

# A Correlative Analysis of Clinical, Radiological and Operative Findings in Atraumatic Acute Abdomen

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## A B S T R A C T

**Introduction:** This study was conducted to assess the diagnostic accuracy of clinical, radiological and operative findings in cases with non-traumatic acute abdomen.

**Material and methods:** This study was conducted as a prospective observational study on patients presenting with acute abdominal pain of atraumatic origin at emergency department of JK hospital during study period of 2 years. Clinical diagnosis was based upon history and findings of clinical examination. Radiological investigations including X Ray Abdomen, USG or CT scan of abdomen was done to make radiological diagnosis. The operative findings were noted and definitive diagnosis was established.

**Results:** Acute atraumatic abdomen was predominately due to four causes i.e. appendicular pathologies (37.2%), gall bladder pathologies (37.6%), intestinal obstruction (13.6%) and perforation peritonitis (10.1%). The diagnostic accuracy of clinical diagnosis was highest for perforation peritonitis and intestinal obstruction (98%), followed by acute appendicitis (97.3%) and Cholelithiasis/cholecystitis (96.6%). USG had highest sensitivity for diagnosis of Cholelithiasis/ cholecystitis (98.1%) whereas X-ray had highest sensitivity for diagnosis of intestinal obstruction (95%) with diagnostic accuracy of 98.6% for both.

**Conclusion:** Though clinical examination alone is helpful in establishing the etiological diagnosis of atraumatic acute abdomen with high accuracy, few cases such as perforated appendix, pseudocyst of pancreas, empyema of gall bladder, perforated gangrenous gall bladder, appendicular lump and carcinoma gall bladder care often missed on clinical examination. X-ray abdomen (erect) and USG abdomen further improves the diagnostic accuracy. These modalities help the surgeon in accurately diagnosing the causes of atraumatic acute abdomen and plan the management accordingly.

**Keywords:** Atraumatic Acute Abdomen, Operative Findings, Clinical Diagnosis, Radiological Diagnosis.

## INTRODUCTION

Acute abdomen is a condition that demands urgent attention and surgical treatment. The patient will usually present with sudden onset of abdominal pain with associated nausea or vomiting. Most patients with an acute abdomen appear ill. The term acute abdomen is used to define acute abdominal pain of non-traumatic origin with a maximum duration of 8 days.<sup>1,2</sup> Acute abdominal pain is one of the most common reasons for seeking care in the emergency department i.e. approximately 7 to 10% of emergency department visits.<sup>3,4</sup> Acute abdomen may be secondary to infection/ inflammation, vascular occlusion or obstruction.<sup>5,6</sup>

A thorough history and detailed physical and abdominal examination may help in locating the site of pain and establishing the definitive or differential diagnosis. Thus, history taking and physical examination may be the mainstay of the diagnosis.<sup>7</sup> Laboratory and radiological investigations are needed in case of acute abdomen with suspected diagnosis and confirmation of diagnosis. In case of infective etiology, total leucocyte count are raised. Previously, plain

X-ray abdomen were conducted in such cases (especially for intestinal obstruction) but their utility is limited for evaluation of acute abdomen.<sup>8,9</sup> Over the past decade, the radiological imaging have allowed more accurate diagnosis of the underlying etiology associated with acute abdomen.<sup>10</sup> CT scan of abdomen may be utilized in evaluation of cases presenting with acute abdomen which allow for improved resolution of the abdominal structure in a 3 dimensional plane. Still their utility is limited for diagnosis of certain conditions such as appendicitis.<sup>11</sup> Ultrasonography is one of the preferred modalities for evaluation of patients with acute abdomen diagnostic as it is noninvasive, readily available, inexpensive, and without the risk of radiation. The diagnostic accuracy of ultrasonography in cases of acute abdomen has been considered equivalent or even superior to CT.<sup>12</sup> Recently, multislice helical CT has shown superior results and can give results extremely fast, and with high accuracy as compared to USG. The modern physician should be humbled by the fact that, despite diagnostic and therapeutic advances (computed tomography, ultrasonography) the misdiagnosis

rate of the most common surgical emergency has changed little over time.<sup>13</sup>

