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The atraumatic acute abdomen-A comparative analysis of clinical, radiological and operative findings

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Abstract
Background and objectives: "The term acute abdomen refers to signs and symptoms of abdominal pain and tenderness, a clinical presentation that often requires emergency surgical therapy".
To study the incidence of non-traumatic acute abdominal emergencies. To assess the association between clinical, radiological and operative findings in a case of atraumatic acute abdomen and thus to evaluate clinical diagnostic accuracy and radiological diagnostic accuracy.
Methods: Hundred patients with atraumatic acute abdomen who underwent surgical intervention at KVGMC&H were included in the study. Patient's clinical, biochemical and radiological data was collected prospectively and was compared to final intraoperative diagnosis.
Results: The highest incidence is seen in age group of 11-30yrs. Majority of them were males. Total white cell count had a sensitivity of 92.86% and specificity of 31.8% Acute appendicitis (58%) is the commonest cause of acute abdomen followed by perforation of hollow viscus (34%), Intestinal obstruction (4%), Meckel's Diverticulitis (2%), Liver Abscess (2%). Sensitivity and Specificity of clinical diagnosis in diagnosing appendicular pathology were 96.5% and 95.2% respectively. Sensitivity and Specificity of clinical diagnosis in diagnosing hollow viscous perforation was 100% and 96.9% respectively. Sensitivity and Specificity of plain X-ray abdomen in diagnosing hollow viscous perforation was 94.1% and 96.9% respectively. Sensitivity and Specificity of Ultrasonogram in diagnosing appendicular pathology was 93.1% and 95.2% respectively. Sensitivity and Specificity of plain x-ray abdomen in diagnosing intestinal obstruction was 100% and 100% respectively.
Interpretation and Conclusion: Acute appendicitis was the commonest cause of acute abdomen followed by hollow viscous perforation. Commonest in age group of 11-30yrs. Male predominance was noted. Plain X-ray abdomen was useful in cases of hollow viscus perforation and intestinal obstruction. Not all patients with acute abdomen necessitated plain X-ray of abdomen. Ultrasonogram was more accurate in case of acute appendicitis and was contributory in diagnosis of intestinal obstruction. Apart from clinical diagnosis, the laboratory tests and radiological investigations were complimentary to arrive at an accurate diagnosis of acute abdomen.

Keywords: atraumatic acute abdomen, acute appendicitis, ultrasonogram, computed tomography, hollow viscus perforation with peritonitis, intestinal obstruction

Introduction
The term '*Acute Abdomen*' refers to signs and symptoms of abdominal pain and tenderness, a clinical presentation that often requires emergency surgical therapy [1]. It may be caused by a variety of intra-abdominal disorders and extra abdominal disorders [2]. It encompasses a spectrum of surgical, medical and gynaecological conditions, which require hospital admission, investigations and treatment [3]. Acute abdominal conditions occupy one of the few areas of medical practice where the surgeon often reaches a clinical diagnosis without resorting to numerous investigations [3]. The investigative procedures involved should be such that, they should give a definite diagnosis in a short time like USG and X-ray [4]. And once the diagnosis is made, the method of management of the patient holds prime importance both as a life saving procedure and to relieve his agony [4].

Aims and Objectives
- To study the incidence of non-traumatic acute abdominal emergencies.
- To assess the association between clinical, radiological and operative findings in a case of atraumatic acute abdomen and thus evaluate clinical diagnostic accuracy and radiological diagnostic accuracy.
- To assess the effectiveness of radiological investigations in diagnosing acute abdominal conditions.

Materials and Methods
This is a prospective study conducted in the Department of General Surgery, K V G Medical College Hospital, Sullia. 100 patients with acute abdomen of non-traumatic origin undergoing surgery were included in the study by systematic random sampling over a period of one and half years from October 2018 to March 2020. Ethical approval for the study was obtained from institutional ethical committee.

Inclusion criteria

Patients with non-traumatic acute abdomen undergoing surgical intervention within 24 hours.

Exclusion Criteria

- Acute abdomen secondary to trauma
- Acute abdomen who did not undergo surgical intervention
- Acute abdomen due to gynaecological causes
- Age < 10 years.

Results

This is a prospective study of 100 cases of acute abdomen of non-traumatic origin done from October 2018 to March 2020.

