

# Comparative analysis of clinical, radiological and operative findings in Acute Abdomen Cases

Dr.Sumitoy Singh<sup>1</sup>, Dr. Ashok Kumar<sup>2</sup>, Dr.Nandu unnikrishnan<sup>3</sup>, Dr.Narinder Pal Singh<sup>4</sup>, Dr Vandana Sidhu<sup>5</sup>

<sup>1</sup>Professor, Department of General Surgery, Government Medical College, Amritsar, Punjab, India;

<sup>2</sup>Associate Professor, Department of General Surgery, Government Medical College, Amritsar, Punjab, India;

<sup>3</sup>Junior resident, Department of General Surgery, Government Medical College, Amritsar, Punjab, India;

<sup>4</sup>Assistant professor, Department of General Surgery, Government Medical College, Amritsar, Punjab, India

<sup>5</sup>Assistant Professor, Department of Anatomy, Government Medical College, Amritsar, Punjab, India

**Corresponding author:** Dr. Ashok Kumar, Associate Professor, Department of General Surgery, Government Medical College, Amritsar, Punjab, India

## **ABSTRACT:**

**AIM:** *The present study was carried out as an attempt to correlate and emphasize the salient approaches to the diagnosis and treatment of the various acute abdominal conditions.*

**Material and methods:** *This study was a prospective observational study consisted of 50 patients with non-traumatic acute abdomen presenting to the ED that were clinically diagnosed acute abdomen. Detailed history was taken followed by clinical examination and radiological investigations for all the patients. Comparative analysis of all investigations and clinical features were made and a provisional diagnosis was derived.*

**Results:** *The results showed that mean age of the patient is  $38 \pm 13.6$  years with M: F ratio of 1:3.5. Acute cholecystitis was the most common cause of acute abdomen, accounting for 36% of total cases followed by perforation peritonitis (24%) which included peptic perforation and intestinal perforation. The accuracies was recorded for clinical features, ultrasonography and Xray for acute abdomen cases.*

**Conclusion:** *We concluded that Plain X rays and ultrasonography can be used for diagnosing acute abdominal emergencies; they are the cheaper, non-invasive, quick, reliable and highly accurate modality in diagnosing the exact cause of pain and its origin in a patient presenting with an acute abdomen and thus helps the physician or surgeon to plan the timely management.*

**Key words:** *Acute cholecystitis, perforation peritonitis, ultrasonography.*

## INTRODUCTION

Acute abdominal pain is the most common presentation at the Surgical Emergency Department (ED) and poses a great diagnostic challenge for clinicians. It is defined as an entity with a sudden onset of intense abdominal pain requiring emergency medical/surgical management.<sup>1</sup> Most of the patients with acute abdomen presents with multiple symptoms, of which abdominal pain is the commonest. Other symptoms like nausea, vomiting, pyrexia and constipation are also seen depending on the underlying pathology.<sup>2</sup>

There are various conditions that can lead to acute abdominal pain, ranging from mild self-limiting illness to severe life-threatening conditions. Out of these, only a few require immediate surgical interventions but the major challenge lies in the diagnosis of these conditions and differentiating them from the self-limiting ones.<sup>1</sup>

The diagnosis and treatment of the patient with an acute abdomen represents one of the greatest challenges for a surgeon. It requires a diverse array of skills. The clinical history and physical examination done by a surgeon remains the keystone of the diagnosis, which is confirmed by laboratory tests and radiographic studies. Today, the combination of improved diagnostic procedures, better anaesthesia and pre/postoperative patient care has led to a decrease in morbidity and mortality of patients with acute abdominal emergencies.<sup>3</sup>

The present study was carried out as an attempt to correlate and emphasize the salient approaches to the diagnosis and treatment of the various acute abdominal conditions, because the clinical feature generally referred to acute abdomen often present an intriguing diagnostic challenge to the surgeon. In majority of the patients, a proper diagnosis may be reached by means of careful history and complete mastered examination, supplemented by a few simple laboratory findings and radiological imaging. It is hoped that this attempt will be of some aid in clarifying the vital decision any surgeon should take, when confronted with acute abdominal problem especially in places where the least diagnostic facilities are available.

