

**THE ACUTE ABDOMEN: A COMPARATIVE ANALYSIS OF CLINICAL,
RADIOLOGICAL AND OPERATIVE FINDINGS*****Kesarwani Abhinav¹, Pardeshi C.Z², Das Ankur Gopendra³, Yadav Parth⁴ and Khairnar Nitinchandra⁵**^{1,3,4,5}Resident, Department of surgery, Krishna Institute of Medical Sciences, Karad.²Assistant Professor, Department of surgery, Krishna Institute of Medical Sciences, Karad.***Corresponding Author: Dr. Abhinav Kesarwani**

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ABSTRACT

Background: The acute abdomen remains a challenge to surgeons and other physicians. Abdominal pain is the most common cause for hospital admission. The term, acute abdomen, is often used synonymously for a condition that requires immediate operative intervention. The aim of the present study is to analyse modes of presentation of acute abdomen and to compare the efficacy of clinical diagnosis with that of radiological diagnosis. **Materials and methods:** 100 cases of acute abdomen admitted in Krishna Hospital, Karad from December 2015 to June 2017, fulfilling the inclusion criteria of the study, were prospectively analysed regarding clinical features and also assessed the effectiveness and role of radiological investigation in the diagnosis of these conditions. The radiologic investigations included plain abdominal radiographs, ultrasonography and computed tomography. **Results:** Acute abdomen was more common in 2nd-5th decade of life and in males. Acute appendicitis forms the commonest cause of acute abdomen. Hollow viscus perforation being the 2nd and intestinal obstruction forms the 3rd commonest cause of acute abdomen. Abdominal pain was the commonest symptom. Positive x-ray findings are found in 83.82% of the cases of acute abdomen. Ultrasound abdomen accurately diagnosed appendicitis in 83.33% of patients. Surgeon's clinical diagnostic accuracy was found to be superior to the radiologic diagnostic accuracy. **Conclusions:** As there are many causes of acute abdominal pain, a systematic approach is necessary to narrow the differential diagnosis. A well conducted history and a proper clinical examination are the most important components in diagnosing patients with an acute abdomen. The clinical and radiological findings are complementary to each other.

KEYWORDS: Acute appendicitis, perforation, intestinal obstruction, ultrasound.**INTRODUCTION**

Term acute abdomen inherently implies a suddenness of onset; the clinical course of abdominal symptoms can range from minutes to hours to weeks, and is often used synonymously for a condition that requires immediate operative intervention.^[1] There are really only four pathologic processes that occur in the GI tract: haemorrhage, ischemia, obstruction, and infection. Most abdominal pathology involves one or a combination of these processes. It is ironic that given this pathophysiologic simplicity the diagnosis of abdominal complaints is often so imprecise. The tools for evaluating abdominal complaints are patient history, physical examination, imaging studies, and laboratory tests.^[2] History taking and physical examination form the corner stone of diagnosis.^[4] Equally important is the investigational confirmation of the suspected diagnosis by laboratory tests and radiologic investigations. In the past 10 years, the ability to accurately determine intra-abdominal pathology by radiologic imaging has allowed earlier and more accurate diagnosis³. And in no

other specialty has such dramatic transformation taken place.^[4]

Ultrasound is a well-established imaging modality for evaluating the abdomen, as it is non-invasive, portable, readily obtainable, relatively inexpensive, and without the risks of ionizing radiation or iodinated intravenous contrast. In addition, ultrasound has extremely high diagnostic accuracy in many clinical scenarios equivalent or even superior to CT.^[5] Multislice, helical CT is increasingly replacing Ultrasonography (USG) for the evaluation of patients with acute abdominal pain. CT has major advantages over USG: it is extremely fast and the time burden is often less than that of a USG examination.^[6]

The present study aimed at to assess atraumatic acute abdomen, the various clinical patterns that help to make a clinical diagnosis and effectiveness of radiological investigation in diagnosing acute abdomen and its influence on clinical decision making. The emphasis laid here is whether a proper history and clinical examination, coupled with cost effective investigations like plain x-ray

or ultrasound can help prove the diagnosis as later confirmed by operative findings.

METHODOLOGY

The present cross sectional analytical study was carried out for comparative analysis of clinical, radiological and operative findings among 100 randomly selected cases who presented with acute abdominal pain (of non-traumatic origin) at the emergency department, surgical ward and patients referred from other department at Krishna Hospital and Research Center Karad from December 2015 to June 2017. Paediatric age group (12 years and below), Traumatic cases (blunt and penetrating), Acute abdomen in pregnancy and gynaecological causes of acute abdomen, Conservatively managed cases were excluded from the study. Detailed history and thorough physical examination findings were noted down and recorded in the semi-structured pre-validated proforma.