There were 68 men and 32 women in varying age groups with male to female ratio of 2.1:1. Patient's age ranged from 11 to 80 years with mean age of 32.8 years. Patients presented with acute abdominal pain (100%), fever (44%), vomiting (62%) etc. On physical examination, patients had tenderness (100%), rigidity (72%), distension (26%), free fluid (24%), obliterated liver dullness (30%). Clinical diagnosis included acute appendicitis (58%), perforated hollow viscus with peritonitis (36%) and intestinal obstruction (6%) Total leukocyte count was raised in 82 out of 100 patients. Sensitivity and specificity of raised white cell count in cases of acute appendicitis was 92.8% and 31.8% respectively.

Plain X-ray of erect abdomen was performed in 20 patients and the following were noted: pneumoperitoneum suggestive of hollow viscus perforation (34%), multiple air fluid levels along with dilated small bowel suggestive of intestinal obstruction (4%) and normal x-ray in one patient.

Ultrasound findings were suggestive of acute appendicitis (54%), appendicular abscess (2%), liver abscess (2%), obstructed inguinal hernia (2%) and intestinal obstruction (2%).

Final diagnosis was derived from operative findings which showed acute appendicitis (58%), perforated hollow viscus with peritonitis (34%), intestinal obstruction due to adhesion bands (2%) and intestinal obstruction due to obstructed inguinal hernia (2%), Meckel's diverticulitis (2%) and ruptured liver abscess (n=1, 2%). Sensitivity and Specificity of clinical diagnosis in diagnosing appendicular pathology were 96.5% and 95.2% respectively. Sensitivity and Specificity of clinical diagnosis in diagnosing hollow viscus perforation was 100% and 96.9% respectively. Sensitivity and Specificity of plain X-ray abdomen in diagnosing hollow viscous perforation was 94.1% and 96.9% respectively. Sensitivity and Specificity of USG in diagnosing appendicular pathology was 93.1% and 95.2% respectively. Sensitivity and Specificity of plain x-ray abdomen in diagnosing intestinal obstruction was 100% and 100% respectively.