## MATERIAL AND METHODS

This study was a prospective observational study performed in surgical units of Government Medical College Amritsar, Punjab, after obtaining approval from the Institutional Ethics Committee. It consisted of 50 patients with non-traumatic acute abdomen presenting to the ED that were clinically diagnosed acute abdomen. Patients with various gynaecological, traumatic conditions, patients with mild and vague abdominal symptoms and patients below 12 years were excluded from this study. Detailed history was taken followed by clinical examination for all the patients.

The main clinical features considered were abdominal pain, nausea, vomiting, bowel disorders, fever and abdominal distension. After thorough clinical examination and initial resuscitation, patients were sent for radiological investigations. Comparative analysis of all investigations and clinical features were made and a provisional diagnosis was derived. Those cases requiring surgical intervention were taken up for surgery and their intra-operative findings were documented, analysed and final diagnosis was derived.

The radiological diagnosis and clinical diagnosis were compared and sensitivity, specificity, positive & negative predictive values of the investigations were calculated. Statistical analysis was done by using computer –based SPSS-20.0 software programme.

## RESULTS

In the present study, an increased incidence in female was observed, M: F ratio of 1:3.5(Fig 1). Mean age of the patient is  $38 \pm 13.6$  years with the range of 7-70 years (Fig 2). Most common age group was 21-30(34%) years, followed by 31-40(30%) years.

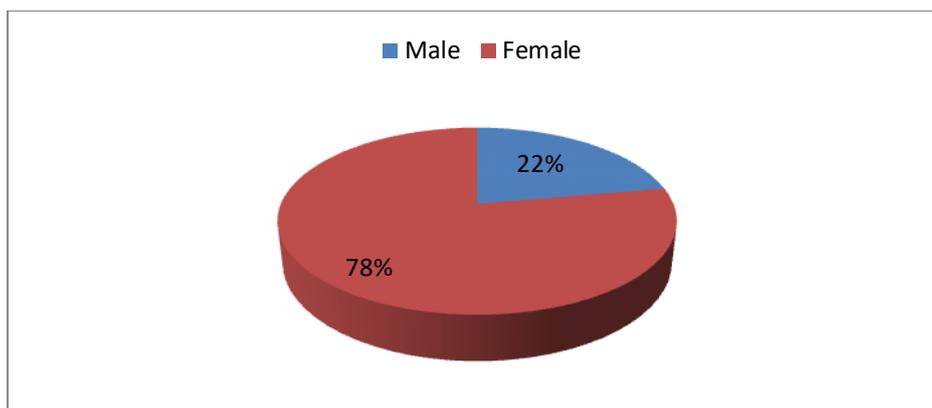
Most common clinical complaint of patients was abdominal pain (localized or diffuse) present in 100% cases followed by vomiting, fever, abdominal distention, and constipation seen in 88%, 60% , 34 % and 30 % respectively (Table 1).

Acute cholecystitis was the most common cause of acute abdomen, accounting for 36% of total cases. Second commonest cause for acute abdomen was perforation peritonitis that was seen in 24% cases which include gastric perforation and intestinal perforation. This was followed by intestinal obstruction, acute pancreatitis and acute appendicitis with 10% cases each. Lesser common diagnosis were of Renalcalculi (6%), Right Strangulated Hernia (2%) and MeckelsDiverticulitis (2%). (Table 2)

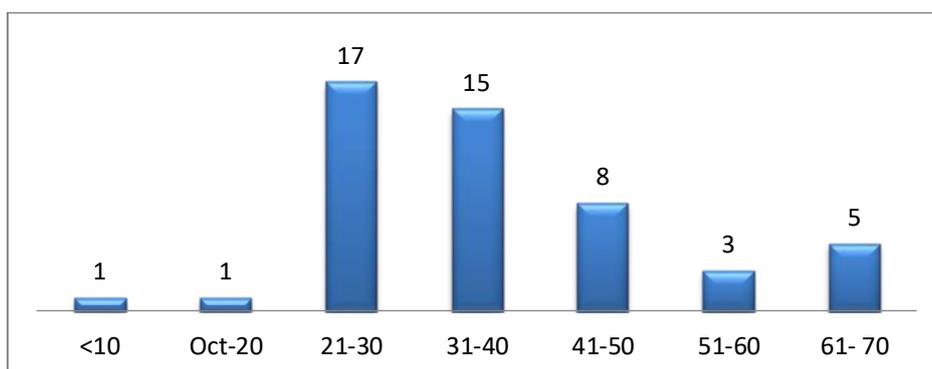
Total 19 cases underwent radiographic analysis using X-ray. The specificity and sensitivity in acute intestinal obstruction were 80% and 92.86% respectively with PPV of 80% and NPV of 92.86%. The accuracy recorded in our series was 89.47 %. However the X-ray could not accurately diagnose between the ileal and gastric perforations, it diagnosed pneumoperitoneum (air under the diaphragm) with sensitivity of 80.33% and specificity of 100% with accuracy of 89.47%. Pneumoperitoneum indicates that patient had gastro intestinal perforation. One case each of strangulated hernia and meckels diverticulum had x-ray abdomen, it failed to arrive at an accurate diagnosis. (Table 4)

