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RESEARCH ARTICLE

EVALUATION OF ACUTE APPENDICITIS USING ULTRASOUND

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Abstract

The diagnosis of acute appendicitis is mainly clinical and to confirm the clinical diagnosis ultrasonography (USG) of the abdomen is being used to help in diagnosis of the disease. To find out the role of USG in the diagnosis of acute appendicitis in clinically equivocal cases and to correlate USG findings with histopathological reports (HPR) of removed appendix. Total numbers of 100 patients were included in the study from 12 March 2019 to 5 December 2019. Findings on ultrasound were finally compared with histopathological report of appendices removed on surgery. Those cases with alternate diagnosis were followed up and proved with other means of investigation. The sensitivity, specificity, positive predictive value, negative predictive value and overall accuracy of ultrasound in diagnosis of acute appendicitis in our study were found to be 79 %, 84.20 %, 95.50%, 48.40% and 80% respectively.

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Introduction:-

A acute appendicitis is the most common cause of emergency abdominal surgery⁽¹⁾. It is one of the main causes of acute abdomen⁽²⁾. Without a classic presentation of pain around the umbilicus that migrates towards the lower right quadrant, diagnosis can be difficult. Gynecology may also cause a diagnostic dilemma. To reduce morbidity, it is necessary to early and accurate diagnosis of appendicitis before appendicitis progresses to the perforation. Even though the diagnosis of acute appendicitis is still thought to be a clinical one, a significant number of patients have normal appendices at surgery. Wrong diagnosis of appendicitis has led to a high rate (8-30%) of inappropriate removal of the normal appendix⁽³⁾. Although acute appendicitis has typical clinical presentation in 70% of the cases, about 30% of the patients have an uncertain pre-operative diagnosis due to which there is negative laparotomy in as high as 20-25% cases. The rate of such unnecessary laparotomies is even higher (35-45%) in women of childbearing age, because of the female pelvic organs and complications of pregnancy in this group⁽⁴⁾. Ultrasound has also been shown to be highly sensitive and specific for the diagnosis of not only acute appendicitis but also other conditions that cause right lower quadrant pain⁽⁶⁾. It was not possible to routinely evaluate acute appendicitis routinely till the development of high resolution real time sonography⁽⁶⁾. But at present with availability of high frequency transducers, it is easier to diagnose appendicular pathologies owing to its better resolution. Graded compression sonography is particularly useful in cases of suspected uncomplicated acute appendicitis⁽⁷⁾. Obvious benefits of ultrasound are no ionizing radiation, non-invasive, minimal discomfort to the patient, easy availability, portability, and repeatability no specific patient preparation required⁽⁸⁾. In many centers, sonography has become the procedure of choice for the initial evaluation of acute appendicitis with equivocal clinical features, particularly in pediatric and women of childbearing age group⁽⁹⁾. Very few studies have been done in our country of the country and not enough data available regarding the role of ultrasound in assessing clinically suspected appendicitis cases. Hence, this study

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was conducted to establish the role of sonography either in diagnosis or in ruling out appendicitis as the cause of acute abdomen, thus enabling in avoiding unnecessary negative laparotomies.

Materials and Methods:-

Our study was retrospective study of 100 patients clinically suspected for acute appendicitis. After a detailed history and clinical examination, the patients were subjected to ultrasound examination of the right iliac fossa using graded compression technique as explained by Puylaert using high resolution, high frequency probes. All patients underwent 'sonographic imaging' during 12 March 2019 to 5 December 2019 in Radiodiagnosis department, in Qassim region, King Fahad Hospital. All US studies were performed with the 7.5-10.0MHZ linear array transducer. In women a US study of abdomen and pelvis was acquired with 3.5MHZ-7.0MHZ curvilinear transducer with the patient's bladder partially filled. The standardized protocol involving graded compression longitudinal and transverse images of the right lower quadrant as well as right lower quadrant cine clips. Doppler images were reviewed in available cases.

Result and Discussion:-

Suspected acute appendicitis is one of the most common diagnostic dilemmas encountered in clinical practice. Moreover, clinical signs and symptoms may overlap with other conditions such as viral gastroenteritis, intussusception, and mesenteric adenitis. In female patients, ovarian conditions may also mimic appendicitis. Total number is 100 patients most of them were males 80(80%), females 20 (20%), males to females ratio 4:1 (Figure 1).

