appendicitis with intra-operative and histopathological findings of normal Appendix. Higher incidence of negative appendectomy has been observed in females of the reproductive age group. The principle factors adding to this high negative appendectomy rate has been the vague clinical features in females[4]. Various non-appendiceal pathologies in the right iliac fossa can imitate acute appendicitis and a noteworthy number of appendectomies are being performed for non-appendiceal pathologies[5]. Ultrasound has been proposed as a perfect noninvasive investigation in suspected appendicitis. The main advantages of ultrasound being its non-invasiveness, and it are cheap and easy to perform [6]. Scoring systems have also been developed to aid in the diagnosis. The best among them is the Alvarado scoring system[7](Table 1). It comprises of 8 weighted clinical indicators - three symptoms, three signs, and two laboratory findings; migratory pain, anorexia, nausea and/or vomiting, right lower quadrant tenderness, rebound tenderness, pyrexia, leucocytosis (>10×10<sup>9</sup>/L) and a neutrophilic shift to the left >75%. The diagnostic accuracy of the Alvarado score has been reported as 90.9% for a score of 7-10[8]. The purpose of the study was to correlate between the clinical features, and histopathological findings and to assess the negative appendectomy rate.

Table 1: Alvarado Score

Symptoms	
Migrating pain in right iliac fossa	1
Anorexia	1
Nausea or vomiting	1
Signs	

Tenderness in right iliac fossa	2
Rebound tenderness	1
Fever (elevated temperature)	1
Laboratory	
Leucocytosis (> 10 x 10 <sup>9</sup> /L)	2
Neutrophilia >75%	1
Total	10

### Materials and Methods

This study complied with the Declaration of Helsinki guidelines and was approved by the Institutional Ethics Committee. This study was conducted from April 2014 to March 2015 at a Multispecialty Hospital in Central Eastern India. The patients who visited our hospital with clinical features of acute appendicitis, shaped the pool for the present study. A definite history was taken followed by clinical assessment of the patients and ultrasound abdomen. After confirmation, either clinically or on ultrasound abdomen, surgery was performed or the specimen were sent for histopathological examinations.

The Microsoft excel data sheet was used for analysis and tested statistically with SPSS software for windows version 10. For categorical variations Fischer's exact/Chi square test was used. For data that follow normal distribution, student t test was used. For data which do not follow normal distribution non parametric Mann-Whitney test was used. p score <0.05 was regarded as significant.

### Results

In the present study, the most common age group was 20-30 years (46%) with the median age being 24 years. The sex distribution was 3.1:1.9 (male: female). As shown in Table 2, Right iliac fossa tenderness was present in 100% cases at the time of presentation, a major contributor to the diagnosis of acute appendicitis. Furthermore, rebound tenderness was present in 44.3%

of the patients, 48.4% patients had history of fever (which was low grade and continues in majority of the patients). W.B.C. count more than 10,000 cells/cu mm was found in 50% of cases and in 2% it was raised above 20,000 cells/ cu mm.

In our study, 12% of the patients were reported as normal on ultrasound (88% sensitivity and 88% specificity). Alvarado score of  $\geq 7$  was seen in 92.8% patients (87% (54/62) males and 94.7 % (36/38) of females respectively). Of the 100 patients three were managed conservatively and features of appendicitis was confirmed in 88.65 % (86/97 operated) on histopathological examination. The present study showed a negative appendectomy rate of 16.7% (6/36) in females and 8.19% (5/61) in males.

Table 2: Symptoms, Signs and Laboratory parameters

Symptoms	Number	Percentage
Periumbilical pain	72	74.2
Right iliac fossa pain	60	61.8
Anorexia	88	90.7
Nausea	84	86.5
Vomiting	68	70.1
Right iliac fossa tenderness	97	100
Rebound tenderness	43	44.3
Fever	47	48.4
Leucocyte count		
Percentage $>10,000$ cells/ mm <sup>3</sup>	48	49.4
Percentage $>20,000$ cells/mm <sup>3</sup>	2	2
Neutrophil count $>75\%$	83	85.5

**Discussion**

Appendicitis is a disease of the young and this declaration has been reinforced by the findings of

present study. However, no age is immune. The most common age group in this study was 20-30 years, which conforms that to findings of other studies. In addition, in all age groups, there was a well-established predilection towards male patients and young male patients constituted majority of the cases. These observations were comparable to those observed in other studies [9, 10].