Currently, for the management of patients with acute abdomen, the axiom of treat the patient is followed rather than test the patient. A patients with no definitive diagnosis must be reassessed and repeat examination for disease progression should be done. Surgical intervention especially laparotomy may be necessary in cases with no definitive diagnosis.<sup>14</sup> As acute abdomen is associated with significant morbidity, efforts must be made for early diagnosis and treatment of patients. With the above background, the present study was conducted at tertiary care centre to assess the diagnostic accuracy of clinical, radiological and operative findings in cases with non-traumatic acute abdomen. This study might be helpful in improvising the differential diagnosis; subject the patient for specific investigations; reduce radiation exposure, amount of pain and to increase cost effectiveness of the treatment. Also the findings of the study may help in reducing the rate of negative laparotomy.

## MATERIAL AND METHODS

This study was conducted as a prospective observational study on patients presenting with acute abdominal pain of atraumatic origin at emergency department of L.N Medical College and JK hospital during study period of 18 months i.e. from 1<sup>st</sup> August 2019 to 31<sup>st</sup> July 2021. All patient above 5 years of age with clinical diagnosis of acute abdomen of atraumatic origin with a maximum duration of 10 days, requiring surgery for acute abdomen were included in the study whereas patients not giving consent and patient with acute abdomen in pregnancy & gynecological etiology were excluded from study.

After obtaining ethical clearance from Institute's ethical committee, all the patients fulfilling inclusion criteria were enrolled. Data regarding sociodemographic variables was obtained from all the participants and entered in questionnaire. A detailed history of onset, duration,

characteristic, progression, location, radiation of pain was obtained along with associated symptoms such as nausea and vomiting, fever, anorexia, hematuria, abdominal distension, ability to flatus & motion etc. Other relevant history if any was obtained and documented.

All the participants were then subjected to detailed examination including general examination from head to toe and vitals. Further systemic examination of all the system was done with special emphasis on per abdominal examination. Initially, abdomen was inspected with respect to nine quadrants and findings if any were noted. Palpation of abdomen was done and tenderness, guarding, rigidity, rebound tenderness if any was noted. Percussion and auscultation was also done and findings were noted. Based upon these findings, clinical diagnosis was established.

Radiological investigations including X Ray Abdomen, USG, CT scan or MRI of abdomen was done when required. A pre-operative diagnosis was established based upon the findings of history examination and investigations. The cases were then subjected to surgical procedure based upon the diagnosis. The operative findings were noted and definitive diagnosis was established.

### Statistical Analysis

Data was compiled using Ms Excel and analyzed using IBM SPSS software version 20. Categorical data was expressed as frequency and proportion whereas continuous variables were presented as mean and standard deviation. Correlation of operative findings with radiological and clinical diagnosis was done. Using operative diagnosis as gold standard, diagnostic accuracy of radiological and clinical diagnosis was calculated and presented in percentage.

## RESULTS

The present study was conducted on a total of 148 patients who presented to the emergency department with atraumatic acute abdomen with duration of pain of less than 10 days.

Mean age of the patients with atraumatic acute abdomen was

Baseline variables		Frequency (n=148)	Percentage
Age (years)	≤20	14	9.5
	21-30	38	25.7
	31-40	23	15.5
	41-50	29	19.6
	51-60	23	15.5
	>60	21	14.2
Sex	Male	83	56.1
	Female	65	43.9
Clinical features	Pain abdomen	148	100.0
	Nausea and vomiting	113	76.4
	Fever	76	51.4
	Anorexia	86	58.1
	Abdominal distension	39	26.4
	Inability to pass flatus and motion	37	25.0
Past history	Previous Abdominal Surgery	4	2.7
	Abdominal Koch's	1	0.7
	Pulmonary Koch's	1	0.7
	Sickle cell anemia	1	0.7

