

Determining the Effect of Acute Abdominal Pain Using Ultrasound

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How to cite this paper: Elhaj, M. (2023) Determining the Effect of Acute Abdominal Pain Using Ultrasound. *International Journal of Medical Physics, Clinical Engineering and Radiation Oncology*, 12, 9-16.
<https://doi.org/10.4236/ijmpcero.2023.121002>

Received: October 31, 2022

Accepted: February 3, 2023

Published: February 6, 2023

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Abstract

Acute abdominal pain is a medical emergency that is characterized by abrupt, acute, recently developed abdominal pain that is accompanied by other signs that are confined in the abdomen area. The purpose of this study was to illustrate how ultrasonography may be used to identify sudden abdominal pain. From December 2021 and March 2022, a comprehensive examination of 50 patients with acute abdominal pain was conducted. Seven hospitals in Khartoum State, Sudan, examined individuals with clinically suspected abdominal and pelvic deformities using 3.5 MHz ultrasound machines. Out of the 50 (100%) patients who were presented with acute abdominal pain 10 (20%) were appendicitis, 9 (18%) were cholecystitis, 8 (16%) were Nephrolithiasis, 3 (6%) were Choledocholithiasis, 3 (6%) were Chronic kidney disease, 3 (6%) were Cholelithiasis, 3 (6%) were Cystitis, 4 (8%) were Ascites, 1 (2%) was acute kidney injury, 1 (2%) was Acute Peritonitis, 1 (2%) was Diverticulum and 1 (2%) each was of Epigastric hernia, Hepatosplenomegaly, Liver cirrhosis, Nephritis and Ovarian cysts respectively. According to the study results, ultrasonography (US) proceeds to be the go-to imaging strategy in most situations, particularly for younger and female patients, where limiting exposure to radiation must be obligated. The application of Computerized Tomography CT should be restricted in circumstances where there is no diagnostic US and, in all situations, where there is a significant disparity between medical symptoms and negative imaging in the US.

Keywords

Ultrasound, Abdominal Pain, Emergency

1. Introduction

Acute abdominal pain is characterized by severe, and over six-hour-long discomfort in a formerly normal individual that needs prompt diagnosis and vigorous,

typically surgical treatment. A multitude of causes from mild and self-limited condition to surgical emergency can induce severe stomach pain. A method that considers the possibility of illness, clinical records, physical assessment, laboratory testing, and imaging scans is necessary for evaluating abdominal pain [1]. Acute abdomen is indeed a life-threatening emergency which is characterized by immediate, acute abdominal pain with rapid onset and supporting symptoms and signs that are concentrated on the abdomen. It can refer to a wide range of illnesses, from moderate and self-limiting condition to an urgent surgical imperative [2].

Furthermore, only 25% of patients who already have recently been diagnosed with an acute abdomen really undergo surgical therapy; therefore, the clinical challenge is whether the patients require surgical intervention or not, as well as whether the medical alternative must be made as quickly as possible [3]. This makes a careful and rational approach to stomach pain treatment essential. According to some writers, the position of the suffering is a good place to begin and will direct comparative analyses [2] [4]. However, other causes like appendicitis or adenomesenteritis are more prevalent in children or are simply associated with one gender (*i.e.*, gynecologic causes). It's also crucial to take into account certain demographics such as the elderly or cancer patients, who could exhibit unusual clinical symptoms. These factors also reveal a distinct diagnostic technique [2] [5].

Magnetic Resonance Imaging MRI is a device which has proved to be more efficient in emergency circumstances and does not employ radiation exposure [6]. A further benefit of MRI is its outstanding soft-tissue contrasting. However, accessibility and comparative costs prevent MRI from being widely used in times of emergency [7]. Despite these shortcomings, developments in MRI technology such as better pulsing sequence and coil technology as well as a rise in clinician understanding of MRI have raised the demand for abdominal MRI in cases of emergency [8]. This is especially true when evaluating patients with acute appendicitis, especially those who are pregnant, acute pancreatitis, choledocholithiasis with or without cholecystitis, and in rare circumstances, Crohn's disease. MRI also contributes to later follow-up examination in patients with pancreatitis and Crohn's disease [6] [8].

The clinical management of this condition has been improved through the application of Multidetector Computed Tomography (MDCT), which facilitates diagnosis but imposes a load on radiologists in terms of medical therapy [9]. However, despite the fact that CT is becoming a preferred method for evaluating the severe abdomen discomfort. Abdominal ultrasonography can help the doctor see many organs (such as abdominal blood vessels, gallbladder, the intestine, kidneys, liver, pancreas, and spleen) in the abdominal cavity [10]. The doctor can determine the reason for stomach discomfort or enlargement with the use of abdominal ultrasonography. It can aid in the detection of cancers, liver illness, kidney stones, and a variety of other problems [11]. Most of the time, ultrasound (US) is the preferred imaging method, particularly in patients who are young

and female and in whom it is imperative to reduce irradiation [12].