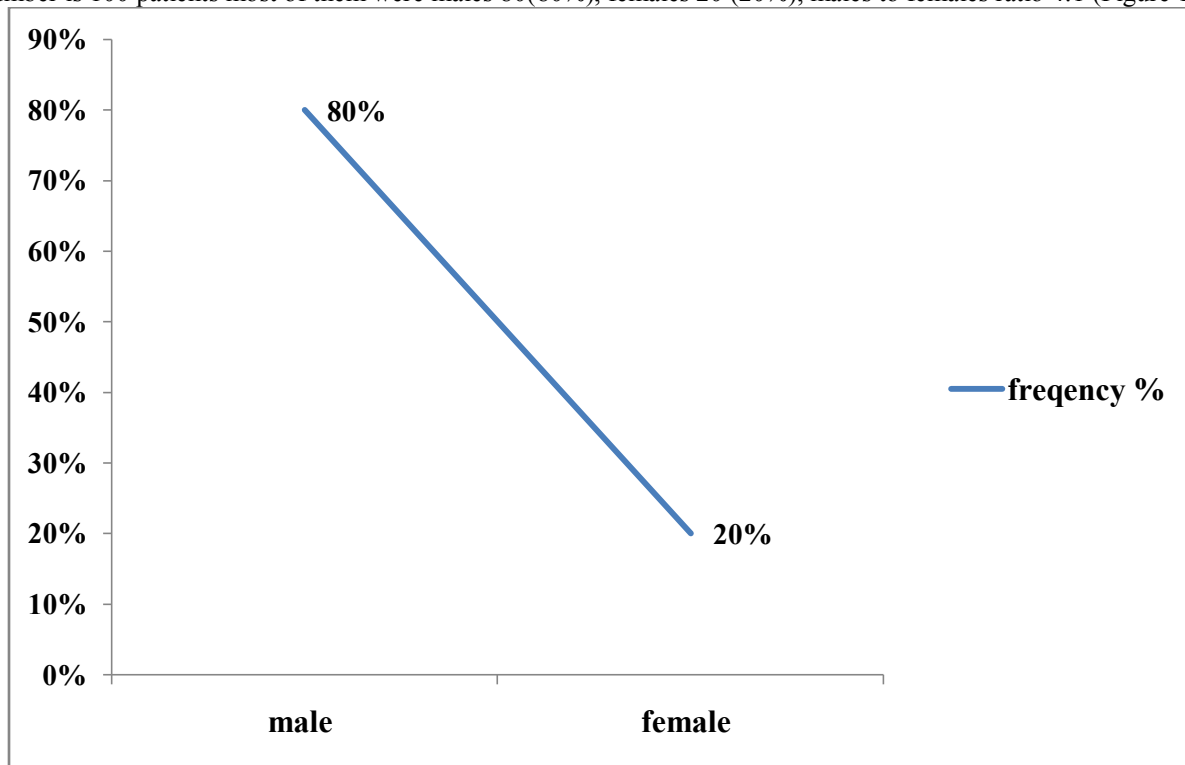


Fig.1:- shows distribution of 100 patient of acute appendicitis according to males and females.

Imaging plays an important role in the modern evaluation of abdominal pain, although a definitive consensus on the appropriate imaging workup protocol remains elusive. The highest level of acute appendicitis in our study is found between the ages 11-30 years 73 (73%) and the low level between 51-70 years 4(4%) most of them were males (Figure 2).