Routine investigations namely Hb%, TC, DC, ESR, urine routine were carried out. Relevant procedures like four quadrant aspirations were carried out in some cases. The radiological investigations comprised of plain abdominal x-ray, ultrasonography and CT scan for which no ordering protocol was followed. It was left to the discretion of the treating unit to order the investigation which they felt appropriate for each case. The pre-operative resuscitation of patients was done by monitoring of vital signs and maintaining an adequate urine output. Fluid and electrolyte imbalance correction was carried out. Ryle's tube insertion, nil by mouth status, intravenous fluids, analgesics and antibiotics were administered to all the patients.

Postoperatively patients were put on nasogastric aspiration, intravenous fluids, antibiotics, analgesics and H2 blockers/proton pump inhibitors. Regular monitoring of vitals, input/output and biochemical parameters were done. Drain removal, Ryle's tube removal and suture removal was done depending upon clinical judgement of individual cases. Regular follow up of patients was carried out. All the recorded data was entered using MS Excel software. The data was analysed using appropriate statistical tests with the help of SPSS statistical software.

RESULTS

The present study was conducted among 100 cases of acute abdomen, which comprised of 82% males and 18% female cases of acute abdomen. When we analyzed age groups of the study participants, majority of the cases belonged to age group of 21-40 years followed by 41-60 years with the mean age of the 100 cases of acute abdomen was 39.68 years with a standard deviation (SD) of 16.80 years. The overall sex ratio is 82:18, males to females. Males are 4.55 times as likely to suffer from acute abdomen as females. Male preponderance is true of all age groups from 10 to 80 years (Figure 1).

We classified the cases of acute abdomen by the cause of acute abdomen, it was found that majority of the cases had acute appendicitis followed by peptic ulcer, intestinal obstruction, perforated duodenal ulcer (Figure 2). It was also observed that the age difference in the causes of acute abdomen on the whole are significant ($p < 0.001$). The difference in the mean ages of acute appendicitis and perforated ulcer is also significant ($p < 0.001$). The difference between acute appendicitis and intestinal obstruction too is significant ($p < 0.01$). Cases of acute appendicitis are more common below 30 years, where as those of peptic ulcer perforations are more frequent above 30 years (Table 1) (Figure 3). Duodenal and gastric ulcer groups are treated as one category (peptic ulcer perforation), small and large bowel obstruction is regarded as single group (intestinal obstruction). Necrotising enteritis and Meckel's diverticulum is clubbed to form miscellaneous group. The present study reports 41 cases of hollow viscus perforation, out of them 20(48.8%) had duodenal perforation, 13 (31.7%) had perforated gastric ulcer 8 (19.5%) patient had ileal perforation. In general, all types of acute abdomen have got preponderance in males (Table 4). Out of 21 cases intestinal obstruction, the commonest cause was secondary to postoperative adhesions or due to bands.

The most prominent symptom was pain. This was present in 100 cases of acute abdomen, both at onset of attack and at hospitalization. The mean duration of pain the 100 cases of acute abdomen was 61.08 hours with SD of 36.17 hours (Table 2). Site of pain at onset varied according to the underlying cause of acute abdomen. It was umbilical and right iliac fossa in the case of acute appendicitis and diffuse in cases of intestinal obstruction. It was Epigastrium in peptic ulcer perforation, and in pancreatitis it was Epigastrium and umbilical region. The preferred site of pain at admission to hospital was right iliac fossa in the cases of acute appendicitis. It was diffuse all the over abdomen in the cases of peptic ulcer perforation, ileal perforation, and necrotising enteritis. The duration of pain was the longest in the Intestinal Obstruction and the shortest in peptic ulcer perforation. The difference in the mean duration of pain by the type of acute abdomen, however, is statistically significant ($p < 0.001$) (Table 1). Tenderness was positive in all 100 cases. The next common features were guarding abolished/sluggish bowel sounds, tachycardia, rigidity, abdominal distension (Table 2).