Total 48 cases in present series underwent USG abdomen and the sensitivity and specificity of USG in renal colic were 100%. In cholecystitis it was 94.4% sensitive and 100% specific. In appendicitis it was 80% sensitive and 100% specific. The accuracy in appendicitis was 97.92%. It was 63.6% sensitive and 100% specific in GI perforation. However USG couldn't differentiate between gastric and ileal perforation. (Table 5).

Total 14 cases underwent CT scan and all the cases were correctly radiologically diagnosed by CT scan in the present series. In case of GI perforation, CT couldn't differentiate between gastric and ileal perforation, however it diagnosed pneumoperitoneum accurately.



**Fig 1: GRAPH SHOWING GENDER DISTRIBUTION IN CHOLECYSTITIS**



**Fig 2: GRAPH SHOWING AGE DISTRIBUTION OF PATIENTS WITH ACUTE ABDOMINAL EMERGENCY**

**TABLE1: PRESENTING COMPLAINTS**

Complaints	Number Of Patients	Percentage Of Patients
Pain	50	100%
Vomiting	44	88%
Constipation	15	30%
Abdominal Distention	17	34%
Fever	30	60

**TABLE2: INCIDENCE OF VARIOUS ACUTE ABDOMINAL EMERGENCY**

Diagnosis	Number of Patients Examined Clinically	Number of Patients Examined Radio - logically (X-ray abdomen)	USG	CT - scan	Final Diagnosis Of The Patients
Cholecystitis	19	-	17		18
Appendicitis	4	-	4	1	5
Acute Intestinal Obstruction	6	5	6	5	5
Pancreatitis	4	-	4	5	5

<b>GI Perforation</b>	12	10	7	2	6
<b>Renal Colic</b>	3	-	3	-	6
<b>Strangulated Hernia</b>	1	-	-	-	3
<b>Gastritis</b>	1	-	-	-	-
<b>Meckel's Diverticulitis</b>	-	-	-	1	1
<b>Cancer With Appendicitis</b>	-	-	-	-	-
<b>No Diagnosis</b>	-	4	7	-	-
<b>Total</b>	50	19	48	14	50

**TABLE 3: COMPARING ACCURACY OF CLINICAL DIAGNOSIS WITH FINAL DIAGNOSIS**

<b>Clinical Diagnosis / Final Diagnosis</b>	<b>Sensitivity (%)</b>	<b>Specificity (%)</b>	<b>Positive Predictive Value (%)</b>	<b>Negative Predictive Value (%)</b>	<b>Accuracy (%)</b>
Cholecystitis	100.00	96.88	94.74	100.00	98.00
Appendicitis	100%	100.00	100.00	100%	100%
Acute Intestinal Obstruction	100.00	97.78	83.33	100.00	98.00
Pancreatitis	80.00	100.00	100.00	97.83	98.00
Perforation	100.00	100.00	100.00	100.00	100.00
Renal Colic	100.00	100.00	100.00	100.00	100.00
Strangulated Hernia	100.00	100.00	100.00	100.00	100.00
Gastritis	-	98.00	0.00	100.00	98.00

**TABLE 4: COMPARING ACCURACY OF XRAY DIAGNOSIS WITH FINAL DIAGNOSIS**

<b>X-Ray / Final Diagnosis</b>	<b>Sensitivity (%)</b>	<b>Specificity (%)</b>	<b>Positive Predictive Value (%)</b>	<b>Negative Predictive Value (%)</b>	<b>Accuracy (%)</b>
Acute Intestinal Obstruction	80.00	92.86	80.00	92.86	89.47
Perforation(pneumoperitoneum)	83.33	100.00	100.00	77.78	89.47