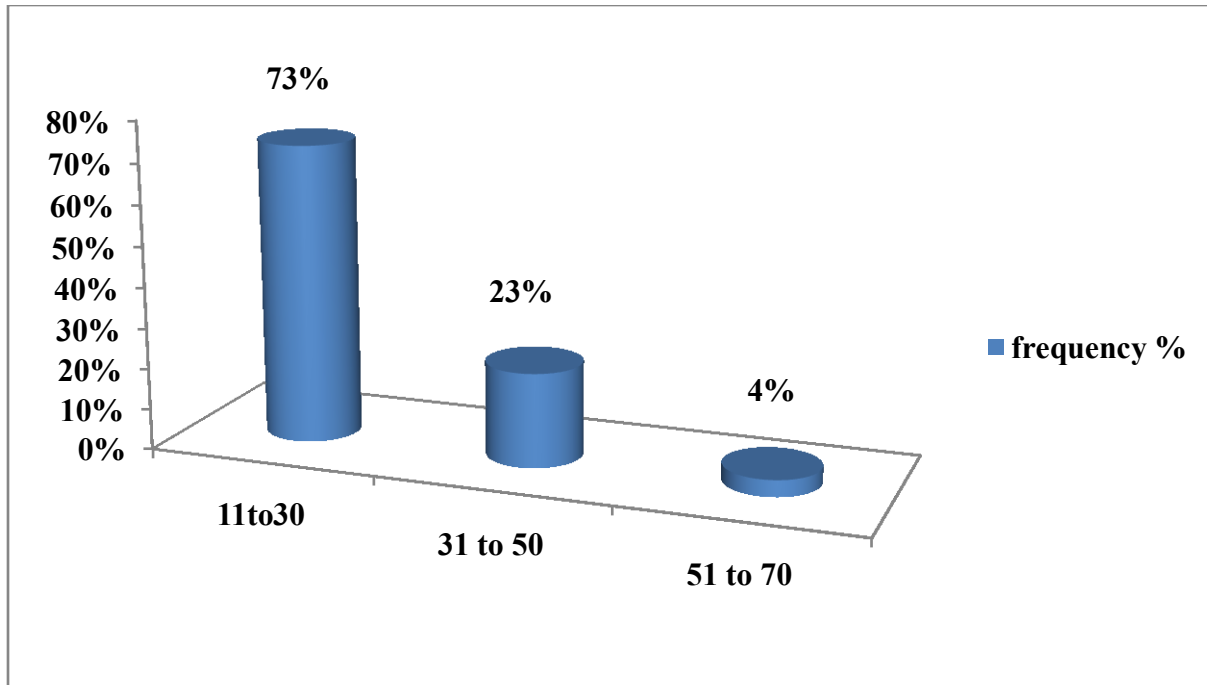


Fig. 2:-Show distribution of 100 patient of acute appendicitis according to range of age.

Patients presented with various symptoms among which 54 % had abdominal pain radiating to right iliac fossa or pain starting directly in right iliac fossa. No significant difference in duration of pain existed between acute appendicitis and other pathological conditions like renal/ureteric colic. Lewis et al ⁽¹⁰⁾ noted pain abdomen in 99% of patients, which was localized to the right lower quadrant in 75% of patients and 10% to the periumbilical area. In our study abdominal pain 54%, Vomiting was seen in 46 % cases, but fever in 17%, whereas diarrhea and constipation was seen in 18 % of patients (Figure3). Our findings are similar to study done by Tauro LF et al ⁽¹¹⁾ in which 37 % patients of acute appendicitis had fever no significant difference in the presentation of illness was seen in other causes of right lower quadrant pain in our study compared to acute appendicitis. This is in conformity with the study done by Lewis et al ⁽¹⁰⁾.