The aim and objective of the current were to 1) To demonstrate the detection, cause and prevalence of acute abdominal pain using ultrasound. 2) To demonstrate the prevalence of acute abdominal pain according to abdominal quadrant, age, gender and weight.

2. Materials and Methods

In this study, we examined 50 patients with acute abdominal pain; all patients attend for abdominopelvic ultrasound scan. Finally, we excluded all patients dose not complain of acute abdominal pain. This research was performed at the time between December 2021 and March 2022. The data used in this study were collected from cases admitted to various hospitals (Ahmed Gasim Hospital, General Omar Sawi Medical Complex, Haj El-Safi Teaching Hospital, Khartoum North Teaching Hospital, Ombada Hospital, and Omdurman Teaching Hospital), at Khartoum, Sudan.

Inclusion criteria were adult patients with ages ranging from 1 years to 85 years old that were clinically who underwent abdominopelvic ultrasound imaging and those diagnosed clinically with acute abdominal pain.

With a 3.5 MHZ curvilinear transducer and a Sony printer utilizing thermal paper, an ultrasound machine (Risingmed, model: RUS 6000D) was used.

This study was prospective descriptive study. The variables of the study were divided into two parts; the first part was related to demographic variables gender, age, weight, and height. The second part was related to ultrasound findings and prevalence of abdominal pathology. Data from the ultrasound images were entered into a protected data sheet for all subjects to maintain consistency with the information. The radiologists and sonographers with experiences more than three years were scanning all patients.

The original summary of all measured data was a table of comparisons. Data was entered as a code using the statistical package for the Social Sciences (SPSS) version 20 (IBM Corp., Armonk, NY, USA). Data were summarized using mean, standard deviation, median, minimum, and maximum in quantitative data, and using frequency (count) and relative frequency (percentage) for categorical data. The gender, diagnosis, and location of anomalies parenthetically found during abdominal ultrasound scans were reported as frequency of incidents and associated proportions.

Approval was obtained from the local ethics committee of the Diagnostic Radiology Department (DRD), Faculty of Radiology and Nuclear Medicine Sciences (FRNMS), National Ribat University, Khartoum, Sudan. The patient included in the study had to give verbally informed consent before recruitments into the study and confidentially was assured.

3. Results and Discussion

Patients visiting the emergency department (ED) complain incessantly of acute

abdominal pain, which can be triggered by a wide range of diseases. In this prospective study we aimed to demonstrate the role of ultrasound in the detection of acute abdominal pain, a total of 50 patients were examined via abdominopelvic ultrasound and presented with clinically suspected abdominal diseases given the presence of acute abdominal pain (**Table 1**). In a study conducted to evaluate the acute abdomen in 152 patients, and an ultrasonographic scan was requested in 66 patients and 77 patients not had requested the result from this study ultrasonography an accuracy of 95% in diagnosing appendicitis [13].

According to analysis of patients with chronic stomach discomfort, women were more impacted than men (**Table 1**). This is due to the fact that from a medical viewpoint, the female population is unique when there is a physical indication of an acute abdomen. Admittedly, pelvic organ disease in women with abdominal pain may also be connected. The three gynecologic disorders that cause acute pelvic pains the most frequently recognized are hemorrhagic ovarian cysts, ectopic pregnancy, and inflammation of the pelvis. Ovarian torsion and deteriorating fibroids develop emerge less commonly. Endometriosis and postpartum reasons such as endometritis or ovary vein thrombosis are further issues to take into account. The most significant of them is acute appendicitis; lastly, non-gynecologic disorders need to be taken into consideration since they may appear with acute pelvic pain. This gender-based differential is consistent with the findings of [14].

To our knowledge, becoming older has always been considered a serious risk factor for abdominal problems. The elevated relative risk might be explained by long-term exposure to recurring environmental conditions. In comparison to the other age categories in the present research, patients aged 31 to 45 years had a greater incidence rate of stomach discomfort (30%) (**Table 2**).

Table 1. Demonstrate the prevalence of acute abdominal pain regarding gender.

	Frequency	Percent
Female	34	68%
Male	16	32%
Total	50	100%

Table 2. Demonstrate the prevalence of acute abdominal pain regarding age group.