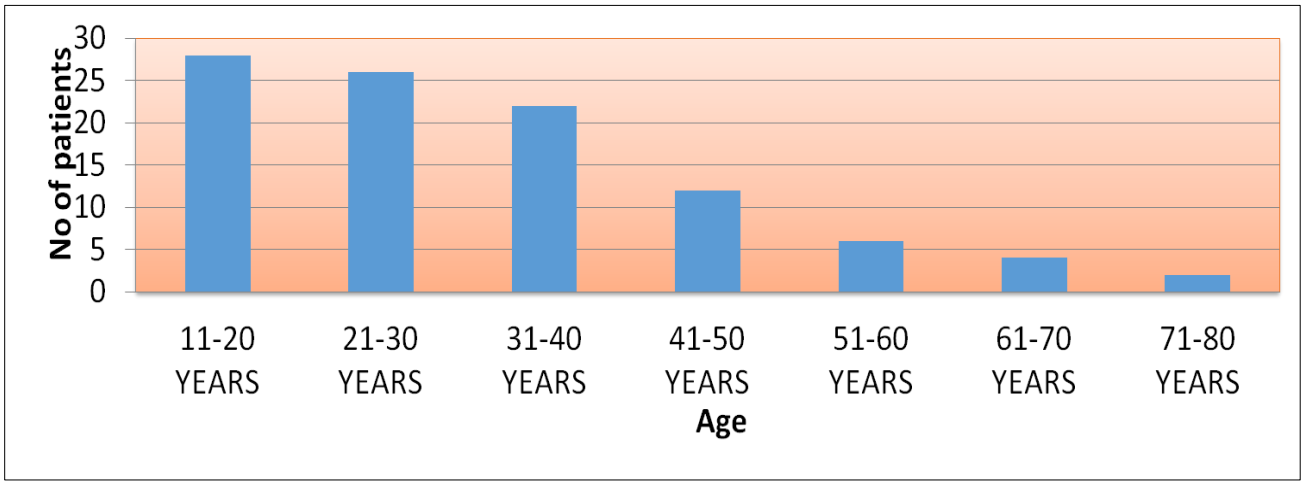

Fig 1: Age distribution

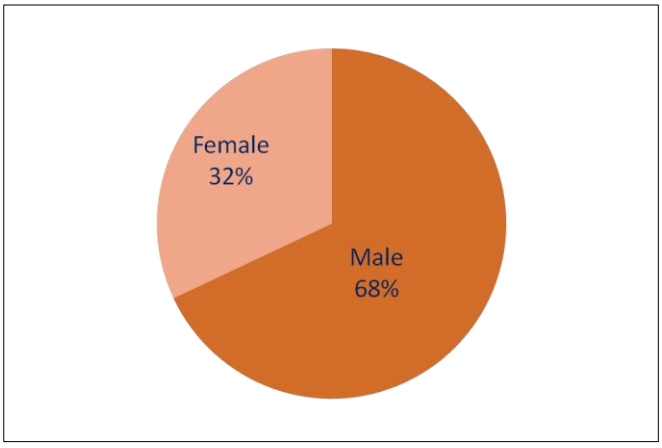

Fig 2: Sex distribution

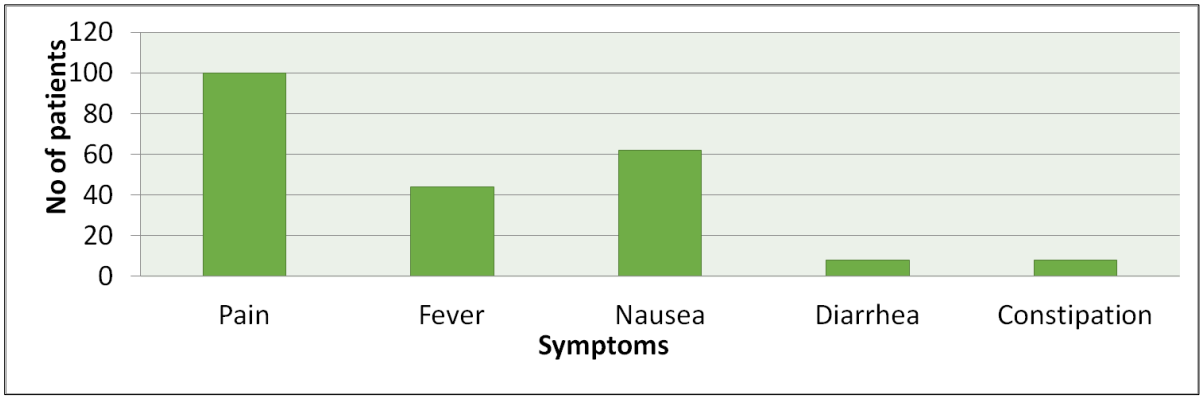

Fig 3: Distribution of symptoms

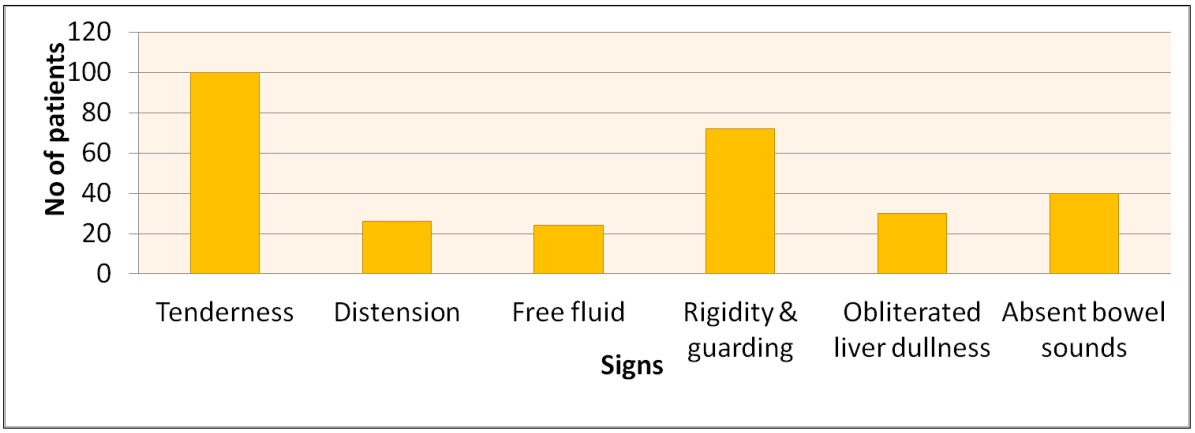

Fig 4: Distribution of signs

Table 1: (A & B) - Correlation of raised white cell count with Intraoperative diagnosis of appendicitis and others