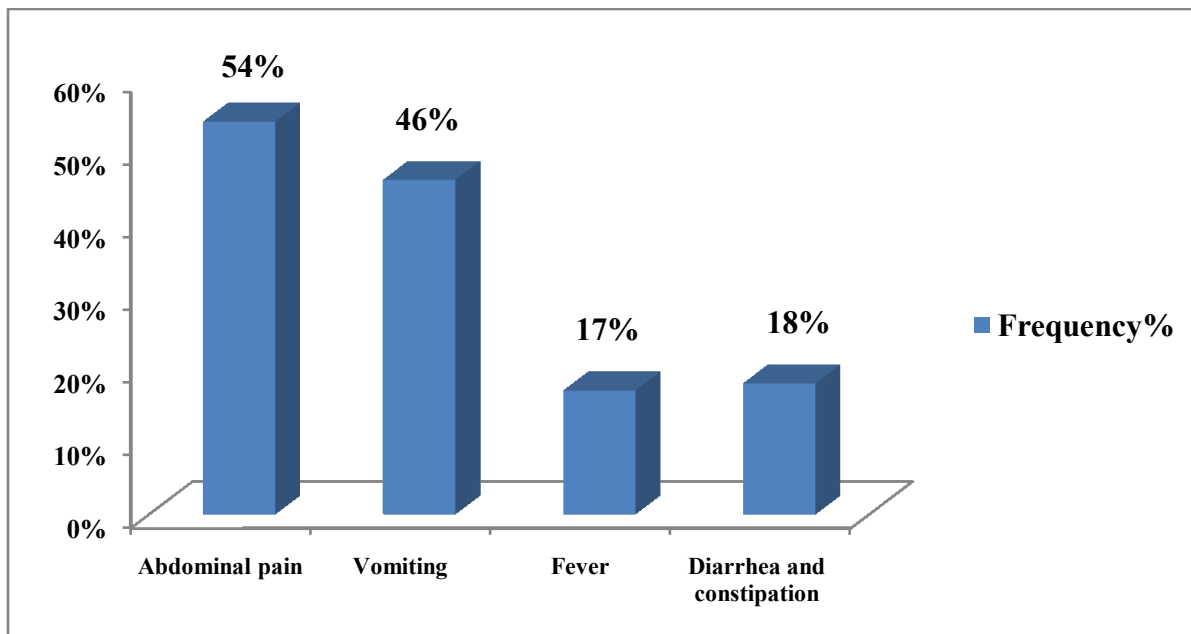


Fig 3:-Show distribution of 100 patient of acute appendicitis according to signs and symptoms.

Blockage in the lining of appendix that result in infection is the main cause of acute appendicitis in our study account 72(72%) followed by the presence of remnants of foreign bodies in the intestine 17(17%) and appendix get blocked result in cancer 11(11%) (Figure 4).

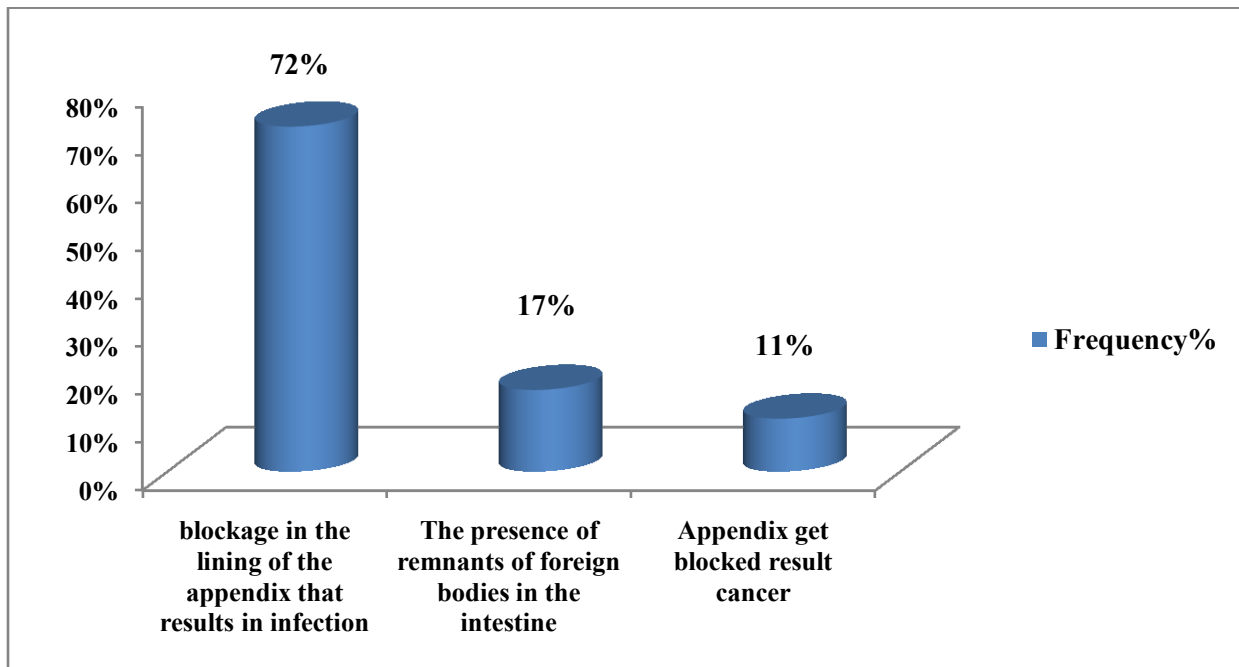


Fig 4:-Shows distribution of 100 patient of acute appendicitis according to causes