In the plain x-ray 32 cases of peptic ulcer perforation, gas under either one diaphragm (25.1%) or under both diaphragms (71.9%) was visualized. In 11 cases (33.3%), additionally, multiple air-fluid level within bowel was present. In all 21 cases of intestinal obstruction showed multiple air-fluid level within bowel. In 6 cases (28.57%), additionally, distended small bowel segments were seen. In 3 out of 4 cases of volvulus x-ray was diagnostic because of presence of 'Bent Inner tube sign'. Three cases of 6 cases of appendicular perforation were x-rayed and found multiple air fluid levels and ground glass

appearance. The x-ray examination was inconclusive in 11 cases. It correctly diagnosed the type of acute abdomen in remaining cases i.e. peptic ulcer perforation, intestinal obstruction and ileal perforation (Table 5). The clinical diagnostic accuracy for the above 68 cases was found to be 88.23%. The x-ray diagnostic accuracy for the cases was recorded to be 83.82%.

Similarly, Ultrasonography was carried out in 44 cases. The clinical diagnostic accuracy for the above 44 cases was found to be 90.90%. The ultrasonography accuracy for the cases was recorded to be 81.81 % (Table 6).

Table 1: Various parameters related to common causes of acute abdomen.

Variables	Mean Age (Yrs)	Mean duration of pain (Hr)
Acute appendicitis	27.85	63.88
Peptic ulcer perforation	48.12	47.70
Intestinal Obstruction	50.29	74.86
Ileal Perforation	34.38	72
Miscellaneous	37.75	90

Table 2: Clinical presentation of acute abdomen cases.

Variables		Number of cases	Percentage
Symptoms	Pain	100	100%
	Vomiting	78	78%
	Constipation	29	29%
	Abdominal distension	26	26%
	Fever before pain	17	17%
	Fever following pain	8	8%
	Diarrhoea	1	1%
Signs	Tenderness	100	100%
	Guarding	69	69%
	Abolished/sluggish bowel sounds	63	63%
	Rigidity	49	49%
	Abdominal distension	44	44%
	Liver dullness obliteration	34	34%
	Shock	25	25%
	Free fluid	22	22%
	Temperature	22	22%
	Tenderness per rectum	18	18%
	Abdominal mass	9	9%
	Increased bowel sounds	5	5%

Table 3: Four leading signs in different in different kinds of acute abdomen.

Type of acute abdomen	First leading feature	Second leading feature	Third leading feature	Fourth leading feature
Acute appendicitis	Tenderness (100%)	Tachycardia (50%)	Guarding (41.18%)	Rigidity (20.59%)
Peptic ulcer perforation	Tenderness (100%)	Guarding (100%)	Rigidity (100%)	Obliteration of liver dullness (87.88%)
Intestinal Obstruction	Tenderness (100%)	Abdominal distension (76.19%)	Abnormal bowel sounds (71.43%)	Guarding (52.38%)
Ileal Perforation	Tenderness (100%)	Guarding (100%)	Obliteration of liver dullness (100%)	Tachycardia (87.5%)

Table 4: Various conditions associated with cases of acute abdomen.

Variables		No. of Cases	Percentage
Hollow Viscus Perforation	Perforated duodenal ulcer	20	48.8%
	Gastric perforation	13	31.7%
	Ileal perforation	8	19.5%
	Total	41	100%
Causes of intestinal obstruction	Postoperative Intestinal adhesions/Bands	9	42.86%
	Sigmoid Volvulus	4	19.4%
	Obstructed Inguinal Hernia	4	19.4%
	Intussusception	3	14.3%
	Malignancy	1	4.76%

Table 5: Correlation between clinical and x-ray diagnosis.

Diagnosis	Number of cases x-rayed	Clinical diagnosis		X-ray diagnosis	
		Correct	Incorrect	Correct	Incorrect
Peptic ulcer perforation	33	33	00	32	01
Intestinal obstruction	21	21	00	19	02
Ileal perforation	07	04	03	06	01
Acute appendicitis	03	01	02	00	03
Pancreatitis	01	01	00	00	01
Necrotising enteritis	02	00	02	00	02
Meckels diverticulum	01	00	01	00	01
Total	68	60	08	57	11

Table 6: Correlation between clinical & ultrasonographic diagnosis.