WBC Count	Appendicitis +	Appendicitis -	Total
> 11000	52	30	82
< 11000	4	14	18
Total	56	44	100

Table 2

Sensitivity	92.86%
Specificity	31.81%
PPV	63.41%
NPV	77.78%
p value	0.024 (s)

Table 3: (A & B) - Clinical correlation of appendicitis compared to intraoperative findings

	Intraoperative findings		
Clinical	**Appendicitis +**	**Appendicitis -**	**Total**
Appendicitis +	56	2	58
Appendicitis -	2	40	42
Total	58	42	100

Table 4

Sensitivity	96.55 %
Specificity	95.23 %
PPV	96.55 %
NPV	95.23 %

Table 5: (A & B) - Sonological correlation of appendicitis with intraoperative findings

	Intraoperative findings		
USG	Appendicitis +	Appendicitis -	Total
Appendicitis +	54	2	56
Appendicitis -	4	40	44
Total	58	42	100

Table 6

Sensitivity	93.10 %
Specificity	95.23 %
PPV	96.42 %
NPV	90.91 %

Table 7: (A & B) - Clinical correlation of perforated peritonitis (PP) with intraoperative findings

	Intraoperative findings		
Clinical	PP +	PP -	Total
PP +	34	2	36
PP -	0	64	64
Total	34	66	100

Table 8

Sensitivity	100 %
Specificity	96.97 %
PPV	94.44 %
NPV	100 %

Table 9: (A & B) - Radiological correlation of perforated peritonitis (PP) compared to intraoperative findings

	Intraoperative findings		
Radiological	PP +	PP -	Total
PP +	32	2	34
PP -	2	64	66
Total	34	66	100

Table 10

Sensitivity	**94.11 %**
Specificity	96.97 %
PPV	94.11 %
NPV	96.97 %

Table 11: (A & B) - Clinical correlation of intestinal obstruction (IO) compared with intraoperative findings

	Intraoperative findings		
Clinical	**IO +**	**IO -**	**Total**
IO +	4	2	6
IO -	0	94	94
Total	4	96	100

Table 12

Sensitivity	**100 %**
Specificity	97.91 %
PPV	66.66%
NPV	100 %

Table 13: (A & B) - Radiological correlation of intestinal obstruction (IO) with intraoperative findings

	Intraoperative findings		
Radiological	IO +	IO -	Total
IO +	4	0	4
IO -	0	96	96
Total	4	96	100

Table 14

Sensitivity	**100 %**
Specificity	100 %
PPV	100 %
NPV	100 %

Discussion

Acute abdominal pain of non-traumatic origin constitutes a significant percentage of emergency admissions worldwide and comprises the largest group of patients presenting as general surgical emergency. The term encompasses within it a long list of differential diagnosis and poses a greatest challenge to clinicians. Pattern of disease vary according to age and sex in our study. Correlation of clinical diagnosis with the final diagnosis (Intraoperative findings), and radiological diagnosis with the final diagnosis (Intraoperative findings) was evaluated. Clinical diagnosis correlates well with the final diagnosis among acute abdomen patients who underwent surgical intervention. Similarly radiological correlation correlates well with the final diagnosis.

A total of 100 patients were included in the study. Out of which 68 are male and 32 are female patients. The patients ranged from 11-80 years of age. The highest incidence was seen in the age group of 10-30 years (54%). In a study done by Datubo-Burwn-DI et al in university of port hart court teaching hospital showed the highest incidence in the age group between 10-30yrs and 7% were below 10 yrs and 2% were above 70 yrs of age [5]. In a study done by Aijaz et al., [6] shows the ages varied between 10-70yrs and most of them were in the age range of 20-40years. The highest incidence of acute abdomen was found in patients of age group twenties, followed by teens, which is in contrast to studies conducted in west where the incidence was found to be highest in 45-60 years of age. In our study of 100 patients the average age was 32 years which is similar to Aijaz et al study [6].

In a study done by Aijaz et al., males were more frequently affected than females in a ratio of 3:1 and in our study male to female ratio is 2.1:1.

A study done by de Dombal in 1991 showed the cause of acute abdomen in developed world Acute pancreatitis 34% , acute appendicitis 28%, acute cholecysytitis 10% and small bowel obstruction 4% [7].