Out of 100 cases of this study, 92 cases underwent appendectomy of which 88 cases were proved to be acute appendicitis by histopathological examinations. Among the 100 cases, ultrasonography was reported acute appendicitis in 92 cases. However, the operated USG positive cases of appendicitis, 88 cases were acute appendicitis on histopathological examination. Thus, 88 cases were taken as true positive cases. 4 cases were negative for acute appendicitis on histopathological report and were taken as false positive case. Other 8 cases which were negative for acute appendicitis on ultrasound also underwent computerized tomography (CT) because of typical clinical picture and reducing pain in conservative management. Among these 8 cases, two were positive for appendicitis on (CT). These 2 cases were taken as false negative cases. The remaining six cases were considered true negative. However, these six patients, 4 cases in which we gave alternating diagnosis like right renal calculus, right ureteric calculus and bowel mass which later proved to be caecal malignancy were also taken as true negative cases. Hence, total number of true negative cases in our study was 6 (Figure 5&6).

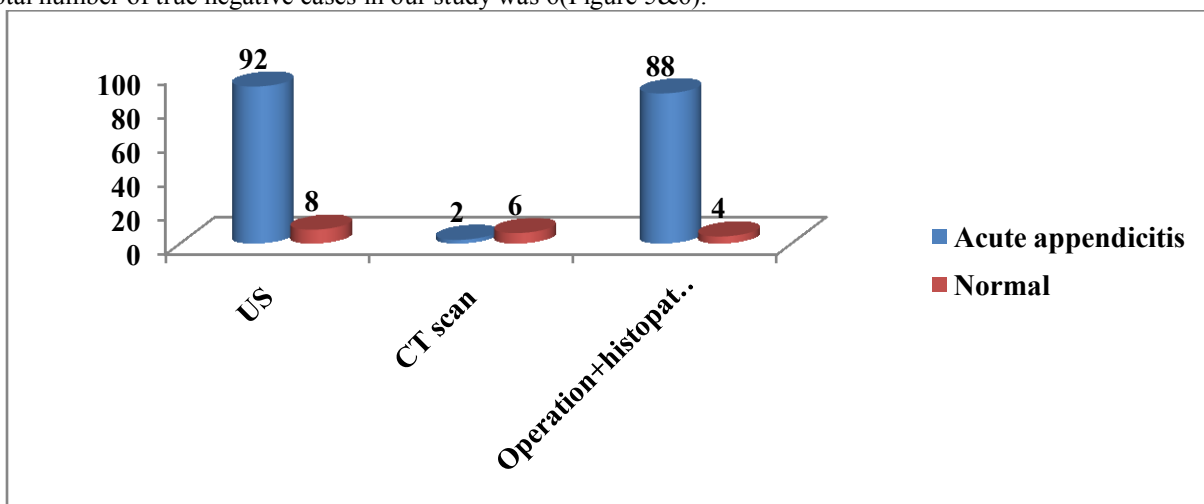


Fig 5:-Show general diagnosis according to US, CT, and operation histopathology examination.