	Frequency	Percent
1 - 15 year	5	10%
16 - 30 year	12	24%
31 - 45 year	15	30%
46 - 60 year	11	22%
61 - 75 year	3	6%
75 - 85 year	4	8%
Total	50	100%

The observations of Adam Gyedu *et al.* and our results regarding the impact of age were in accordance [15]. He claimed that the occurrence of abdominal pain gradually increases with age, particularly in individuals who are 40 years or older. Additionally, our study discovered that the following common clinical characteristics associated with these patients' symptoms were observed in these individuals: 1) Vomiting and Abdominal Pain (n = 12; 24%); 2) Fever, Vomiting, and Abdominal Pain (n = 12; 24%); 3) Abdominal Pain only (n = 8; 16%); and 4) Fever and Abdominal Pain (n = 8; 16%) (**Table 3**).

When further exploring symptoms of acute abdominal pain, our findings agree with research conducted by Sharif *et al.* [16]. To demonstrate the signs and symptoms of common abdominal complaints of patients in pain, where they found that the traditional cardinal symptoms of abdominal complaints are abdominal pain, vomiting, abdominal distention and Fever. Many patients do not present with all the symptoms, however, and some patients will still pass gas or stool.

Additionally, there are specific situations where it is crucial to choose medical treatment. This makes a careful and rational approach to stomach pain diagnosis essential. According to some research, the position of the pain is a helpful place to start and will direct surgeons throughout diagnosis. Our findings demonstrate that abdominal pain is the most frequent in the right upper quadrant and left upper quadrant (46%) and (20%), respectively (**Table 4**).

The main reason for our results is that the majority of this pain in right and left upper quadrants was due to abnormalities in the biliary and urinary systems (**Table 4**). According to our understanding, the most typical reason for right lower quadrant pain that necessitates surgery is appendicitis. Patients suffering from acute appendicitis typically appear with abdominal pain as their main symptom. In the study conducted by Gianfranco Cervellin *et al.* [14], the prevalence of appendicitis was 4.54%, while the prevalence of appendicitis in our study was 20% (**Table 5**). The lower sample size relative to previous research may be the cause of the variation in prevalence rate.

Table 3. Demonstrate the compiling of a patient referred to ultrasound examination.

	Frequency	Percent
Abdominal Pain	8	16%
Fever, Dysuria and Abdominal Pain	4	8%
Fever and Abdominal Pain	8	16%
Fever, Vomiting and Abdominal Pain	12	24%
Hematuria and Abdominal Pain	2	4%
Nausea and Abdominal Pain	4	8%
Vomiting and Abdominal Pain	12	24%
Total	50	100%

Table 4. Demonstrate the prevalence of acute abdominal pain regarding abdominal quadrants.

	Frequency	Percent
left lower quadrant LLQ	2	4%
left upper quadrant LUQ	10	20%
LUQ and LLQ	1	2%
Right lower quadrant RLQ	10	20%
Right upper quadrant RUQ	23	46%
RUQ and LUQ	4	8%
Total	50	100%

Table 5. Demonstrate the Sonographic findings in a patient complaining of acute abdominal pain.

	Frequency	Percent
Acute kidney injury	1	2%
Acute Peritonitis	1	2%
Appendicitis	10	20%
Ascites	4	8%
Cholecystitis	9	18%
Choledocholithiasis	3	6%
Cholelithiasis	2	4%
Chronic kidney disease	3	6%
Cystitis	3	6%
Diverticulum	1	2%
Epigastric hernia	1	2%
Hepatosplenomegaly	1	2%
Liver cirrhosis	1	2%
Nephritis	1	2%
Nephrolithiasis	8	16%
Ovarian cysts	1	2%
Total	50	100%

Moreover, gallbladder inflammation known as cholecystitis typically results from a gallstone blocking the cystic duct. In our study, individuals who come with recently developed abdominal pain must be examined for acute cholecystitis as a main diagnostic indication (n = 9; 18%). In a study carried out using ultrasound of the abdomen, the incidence of Cholecystitis was noted to be 5.9% [15]. This difference between our results and Adam Gyedu [15]'s results might be due to the fact that our sample size is smaller than the population they investigated. Because of the random selection approach, the population's heterogeneity is a limita-

tion of this study, which might affect the precision of our results and decrease the impact of our findings. Further shortcomings of this research included: Considering that none of the imaging modalities employed included a second observer and that the cohort sample size was rather modest.

4. Study Limitation

This study is limited by the heterogeneity of the population because of the randomized selection process, which may influence the exactness of our outcomes and lessen the intensity of our conclusions. Other limitations of this study were: 1) there was no second observer for any of the ultrasound techniques used, meaning that the error rate of interobserver and intraobserver variability cannot be calculated; 2) there was a relatively small cohort sample size.

5. Conclusion

The US has retained a significant role in the assessment of the acute abdomen even throughout the recent dissemination of MDCT because of its accessibility, cheap cost, lack of radiation exposure, and requirement for contrasting materials. Radiologists will be able to employ this imaging modality to its full potential by being aware of both the normal and abnormal sonographic features of the gut and paying close attention to technique.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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