Diagnosis	Number of USG	Clinical diagnosis		USG diagnosis	
		Correct	Incorrect	Correct	Normal /equivocal
Acute appendicitis	30	30	00	25	05
Intestinal obstruction	09	09	00	09	00
Ileal perforation	02	00	02	01	01
Meckels diverticulum	01	00	01	00	01
Necrotising enteritis	01	00	01	00	01
Pancreatitis	01	01	00	01	00
Total	44	40	04	36	08

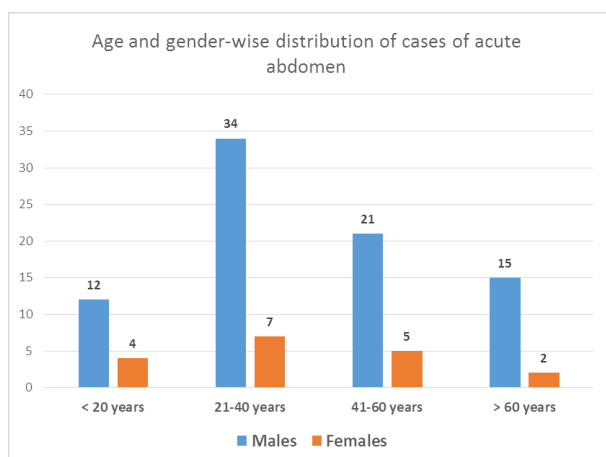


Figure 1: Age and gender wise distribution of study subjects.

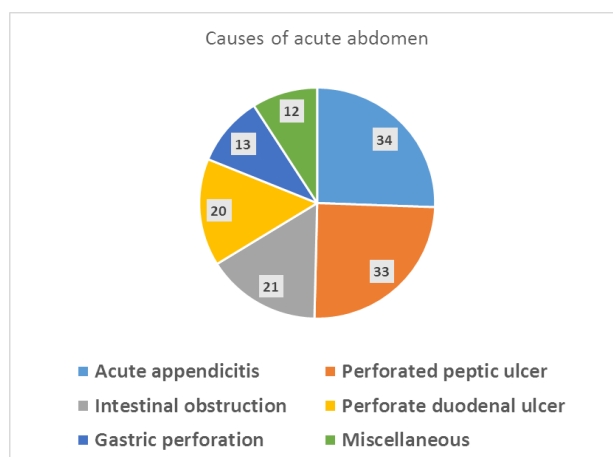


Figure 2: Distribution of cases according to causes of acute abdomen.

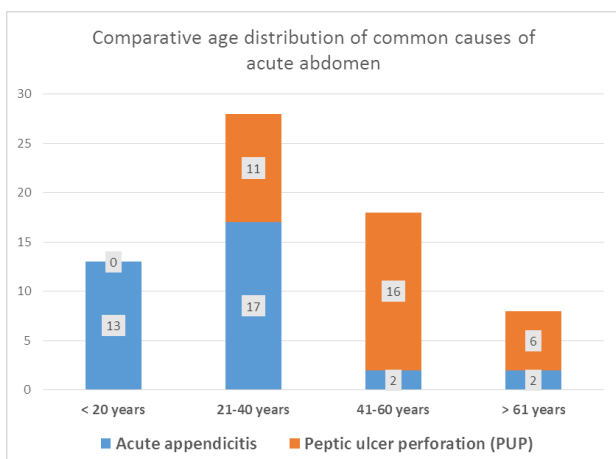


Figure 3: Comparative age distribution of acute appendicitis and peptic ulcer perforation.

DISCUSSION

This study was conducted in Krishna Institute of Medical Science Hospital, Karad among hundred randomly selected patients of acute abdomen admitted under department of surgery. Maximum number of cases was seen in age groups of 21-30 years accounting for 25% of the cases. The youngest patient was 14 years old and the eldest was 80 years. Rao D.C.M et al (1984)^[7] in their study observed that the majority of cases of acute abdomen belonged to age group of 21-40 years, whereas M.C.Dandapat (1991)^[8] found it as 20-40 years. The peak age incidence among various studies has varied from 20 to 50 years. Peptic ulcer perforations (duodenal and gastric ulcers) commonly occurred between 31-50 years, accounting for 51.51% of the cases in our study. Kohli V. et al (1988)^[9] obtained similar results in their study, where the commonest age of presentation was between 30-50 years (66%). Ramesh C.Bharti et al (1996)^[10] and Rao D.C.M et al.^[7] (1984), reported high incidence of ulcer perforations in age group of 31-40 years and 21-40 years respectively. In our study only 15.15% of cases developed duodenal ulcer perforation below 30 years of age, which is close to figures quoted by Schwartz SI et al.^[11] in their study (17%) emphasized the rarity of condition in the young.