**TABLE 5:COMPARING ACCURACY OF USG DIAGNOSIS WITH FINAL DIAGNOSIS**

<b>USG / Final Diagnosis</b>	<b>Sensitivity (%)</b>	<b>Specificity (%)</b>	<b>Positive Predictive Value (%)</b>	<b>Negative Predictive Value (%)</b>	<b>Accuracy (%)</b>
Cholecystitis	94.44	100.00	100.00	96.77	97.92
Appendicitis	80.00	100.00	100.00	97.73	97.92
Acute intestinal obstruction	100.00	97.67	83.33	100.00	97.92
Pancreatitis	80.00	100.00	100.00	97.73	97.92
Renal colic	100.00	100.00	100.00	100.00	100.00
Gastro intestinal perforation	63.64	100.00	100.00	90.24	91.67

**DISCUSSION**

The present study comprises of a detailed clinical and radiological analysis of 50 cases of acute abdominal conditions admitted in the surgical units of government medical college, Amritsar. The criteria for selection of patients for this study were clinically diagnosed acute abdominal cases.

Most of the patients were in age group of 21-40 years with mean age of  $38 \pm 13.6$  years. Mean age of patients in a study done by Gupta K et al<sup>4</sup> were in 37.6 years where as in a study by Choi et al<sup>5</sup>, the mean age of the patients were in 59.7 years. Ali MJ et al<sup>6</sup> in their study also found that the most common age group to be 21-40 years. Sharma P et al<sup>7</sup> in their study showed that most of the patients were in 31-40 years age with  $37.9 \pm 16.7$  years as mean age. In the present study, an increased incidence in female was observed, with M: F ratio of 1:3.5. However in most of the studies there are more males affected than females. Most common clinical complaint of patients were abdominal pain (localized or diffuse); present in 100% cases followed by vomiting, fever, abdominal distention, and constipation. In a study by Choi et al<sup>5</sup> and Gupta et al<sup>4</sup> the most common complaint was also acute abdominal pain. However Karmakar et al<sup>7</sup> in their prospective study observed abdominal pain as most common complaint seen in 70% patients.

In the present study the clinical and radiographic analysis were compared with final diagnosis for different cases.

In the present study the sensitivity and specificity for clinical diagnosis in acute intestinal obstruction was 100% and 97.78% respectively. It has a NPV and PPV of 100% and 83.3% respectively. The accuracy recorded in our series was 98%. The specificity and sensitivity in acute intestinal obstruction for X-ray abdomen was 80% and 92.8% respectively and with a PPV of 80% and NPV of 92.8%. The accuracy for x-ray was 89% (table 4). In case of USG, it

was 97.6% specific and 100% sensitive in acute intestinal obstruction. CT scan was able to diagnose the etiology of acute intestinal obstruction accurately in all the cases (table 5).

Thompson et al in 2007 showed the sensitivity and specificity of acute intestinal obstruction to be 82% and 83% respectively.<sup>9</sup> According to Kim et al, the sensitivity and specificity of plain abdominal radiography for SBO were 82.0% and 92.4% respectively.<sup>10</sup> According to a study conducted by Suri et al, CT had high sensitivity (93%), specificity (100%) and accuracy (94%) in diagnosing the presence of obstruction. The comparable sensitivity, specificity and accuracy were, respectively, 83%, 100% and 84% for USG and 77%, 50% and 75% for plain radiography.<sup>11</sup>

Clinically the accuracy of diagnosis of GI perforation was 100%. X-ray could not differentiate between the ileal and gastric perforation but it diagnosed pneumo-peritoneum with a sensitivity of 83.33% and specificity of 100%. The accuracy of X-ray abdomen was 89.47%. CT diagnosed pneumo-peritoneum accurately in 2 doubtful cases. Ultrasonography was 63.6% sensitive and 100% specific for detecting GI perforation. Even though both USG and x-ray diagnosed pneumoperitoneum, it couldn't differentiate whether the GI perforation was gastric or ileal.