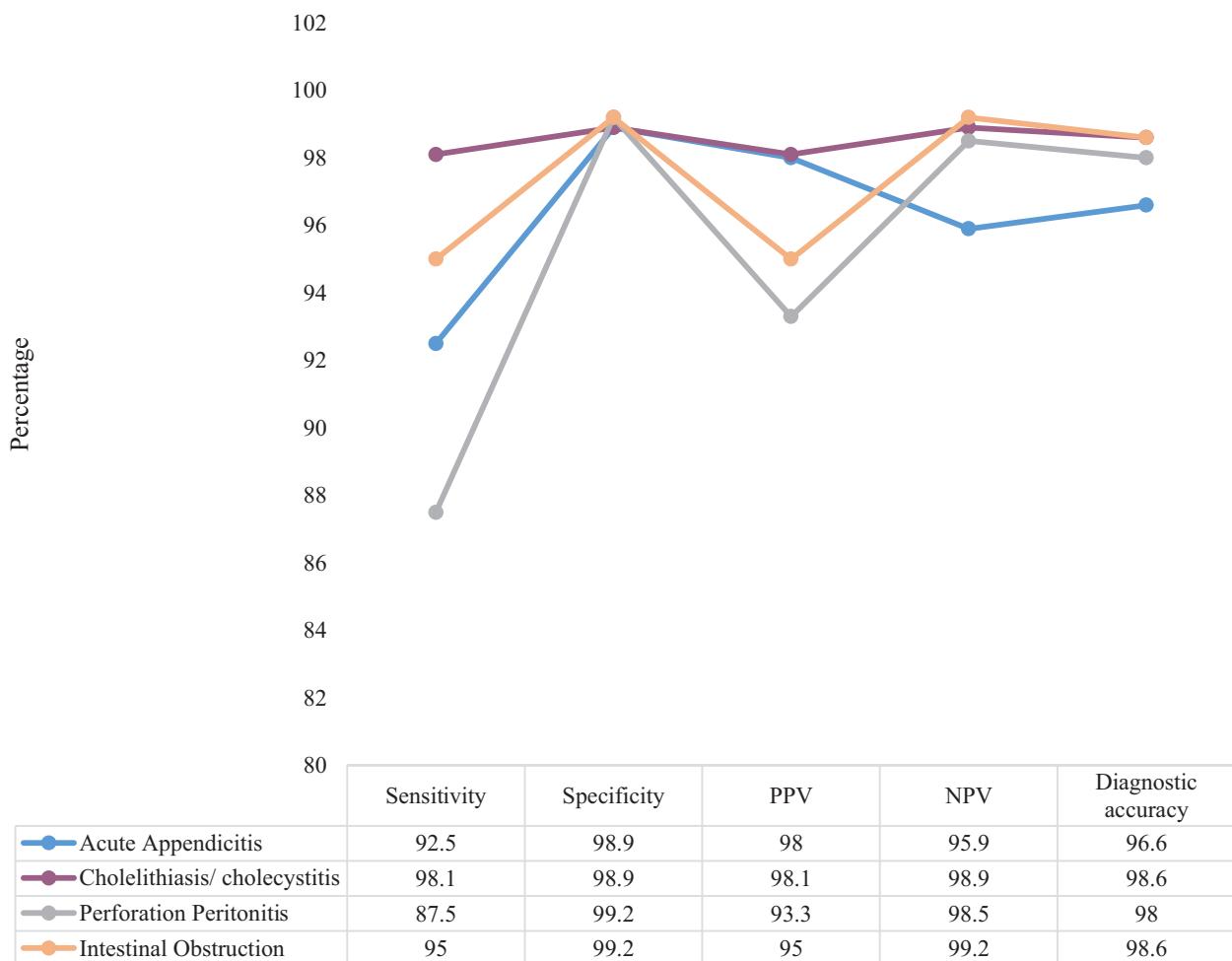
Table 1- Distribution according to baseline variables

Pre-operative diagnosis	Frequency (n=148)	Percentage
Acute Appendicitis	52	35.1
Cholelithiasis	44	29.7
Perforation Peritonitis	15	10.1
Acute Intestinal Obstruction	8	5.4
Subacute Intestinal Obstruction	11	7.4
Cholelithiasis with Cholecystitis	5	3.4
Cholecystitis	4	2.7
Peptic Ulcer Disease	1	0.7
Acute Pancreatitis	2	1.4
Ureteric Colic	2	1.4
Ascites	2	1.4
Cholelithiasis with Choledocholithiasis	1	0.7
Colitis	1	0.7