The age distribution of the two largest groups, the acute appendicitis and acute peptic ulcer perforation has been compared. From this it can be seen that: Acute appendicitis was more common below 30 years, while peptic ulcer perforation were more frequent above 30 years. However there is a steady decline in incidence of ulcer perforation from 30 to 60 years. Rao D.C.M et al.^[7] (1984) too observed a decline beyond 40 years of age in his study. In case of intestinal obstructions, the mean age was 50.28 years. Bhudaraja (1976)^[12] reported maximum incidence between 21 - 50 years.

In the present study, the overall sex ratio, males to females is 82:18; hence males are more than 4.5 times as likely to suffer from acute abdomen as females. Males predominated in all categories of acute abdomen. With

perforated peptic ulcers, majority were males and with only eight females in this study. The ratio of men to women, with regards to perforated peptic ulcers was 3.1:1. Since the beginning of 20th century, perforated peptic ulcer has mainly been a disease of men, but over the years the male: female ratio has been falling.^[11]

The leading cause of acute abdomen in this study was acute appendicitis, constituting 34% of the case. The second common cause was perforated peptic ulcer (33%). Intestinal obstruction accounted for 21% of the cases, the commonest causes of which being adhesions, obstructed hernia, sigmoid volvulus and intussusceptions. Adhesions and obstructed hernias have been documented as the commonest cause for small bowel obstruction and are of particular importance because they are the two main causes of strangulation of bowel.^[2,33,67] In the present study one out of the three hernias underwent strangulation. In the case of gastrointestinal perforation the commonest anatomical site involved was duodenum, followed by ileal, gastric, and appendicular perforation. Similar results were observed in a study conducted by Rao D.C.M et al.^[7] (1984) where the incidence of duodenal ulcer perforation was the highest (43.5%) followed by ileal, gastric and appendicular perforations. Sharma et al (1991)^[13] also reported that peptic ulcer perforations to be the commonest cause, while typhoid perforations (ileal) was the second common cause. There were two cases of necrotising enteritis. Meckels diverticulitis constituted 1% of the case. There was one case of necrotising pancreatitis.

Pain followed by vomiting were most prominent symptoms of cases presented with acute abdomen whereas tenderness, guarding, rigidity followed by sluggish bowel sounds were the most prominent signs associated with cases of acute abdomen. In acute appendicitis about 56% patient's experienced similar episodes of abdominal pain and most of them underwent conservative treatment at various clinics. Past history of peptic ulcer symptoms was present in 54.54% of the cases with perforated peptic ulcers. None of the cases of ileal perforation and necrotising enteritis had a past history of pain. An ulcer history for a varying period was recorded in 30 cases by Mishra S.B. et al (1982)^[14] in their study of 53 cases. In a review of 50 cases by Ramesh CB. et al (1996),^[10] peptic ulcer history was present in 78% of the patients. In a Western series by Stainland J.R. et al (1972),^[15] 50% of the patients did not give previous history of abdominal pain.

Acute appendicitis: Acute appendicitis accounted for 34% of all cases of acute abdomen. The mean age was 27.85 years. The majority were in the 11-30 year bracket. The peak of incidence was in the 11-20 year bracket. Males were 4.6 times as many as females. Pain was present in all the 34 cases. At the time of onset, pain was mostly over the umbilical region. At the time of admission, the commonest site was the right iliac fossa. On examination, the tenderness was found in the right

iliac fossa in the majority of cases. Other common features included tachycardia, guarding, rigidity and fever.

Peptic Ulcer Perforation: Peptic ulcer perforation was responsible for 33% of attacks of acute abdomen. The mean age was 48.12 years. Most of the patients were over 30 years. The peak of incidence was in the 41-50 year group. Males outnumbered females by 3.1 times. At onset pain was felt commonly in the Epigastrium. At admission, it was diffuse and present all over abdomen. Past history of pain was available in about half the cases. Tenderness was diffuse all over the abdomen and was accompanied with guarding, rigidity and obliteration of liver dullness. Free fluid and abolished bowel sounds also were common.

Intestinal Obstruction: Intestinal obstruction was responsible for 21% of acute abdomen. The mean age was 50.29 years. Males were 4.5 times as many as females. Pain at the time of admission tended to be diffuse. Vomiting and constipation were the commonest symptoms. The past history of pain was given by many patients. 38% of patients gave the history of past operation. On examination, the common findings were abdominal distension, diffuse tenderness, guarding, rigidity and abnormal bowel sounds. Plain x-ray of the abdomen, showed evidence of pneumoperitoneum in the 32 cases (97%) of the peptic ulcer perforation. Gas under either one dome of the diaphragm (28.1%) or under both domes (71.8%) was visualized. This agrees with the observations of Mishra S.B. et al (1982)^[14] who in their study noted free gas under the diaphragm in all the cases. Similarly Kachroo et al (1984),^[16] reported liver dullness to be obliterated in all cases of upper G.I perforations and gas under diaphragm in x-rays of duodenal perforations.