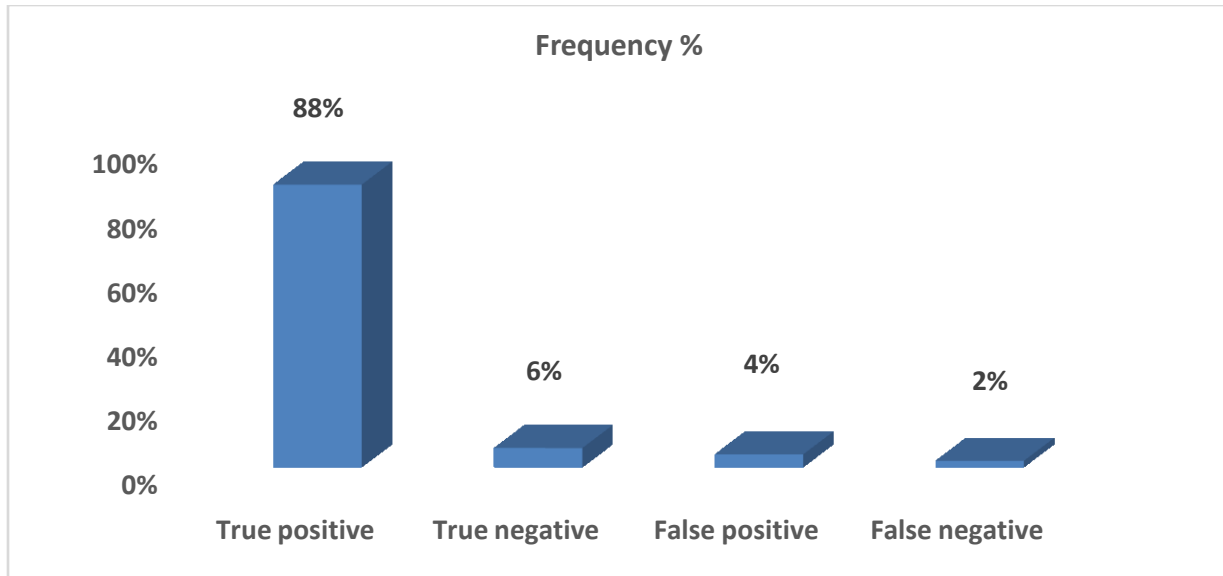


Fig 6:- Ulsterites sensitivities according to diagnosis by US for 100 patients.

The sensitivity, specificity, positive predictive value, negative predictive value and overall accuracy of ultrasound in diagnosis of acute appendicitis in our study were found to be 79 %, 84.20 %, 95.50%, 48.40% and 80% respectively (Figure 7).

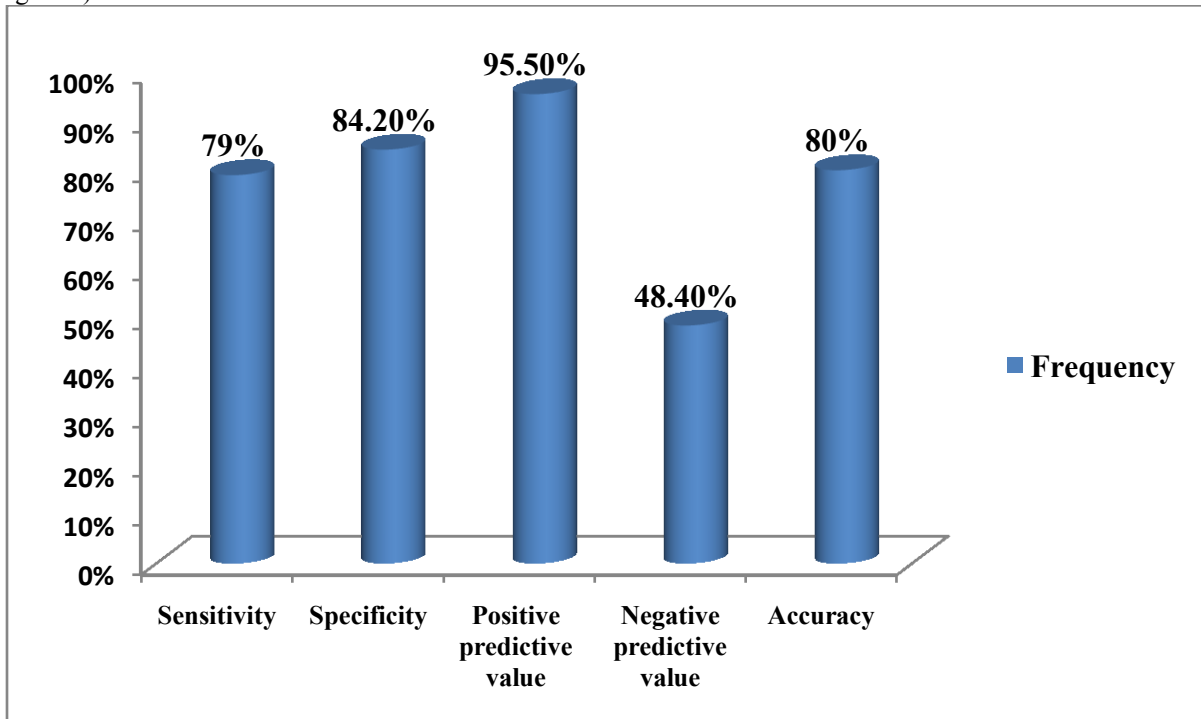


Fig 7:- Shows Sensitivity, Specificity, Positive predictive value, Negative predictive value and Accuracy for acute appendicitis in 100 patients.