**Table-2:** Distribution according to preoperative diagnosis in atraumatic acute abdomen

Radiological Diagnosis	Frequency (n=148)	Percentage
Acute Appendicitis	42	28.4
Cholelithiasis	47	31.8
Acute Intestinal Obstruction	15	10.1
Perforation Peritonitis	15	10.1
Perforated Appendix	7	4.7
Cholelithiasis With Cholecystitis	6	4.1
Subacute Intestinal Obstruction	6	4.1
Pseudocyst Of Pancreas	2	1.4
Empyema Of Gall Bladder	1	0.7
Perforated Gangrenous Gallbladder	1	0.7
Carcinoma Gallbladder	1	0.7
Appendicular lump	1	0.7
WNL	4	2.7

**Table-3:** Distribution according to radiological diagnosis in atraumatic acute abdomen



**Figure-1:** Diagnostic accuracy of radiological findings as compared to final diagnosis

41.23±16.43 years and majority i.e. 25.7% patients belonged to age range of 21 to 30 years. Slight male predominance was observed for atraumatic acute abdomen with male:female ratio of 1.27:1. All the patients with acute abdomen presented with abdominal pain (100%). Pre-operative diagnosis was established based upon clinical findings. Most common cause of atraumatic acute abdomen

was acute appendicitis (35.1%), followed by cholelithiasis (29.7%). Radiological diagnosis was established based upon findings of X-ray, USG and CT scan. The spectrum of radiological diagnosis is depicted in above table. Acute atraumatic abdomen was predominately due to four causes i.e. appendicular pathologies (37.2%), gall bladder

Final diagnosis		Frequency (n=148)	Percentage
Appendicular pathology	Acute appendicitis	46	31.8
	Perforated appendix	7	4.7
	Appendicular lump	1	0.7
Gall bladder pathology	Cholelithiasis	46	31.1
	Cholelithiasis with cholecystitis	7	4.4
	Empyema of gall bladder	1	0.7
	Perforated gangrenous gallbladder	1	0.7
	Carcinoma gall bladder	1	0.7
Intestinal obstruction	Acute	14	10.8
	Subacute	6	2.8
Perforation Peritonitis		15	10.1
Others	Gastric adenocarcinoma with gastric perforation peritonitis with septic shock with MODS	1	0.7
	Pseudocyst of Pancreas	2	1.4

**Table-4:** Distribution according to final diagnosis in atraumatic acute abdomen based upon operative findings

Diagnostic modality	Clinical diagnosis	Sensitivity	Specificity	PPV	NPV	Diagnostic accuracy
Radiological diagnosis	Acute Appendicitis	93.9	93.9	88.5	96.9	93.9
	Cholelithiasis/ cholecystitis	96.4	97.8	96.4	97.8	97.3
	Perforation Peritonitis	100	100	100	100	100
	Intestinal Obstruction	90	99.2	94.8	98.5	98
Final diagnosis	Acute Appendicitis	94.4	98.9	98.1	96.9	97.3
	Cholelithiasis/cholecystitis	96.4	96.8	94.6	97.8	96.6
	Perforation Peritonitis	87.5	99.2	93.3	98.5	98
	Intestinal Obstruction	90	99.2	94.7	98.4	98

**Table-5:** Diagnostic accuracy of clinical findings as compared to radiological diagnosis and final diagnosis

pathologies (37.6%), intestinal obstruction (13.6%) and perforation peritonitis (10.1%).

Overall, the diagnostic accuracy of clinical findings for diagnosis of perforation peritonitis was 100% as compared X-ray abdomen erect. The diagnostic accuracy of clinical diagnosis was highest for perforation peritonitis and intestinal obstruction (98%), followed by acute appendicitis (97.3%) and Cholelithiasis/cholecystitis (96.6%).