In our study, the most common site of abdominal pain was the periumbilical region (74.2%), followed by right iliac fossa pain (61.8%). The most common sign was right iliac fossa tenderness (100%), rebound tenderness was present in 44.3%, fever was a complaint of 48.4% and W.B.C. count was more than 10,000 cells/cu mm in 49.4%; and 2% had W.B.C above 20,000 cells/ cu mm. Observations in our study were in concordance with that in other studies[1, 11].

In our study, according to the Alvarado scoring system, 90% of the patients had a score between 7 to 10 (likely appendicitis) and 10% subjects had a score of 6 or less. The Alvarado score of  $\geq 7$  was helpful in diagnosing acute appendicitis in 87% males and 94.7% female patients. This was in accordance with the studies by Denizbasi et al (95.4%) and Shrivastava et al (92.4%)[13,14].

Appendicitis was confirmed in 88.65% of operated patients on histopathology[15]. The present study showed a negative appendectomy rate of 16.7% (6/36) in females and 8.19% (5/61) in males. In females, the negative appendectomy rate was high. This was probably due to pelvic inflammatory diseases and a ruptured follicular cyst. These conditions cannot be properly diagnosed on ultrasound and mimic acute appendicitis clinically. This figure is in agreement with the previous studies, which has reported a negative appendectomy rate of 10% to 30%[2, 16].

In this study, acute appendicitis was confirmed in 89.69% (87/97) of the cases intraoperatively (Fig. 1) and in 91.75% (86/97) on histopathological examination (Fig. 2). Ultrasonography increases the diagnostic accuracy in patients with suspected acute appendicitis to the tune of 90-95%. If the Alvarado scoring is over 7, the overall accuracy of diagnosing acute appendicitis goes up to 92.8% (90/97).

CT should not be used routinely in the diagnostic evaluation of patients with suspected appendicitis. CT opens the patient to the dangers for unfavorably susceptible different response, nephropathy, yearning pneumonitis, and ionizing radiation and expands hazard in youngsters in whom the pace of radiation-induced disease has been assessed at 0.18%.



Fig. 1: Intraoperative photograph showing inflamed appendix.

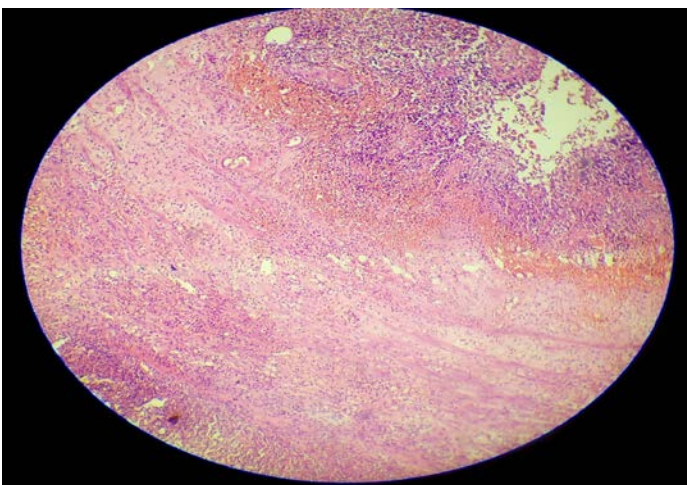


Fig. 2: Histopathology showing layers of appendix with dense aggregates of acute inflammatory cells in lamina propria and muscle layer.

### Conclusion

The diagnosis of appendicitis can be made by combining clinical signs and symptoms with USG findings. USG is a non-invasive investigation and plays an important role in identifying alternative causes of pain thus excluding appendicular pathology. It acts as a useful adjunct in the diagnosis of acute appendicitis and prevents negative appendectomy. The Alvarado scoring system combined with ultrasound can, along these lines, be utilized as a modest and economical tool for affirming appendicitis and in this manner lessen the negative appendectomy rate.

### Acknowledgement

The authors would like to thank the staff of the hospital for the help and co-operation during the study.

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