Bansal et al in their study in diagnosing intestinal perforations, found that overall positivity rate of plain radiography in detecting pneumoperitoneum to be 89.20%. The positivity rate was highest for stomach and duodenal perforation (94.19%) and the least was for appendicular perforation (7.69%).<sup>12</sup> Mohammad T in his study on gastrointestinal perforation concluded that plain X-ray of the chest and abdomen yielded high diagnostic accuracy rate.<sup>13</sup> It is suggested that the patients with no radiological findings in GI perforation, may have small sized perforation, sealed perforation or just a little peritoneal soiling and a conservative treatment should be adopted in these patients.<sup>13</sup>

The sensitivity and specificity of USG abdomen and clinical diagnosis in acute cholecystitis was 100%. In contrast to our study where all the cases were correctly diagnosed, Hwang et al in 2013 showed that it had only 54% sensitivity, 81% specificity, 85% PPV and 47% NPV. In addition to that, they also showed that a higher rate of accurate diagnosis can be achieved using a triad of positive Murphy sign, elevated neutrophil count and an ultrasound showing cholelithiasis or cholecystitis.<sup>14</sup>

Wertz et al in their study showed that the sensitivity of CT for detecting AC was significantly greater than that of US: 85% versus 68% ( $p = 0.043$ ), respectively; however, the negative predictive values of CT and US did not differ significantly: 90% versus 77%. Because there were no false-positives, the specificity and positive predictive values for both modalities were 100%.<sup>15</sup>

Pinto et al in their metaanalysis mentioned that ultrasound has the best sensitivity and specificity for evaluating patients with suspected gallstones.<sup>16</sup> Some ultra-sonographic findings are more strongly associated with acute cholecystitis than others: a positive Murphy's sign (pain is provoked by either the transducer or the sonographer's palpation under guidance, in the exact area of the gallbladder) is reported to have sensitivity as high as 88%. Ralls et al reported that one of the most important advantages of ultrasound over other imaging techniques in the investigation of acute cholecystitis is the ability to assess for a sonographic Murphy sign, which is a reliable indicator of acute cholecystitis with a sensitivity of 92%.<sup>17</sup>

The sensitivity and specificity of USG for diagnosing acute appendicitis was 100%. For appendicitis in the present series the specificity was 100% and sensitivity was 100% for clinical diagnosis, with PPV and NPV of 100 %.

The review by Debnath et al in 2016 mentioned that sonographic studies in late eighties and early nineties revealed sensitivity, specificity, and accuracy of USG for diagnosing AA ranged from 75 to 95%, 85 to 100%, 90 to 96%, respectively.<sup>18</sup>

Debnath et al in another study showed the comparison between CT and USG accuracy in cases of acute appendicitis and found that USG alone had sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy of 81, 88, 92.6, 71.6, and 83 %, respectively. When combined with CT scan in selected cases, the sensitivity, specificity, PPV, NPV, and accuracy of combined USG + CT scan were 96 %, 89 %, 93 %, 93.5 % (P = 0.0001), and 93 % respectively.<sup>18</sup> Hussain et al in 2014 showed that US scan has sensitivity of 88%, specificity of 92%, positive predictive value of 94%, negative predictive value of 86%, and overall accuracy of 90%.<sup>19</sup>

The sensitivity and specificity of clinical diagnosis in acute pancreatitis was 80% and 100% respectively. The sensitivity and specificity of USG in pancreatitis was 100%.

## CONCLUSION

In the present study we found that on combining clinical and radiological analysis, majority cases of acute abdomen could be diagnosed correctly. In the present study the sensitivity of clinical diagnosis was accurate for most of the cases (leaving pancreatitis) however specificity varied for Acute Intestinal Obstruction. However the specificity for acute intestinal obstruction was 92.86% for X-ray diagnosis. For gastrointestinal perforation pneumo-peritoneum could be accurately diagnosed in 89.47% patients. Similarly, USG wasn't of much use in GI perforation. In rest of acute abdominal cases USG had diagnosed most cases correctly. We concluded that Plain X rays and ultrasonography can be used for diagnosing acute abdominal emergencies; they are the cheaper, non-invasive, quick, reliable and highly accurate modality in diagnosing the exact cause of pain and its origin in a patient presenting with an acute abdomen and thus helps the physician or surgeon to plan the timely management. We also concluded that majority of cases can also be diagnosed clinically with high accuracy, provided we take a detailed history and have a thorough clinical examination.