In terms of relying on the standard for measuring the thickness of the appendix's edge, as well as its size, this represented the largest number of 68%, while we found tumors attached to the appendix 19%, most of which were benign. But the rupture and bursting of the appendix is only 13% (Figure .8)

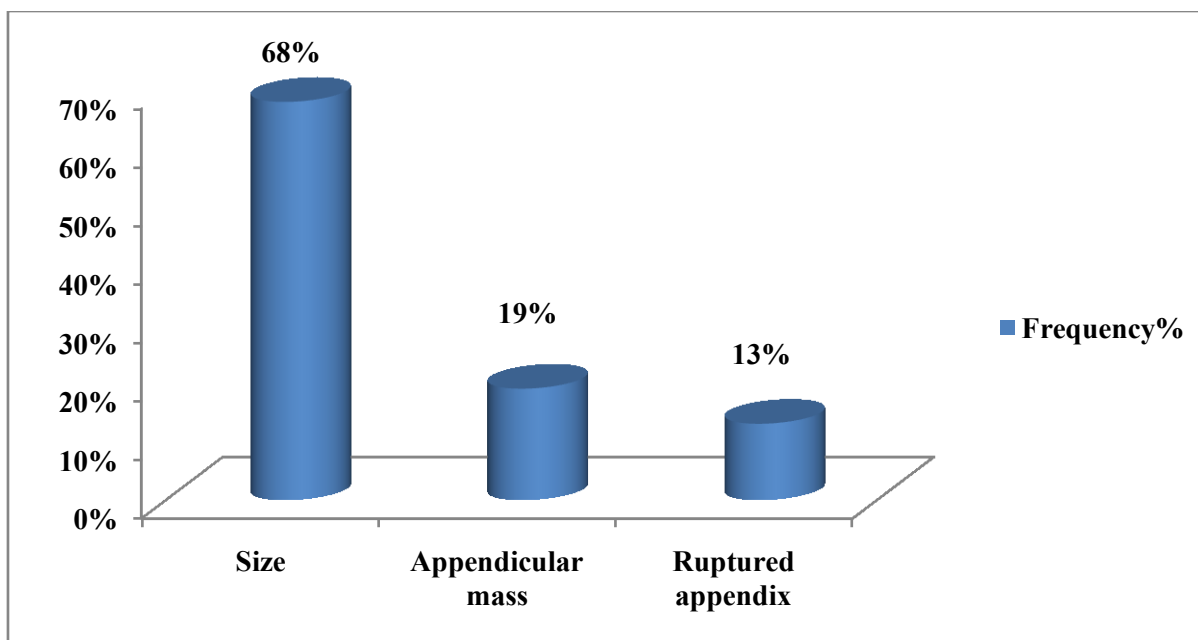


Fig 8:- Shows sonographic features using in diagnosis acute appendicitis for 100 patients.

Our results are comparable to Joshi et al. 1996⁽¹²⁾ who reported diagnostic accuracy of 95 %, sensitivity of 96 %, specificity 93 %, positive predictive value of 93 % and negative predictive value of 88 %. This study results are also similar to study done by Rioux et al⁽¹³⁾ who showed sensitivity of 93 %, specificity of 94 %, positive predictive value of 86%, negative predictive value of 98 % and diagnostic accuracy of 94 %. And so on (Table.1)

Table 1:- Comparative Results in Different Studies.

References	Sensitivity (%)	Specificity (%)	Positive predictive Value (%)	Negative predictive value (%)	Accuracy (%)
Present study	79	84.2	95.5	48.4	80
Joshi et. Al(12)	96	93	98	88	95
Rioux et al (13)	93	94	86	98	94
Puylaert et al (14)	89	100	-	-	-
Wolf et al (15)]	96	93	98	88	95.7
Rettenbacher et al (16)	100	68	63	100	79

Conclusion:-

Sonography has a high NPV and should be considered as a reasonable screening tool in the evaluation of acute appendicitis. Further imaging could be performed if clinical signs and symptoms worsen. The final diagnoses were established on the basis of surgical and histopathologic findings for cases that underwent surgery (n = 92). For nonsurgically treated patients, medical records regarding postpresentation follow-up were reviewed to establish the diagnosis for use in this study. The hospital records for all study patients were reviewed for the 6-month period after their study entry sonograms, few patients would be admitted or taken to our institution. Cases that did not involve surgery and for which follow-up medical records were not available were excluded.

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