USG had highest sensitivity for diagnosis of Cholelithiasis/cholecystitis (98.1%) whereas X-ray had highest sensitivity for diagnosis of intestinal obstruction (95%) with diagnostic accuracy of 98.6% for both.

## DISCUSSIONS

Acute abdomen is associated with significant morbidity. Delay in diagnosis and initiating treatment may lead to complications worsening the prognosis and thus efforts must be made in early diagnosis and management of these cases. The present study was conducted at tertiary care centre to study the diagnostic accuracy of clinical findings as compared to radiological findings and to clinical as well as radiological findings with that of intra-operative diagnosis. Based upon the history and clinical examination, pre-operative clinical diagnosis was established. Most common causes of acute abdomen according to clinical findings were acute appendicitis (35.1%), cholelithiasis (29.7%), intestinal obstruction (12.8%) and perforation peritonitis (10.1%). Ali et al documented most common clinical diagnosis in patients

with atraumatic acute abdomen as acute appendicitis (55%), followed by hollow viscus perforation (36.7%) and intestinal obstruction (8.3%).<sup>15</sup> Similarly, Batra et al reported intestinal obstruction and acute appendicitis as common cause of acute abdomen on clinical diagnosis.<sup>16</sup> Sindhu et al however documented acute cholecystitis as the most common cause of acute abdomen clinically followed by intestinal perforation and intestinal obstruction.<sup>17</sup>

Radiological assessment was done in all the cases using erect X-ray abdomen, ultrasonography and CT scan when needed. The utility of X-ray in acute abdominal cases is low except for the diagnosis of intestinal obstruction and perforated peptic ulcer.<sup>9</sup> Though CT scan can help in accurate diagnosis of etiology of acute abdomen, its availability, affordability as well as radiation hazards limits its utility.<sup>11</sup> Ultrasonography is non invasive technique and its diagnostic accuracy in diagnosis of causes of acute abdomen has been considered equivalent or even superior to CT.<sup>12</sup> In present study, X-ray abdomen was helpful in diagnosis of perforation peritonitis and intestinal obstruction. For perforation peritonitis, the features on X-ray were gas under the diaphragm (10.1%) whereas dilated bowel loops and multiple air fluid levels on Xray were suggestive of intestinal obstruction. However, USG revealed appendicular pathology as blind ended, edematous, dilated, non-pulsatile tubular, inflamed structure in RIF in majority of cases (29.7%), and multiple echogenic foci on gall bladder were suggestive of gall bladder pathology in 20.9% cases. For perforation, free fluid present in peritoneal cavity with moving echoes was the

feature on USG in 9.5% cases whereas dilated small bowel loops was predominant feature on USG for obstruction (7.4%). According to our radiological findings, cholelithiasis was the most common cause of atraumatic acute abdomen (31.8%), followed by acute appendicitis (28.4%). The findings of present study were supported by the findings of Sindhu et al, in which out of 5 cases of intestinal obstruction, X-ray was helpful in diagnosis of intestinal obstruction in 100% cases, whereas it overdiagnosed 4 cases as GI perforation. The authors documented superiority of USG for diagnosis of cholecystitis (94.4%), appendicitis (80%) and pancreatitis (80%).<sup>17</sup> Similar findings were documented by Batra et al observed acute appendicitis followed by intestinal obstruction and hollow viscus perforation as common causes of acute abdomen on radiologically in 30.5%, 25.7% and 24.8% cases respectively.<sup>16</sup>

The final diagnosis of etiological spectrum of atraumatic acute abdomen was established based upon the operative findings. In present study, most common causes of atraumatic acute abdomen were acute appendicitis and cholelithiasis (>30% each). Similarly, acute appendicitis was the most common cause of atraumatic acute abdomen in a study of Ali et al.<sup>15</sup> However, about 36% cases had gall bladder pathology as predominant cause of acute abdomen in a study of Sindhu et al.<sup>20</sup>