Among perforative peritonitis, duodenal perforation was common followed by gastric perforation. In our study there were 2 cases of burst open liver abscess and 2 cases of appendicular abscess.

Appendicitis was the most common cause of acute abdomen in our study, consistent with other studies carried in England [8] which also stated it to be more common between ages 10 and 20 years, as in this study but no age is exempted. Most patients in our study presented with migratory pain in RIF, with pyrexia and rebound tenderness in RIF on examination, but none of these are specific for appendicitis, similar to a meta-analysis of signs and symptoms associated with acute appendicitis, which was unable to identify any one diagnostic finding but showed that migration of pain was associated with diagnosis of appendicitis. Appendicitis can be accurately diagnosed clinically based on history and thorough clinical examination.

Mishra et al., in their study of imaging for acute abdomen had 13 cases of appendicitis [9]. USG was diagnostic in 11 with sensitivity and specificity of 91.6% and 97% respectively. Zoller et al., in their meta-analysis demonstrated that USG has sensitivity of 85% and a specificity of 96% in diagnosing acute appendicitis [10]. Accuracy of ultrasound in diagnosing hepatobiliary and gynecological disorders helps to reduce negative laparotomy rate and is cost effective. Hence ultrasonography should be a part of routine surgical investigation and should be mastered and used by surgeons. Intraoperatively, retrocecal position of the appendix was the most common location.

General peritonitis was the second common cause of acute abdomen in the present series. Obstructed hernia was third common cause of acute abdomen. Routine and discriminate use of x-ray is not recommended in the acute abdomen.[11] Plain X-ray has actual indication in less than 5% of patients with acute abdomen [11].

Ultra sonogram was highly accurate in diagnosing the exact cause of acute abdomen with high overall positive predictive accuracy of 98.3% and sensitivity of 90%.

Plain X-ray abdomen was 100% diagnostic in GIT perforation, GIT obstruction, psoas abscess (caries spine) and renal colic, with overall positive predictive accuracy of 98% and sensitivity of 98% [12].

In a study done by Ashndoitiang JA et al., department of general

surgery, Lagos University Teaching Hospital, Idi-Araba, Lagos over 12 month period (April 2002 to march 2003) plain abdominal radiograph showed high sensitivity in patients with intestinal obstruction 100% and perforated peptic ulcer 90% but was less sensitive in patients with perforated typhoid, acute appendicitis and generalized peritonitis [13].

In our study, plain X-ray abdomen was done in 40 patients which included all patients with peritonitis secondary to hollow viscus perforation. It was also done on patients with intestinal obstruction. It was able to detect gas under the diaphragm in 34 patients and air fluid levels/dilated bowel loops in 4 patients. In our study the causes of intestinal obstruction are strangulated inguinal hernia (2%) and adhesion bands (2%).

All cases of duodenal, and gastric perforations were treated with primary closure and pedicle omental graft (Graham patch). In one case of obstruction due to obstructed inguinal hernia, resection and anastomosis was done in view of the gangrenous changes seen in the bowel. In case of small intestinal adhesion bands, the adhesions were released.

In a study done by Fawkes FGR [14] et al the accuracy of sonography has been found to be between 71-98% for acute appendicitis and biliary tract disease. The sensitivity and specificity of sonography are high in the diagnosis of cholecystitis, ileus and diverticulitis but rather low in the diagnosis of appendicitis.

In a study done by S. Paterson brown and M.N. Vipon shows that the diagnostic accuracy was as high as 95% in acute cholecystitis and 86% in acute appendicitis. In acute appendicitis it has 75% sensitivity but has 100% specificity [15].

X-ray abdomen, supine and erect is indicated in patients with features of peritonitis secondary to hollow viscus perforation, and With bowel obstruction.

Ultrasonography is usually done to rule out other causes of acute abdomen. Ultrasound was done in 64 patients and it has positive findings in 60 patients. It is more accurate in patients with acute appendicitis. USG done in 58 patients of acute appendicitis, showed features of acute appendicitis in 54 patients with sensitivity of 93.1% specificity of 95.2% and positive predictive value of 96.4%.

Conclusion

Thorough clinical examination and appropriate lab tests and radiological investigations which are quick and cheap like USG and X-ray, in a case of acute abdomen are of paramount importance especially in a rural setup with poor patients.

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