## REFERENCES

1. Chanana L, Jegaraj MA, Kalyaniwala K, Yadav B, Abilash K. Clinical profile of non-traumatic acute abdominal pain presenting to an adult emergency department. *J Family Med Prim Care*. 2015 Jul;4(3):422.
2. Patterson JW, Kashyap S, Dominique E. Acute Abdomen. [Updated 2020 Jul 14]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020.
3. Malviya A, Hussain A, Bulchandani HP, Bhardwaj G, Kataria S. A comprehensive study on acute non-traumatic abdominal emergencies. *Int Surg J*. 2017 Jul;4(7):2297-2302.
4. Gupta K, Bhandari RK, Chander R. Comparative study of plain abdomen and ultrasound in non-traumatic acute abdomen *Gastrointest. Radiol*. 2005;5(1):109- 15.
5. Choi SY, Wong TW, Lau CC, Liang E, Fu YK, Khoo J. A study on the use of abdominal X-ray in an emergency department. *Hong Kong J Emerg Med*. 2002 Jan;9(1):30-3.

6. Ali MZ, Maddu VK. Comparative analysis of clinical, radiological and operative findings in acute abdomen. *IntSurg J.* 2019 Feb 25;6(3):806-11.
7. Sharma P, Sidharth, Singh BP, Singh D, Gupta. A Comparative Study between Plain Radiography and Ultrasound Abdomen in Non-Traumatic Surgical Acute Abdominal Conditions *NJR.* 2012;2(3). 28.
8. Karmakar S, Ghosh SK, Ghosh M. Acute Abdomen – Status of Diagnosis in a Rural Based Teaching Hospital. *J Evolution Med dental Sci.* 2013;2(52):10107.
9. Thompson WM, Kilani RK, Smith BB, Thomas J, Jaffe TA, Delong DM, Paulson EK. Accuracy of abdominal radiography in acute small-bowel obstruction: does reviewer experience matter? *AJR Am J Roentgenol.* 2007 Mar;188(3):W233-8.
10. Kim SH, Park KN, Kim J, Eun CK, Park YM, Oh MK, et al. Accuracy of plain abdominal radiography in the differentiation between small bowel obstruction and small bowel ileus in acute abdomen presenting to emergency department. *HONG KONG J Emerg Me.* 2011 Mar;18(2):68-79.
11. Suri S, Gupta S, Sudhakar PJ, Venkataramu NK, Sood B, Wig JD. Comparative evaluation of plain films, ultrasound and CT in the diagnosis of intestinal obstruction. *ActaRadiol.* 1999 Jul;40(4):422-8.
12. Bansal J, Jenaw RK, Rao J, Kankaria J, Agrawal NN. Effectiveness of plain radiography in diagnosing hollow viscus perforation: study of 1,723 patients of perforation peritonitis. *EmergRadiol.* 2012 Apr;19(2):115-9.
13. Mohammad T. Diagnostic accuracy of different radiological investigations in the diagnosis of perforated duodenal ulcer *Alkindy Coll. Med. J.* 2012; 8 (2):83-87.
14. Hwang H, Marsh I, Doyle J. Does ultrasonography accurately diagnose acute cholecystitis? Improving diagnostic accuracy based on a review at a regional hospital. *Can J Surg.* 2014 Jun;57(3):162-8.
15. Wertz JR, Lopez JM, Olson D, Thompson WM. Comparing the Diagnostic Accuracy of Ultrasound and CT in Evaluating Acute Cholecystitis. *AJR Am J Roentgenol.* 2018 Aug;211(2):W92-W97.
16. Pinto A, Reginelli A, Cagini L, Coppolino F, Stabile Ianora AA, Bracale R, Giganti M, Romano L. Accuracy of ultrasonography in the diagnosis of acute calculous cholecystitis: review of the literature. *Crit Ultrasound J.* 2013 Jul 15;5Suppl 1(Suppl 1):S11. doi: 10.1186/2036-7902-5-S1-S11. Epub 2013 Jul 15.
17. Ralls PW, Colletti PM, Lapin SA. et al. Real-time sonography in suspected acute cholecystitis: prospective evaluation of primary and secondary signs. *Radiology.* 1985;5:767-771.
18. Debnath J, Kumar R, Mathur A, Sharma P, Kumar N, Shridhar N, Shukla A, Khanna SP. On the Role of Ultrasonography and CT Scan in the Diagnosis of Acute Appendicitis. *Indian J Surg.* 2015 Dec;77(Suppl 2):221-6.
19. Hussain S, Rahman A, Abbasi T, Aziz T. Diagnostic accuracy of ultrasonography in acute appendicitis. *J Ayub Med Coll Abbottabad.* 2014 Jan-Mar;26(1):12-7.