We aimed to assess the diagnostic accuracy of clinical diagnosis and radiological diagnosis in diagnosis of etiologies of atraumatic acute abdomen. As radiology is superior to clinical diagnosis, we assessed the utility of clinical diagnosis also compared to radiological diagnosis. The diagnosis of perforated appendix, pseudocyst of pancreas, empyema of gall bladder, perforated gangrenous gall bladder, appendicular lump and carcinoma gall bladder could not be made clinically in our study, but radiological investigations were helpful in identifying these causes of atraumatic acute abdomen, which were confirmed by intra-operative findings. For diagnosis of acute appendicitis and cholecystitis, USG findings were compared with clinical diagnosis whereas for perforation peritonitis and intestinal obstruction, X-ray abdomen erect was compared with clinical diagnosis in our study. As compared to radiological findings, the diagnostic accuracy of clinical diagnosis was 100% perforation peritonitis. However, sensitivity of clinical diagnosis for cholelithiasis was higher (96.4%) as compared acute appendicitis (93.9%). The diagnostic accuracy of clinical findings for diagnosis of acute appendicitis, cholelithiasis/ cholecystitis and intestinal obstruction were 93.9%, 97.3% and 98% respectively.

Batra et al also observed the correlation of clinical findings with that of radiological findings and documented the diagnostic accuracy of clinical diagnosis to be 87.5% for acute appendicitis, 92.59% for intestinal obstruction and 73.08% for perforation peritonitis.<sup>16</sup> Chhetri et al in another study reported the diagnostic accuracy of clinical diagnosis as compared to radiological diagnosis as 71.4% overall.<sup>18</sup>

In present study, as taking operative findings as gold standard, we documented highest sensitivity of USG for diagnosis of Cholelithiasis/cholecystitis (96.4%) followed by acute appendicitis (94.4%), whereas X-ray abdomen erect was highly sensitive for intestinal obstruction (90%). Our study

findings were concordant with the findings of Kesarwani et al, in which the diagnostic accuracy of clinical findings for diagnosis of peptic ulcer perforation and intestinal obstruction was 100%, whereas sensitivity for ileal perforation and acute appendicitis were 57.1% and 33.3% respectively.<sup>19</sup> However, Sindhu et al<sup>17</sup> reported the diagnostic accuracy of clinical diagnosis for cholecystitis and intestinal obstruction as 100% and that of acute appendicitis and perforation as 100%.

USG had highest sensitivity for diagnosis of Cholelithiasis/ cholecystitis (98.1%) whereas X-ray had highest sensitivity for diagnosis of intestinal obstruction (95%) with diagnostic accuracy of 98.6% for both. The specificity of X-ray abdomen for diagnosis of perforation peritonitis as well as intestinal obstruction was 99.2%. Kesarwani et al<sup>19</sup> observed sensitivity of X-ray for diagnosis of peptic ulcer perforation and intestinal obstruction as 96.7% and 90.5% respectively whereas that of USG for diagnosis of acute appendicitis was 83.3%. Similarly, Batra et al observed the diagnostic accuracy of radiological diagnosis for Acute Appendicitis to be highest (94.12%), followed by Perforation Peritonitis (92.86%) and intestinal Obstruction (92%).<sup>16</sup> Similarly, diagnostic accuracy of X-ray for intestinal obstruction and perforation peritonitis was 89.5% and that of USG for acute appendicitis and cholecystitis was 97.9% in a study of Sindhu et al<sup>17</sup>.

## CONCLUSION

Atraumatic acute abdomen is one of the common cause for which patients across all age range seek care in emergency department. Though clinical examination alone is helpful in establishing the etiological diagnosis of atraumatic acute abdomen with high accuracy, few cases such as perforated appendix, pseudocyst of pancreas, empyema of gall bladder, perforated gangrenous gall bladder, appendicular lump and carcinoma gall bladder care often missed on clinical examination. X-ray abdomen (erect) and USG abdomen further improves the diagnostic accuracy. Both these modalities are easily available, affordable and carries no or less radiation hazards. These modalities help the surgeon in accurately diagnosing the causes of atraumatic acute abdomen and plan the management accordingly. Thus, clinical diagnosis after thorough history taking and detailed examination is key for diagnosis of acute abdomen, with radiological investigations aiding in management of these cases.

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