Out of the 34 cases of acute appendicitis, only 3 cases were radiographed. All the three cases showed clinical features of acute appendicitis, hollow viscus perforation and intestinal obstruction and provisionally diagnosed as doubtful appendicular perforations, or peptic ulcer perforations or intestinal obstruction. Plain X-ray of all the case showed either ground glass appearance, local ileus, or multiple air fluid levels findings of which were suggestive of peritonitis and were not of much help in confirming the diagnosis. In this study seven cases of ileal perforations were radiographed 6 cases (85.7%) showed pneumoperitoneum suggesting hollow viscus perforation. The other common findings were multiple air fluid levels and ground glass appearance suggestive of peritonitis and dynamic ileus.

Intestinal Obstruction: The most frequent sign observed were multiple gas fluid levels and disproportionate gaseous distension of the bowel segments on erect abdominal X-ray, which was taken in 21 cases. "Step - ladder pattern" of small bowel obstruction were seen in some of the cases. The diagnosis of intestinal obstruction was mainly based on history of colicky abdominal pain,

vomiting and clinical signs of tenderness (100%), abnormal bowel sounds (95.2%) and abdominal distension (76.2%). The X-rays helped to confirm the suspected diagnosis in 90.4% of the cases and in the rest it was inconsistent. In no way was the clinical diagnosis altered by abdominal radiographs.

In the present study, the surgeon's clinical diagnostic accuracy has been compared with the diagnostic accuracy of plain abdominal radiograph. The clinical diagnostic accuracy (88.23%) scored over that of plain X-ray (83.82%). We found 83.82% of the x-rays to have positive findings and thus helpful in confirming the suspected diagnosis. In other words, positive x-rays outnumbered the inconsistent ones. And from the previous discussion it is obvious that none of the x-rays changed the clinical diagnosis already made. In our study, in 25 (83.33%) of the patients with surgically confirmed acute appendicitis, the appendix or its complications, namely abscess or perforation could be visualized unequivocally. The inflamed appendix is identified by its size, shape, location, non-compressibility, presence of peri-appendicular fluid, abscess, or appendicolith.^[17,18]

In the present study the overall diagnostic accuracy for ultrasonography was 81.81%, compared to a clinical diagnostic accuracy of 90.90%. However, if only cases of acute appendicitis, the ultrasonographic accuracy rises to 83.33%. Failure to visualize an inflamed appendix was probably due to dilated bowel loops obstructing the field of study, in these cases. An overall accuracy of 64% was reported by Drew B. et al (1990)¹⁹ with cases of acute appendicitis.

CONCLUSIONS

In the present study, cases of acute abdomen was commonly seen between 2nd and 5th decades of life with male predominance in our study (M: F = 82: 18). In our study appendicitis was the most common cause 34% it followed by perforated DU 20%, Perforated Gastric Ulcer 13%, (perforated peptic ulcer 33%), Intestinal obstruction 21%, Ileal Perforation 8%. With rise in age, the proportion of peptic ulcer perforation in relation to acute appendicitis steadily increases.

The commonest modes of presentation of various causes of acute abdomen included abdominal pain (100%), followed by vomiting (78%), constipation (29%), and abdominal distension (26%) and Fever 25%. Most common signs associated with acute abdomen were Tenderness (100%), guarding (69%), and rigidity.

Positive x-ray findings are found in 83.82% of the cases of acute abdomen. Presence of gas under diaphragm along with the clinical findings of obliterated liver dullness is an ominous indicator of perforated hollow viscus. Multiple air fluid levels and disproportionately dilated small bowel pattern on plain abdominal radiographs are important indicators of mechanical obstruction.

Acute appendicitis can be accurately diagnosed clinically in majority of the cases. It was found that surgeon's clinical diagnostic accuracy is superior to the radiologic diagnostic accuracy. Ultrasound abdomen accurately diagnosed appendicitis in 83.33% of patients. The clinical and radiological findings were found complementary to each other.

A well conducted history and a proper clinical examination are the most important components in diagnosing patients with an acute abdomen.

CONFLICT OF INTEREST: None to declare.

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