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VALUE OF CT SCAN IN NON-TRAUMATIC ACUTE ABDOMEN IN ELDERLY

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Abstract:

Introduction: Differential diagnosis of acute abdomen ranges from benign to life-threatening causes, necessitating imaging for prompt identification. Elderly individuals tend to postpone seeking medical attention and exhibit atypical pathological manifestations and concurrent illnesses, often requiring more time and resources for evaluation.

Objective: To study, assess, and diagnose causes of acute abdomen accurately and to assess the diagnostic role of CT in cases where clinical examination and ultrasound failed to provide a diagnosis among the elderly.

Methodology: A prospective study at Al-Hussein Teaching Hospital Thi-qar's Emergency Department. Seventy-two patients who were over 60 years old, with inconclusive ultrasound, history, and examinations, were assessed from the 1st of March 2023 to the 1st of March 2024. Patients' demographic and clinical data were collected via a questionnaire. They underwent imaging including X-rays, ultrasound, and CT scans, with contrast used selectively.

Results: A study of 72 elderly patients with non-traumatic acute abdomen revealed males as 58.3%, mean age of 65.23 years. Most resided in urban areas (58.3%), 41.7% were illiterate, and 41.7% were retired. Comorbidities were prevalent (66.7%), primarily diabetes mellitus (44.4%). Tumors were the leading CT diagnosis (29.17%), followed by intestinal obstruction (12.5%). 55.6% required surgery, 44.4% were treated conservatively. Most admissions were to the ward (48.6%), with a mean hospital stay of 3.3 days.

Conclusion: CT imaging aids in diagnosing acute abdominal diseases in the elderly, revealing tumors and obstructions. While valuable, it may not always detect underlying conditions, necessitating comprehensive diagnostic strategies and personalized treatments.

Keywords: *CT, elderly, acute abdomen, non-traumatic.*

Introduction

1. INTRODUCTION:

Acute abdomen is a medical condition that requires immediate attention and treatment. Possible etiologies of the acute abdomen include infection, inflammation, vascular occlusion, or obstructions. (1)

Non-traumatic abdominal pain is among the top three most prevalent symptoms seen in people seeking care at emergency departments or being admitted to general hospitals. The differential diagnosis of an acute abdomen encompasses a wide range of causes, ranging from benign self-limiting conditions where surgery may not be necessary, to severe conditions with high morbidity or mortality that need immediate surgical intervention. (2)

Diagnosing the underlying cause of acute abdominal pain may be challenging for all demographic groups, but it is more problematic for the elderly. Furthermore, elderly individuals tend to postpone seeking medical attention and exhibit atypical pathological manifestations and concurrent illnesses. Older patients often need more time and resources during the evaluation procedure compared to younger patients, mostly due to cognitive impairment. (3)

Abdominal pain is the reason for 7% to 10% of visits to the emergency room. Non-specific abdominal pain is the diagnosis made for around one-third of individuals with abdominal pain. (4)

Common causes of a non-traumatic acute abdomen include: (1,5) Cholecystitis, Pancreatitis, and Diverticulitis., Acute peritonitis, which may be caused by the rupture of a hollow viscus or as a consequence of inflammatory bowel disease or cancer, is a contributing factor to the acute abdomen, Biliary diseases, Mesenteric ischemia and ruptured abdominal aortic aneurysm, Urologic disorders such as ureteral colic and pyelonephritis, Many others include small bowel obstruction as a cause of acute abdomen.

The aim of the history and physical exam is to rule out certain illnesses and suggest other possibilities. Unfortunately, the majority of illnesses do not exhibit typical signs and symptoms. (1)

The field of diagnostic imaging has had significant advancements during the last thirty years. An ultrasound performed at the bedside in the Emergency Department may quickly and accurately detect conditions such as cholecystitis, hydronephrosis, hemoperitoneum, and the existence of an abdominal aortic aneurysm in less than 5 minutes. The use of multislice helical CT scanning has significantly simplified the process of diagnosing an acute abdomen. In most instances, intravenous (IV) contrast is adequate. (5)

Computed tomography (CT) is a medical imaging technique that uses X-rays to generate detailed cross-sectional images of the body. The introduction of CT scans in 1973 produced a revolutionary change in cross-sectional imaging. Abdominal CT scans are enhanced using contrast media administered orally, rectally, and intravenously. This makes the examination invasive and costly. (6)

The diagnostic accuracy of CT scans may differ based on the specific medical condition being assessed, the characteristics of the scanner, and the use of contrast agents. In the last decade, there has been a rise in the use of CT scans to assist in the diagnosis of individuals who have abdominal

pain. It has been associated with a high level of accuracy in diagnosing, with a sensitivity and specificity of about 90–95%. (7)

In abdominal CT examinations, intestinal wall thickening is a common nonspecific imaging finding that may be associated with several different disorders, including ischemia, neoplasia, inflammatory bowel disease, and infections. Determining the cause of intestinal wall thickening in individuals with an acute abdomen may be especially challenging, and it can have significant consequences for the management of patients. (8) Imaging characteristics such as the extent of involvement, degree of thickening (normal values ranging from 2-5 mm depending on the specific bowel segment and level of distention), symmetry, and pattern of attenuation, along with the presence of enteric abnormalities such as pneumatosis intestinalis and peri-enteric abnormalities such as portal venous gas, can aid in narrowing down the potential diagnoses. (9,10)

Contrast enhancement is an essential feature for distinguishing between inflammatory, ischemic, and neoplastic causes, (11) as well as for assessing the inflammatory activity, (12) and severity of intestinal ischemia. (13) Furthermore, the use of dual-energy CT-based iodine mapping has been recommended for assessing intestinal disease and might eliminate the need for an unenhanced acquisition. (14) This approach has the potential to increase the visualisation and measurement of minor variations in the enhancement of the intestinal wall in conditions such as ischemia, inflammation, and neoplasia. (15)

2. RESEARCH OBJECTIVES

1. To study, assess, and diagnose causes of acute abdomen accurately.
2. To assess the diagnostic role of CT in cases where clinical examination and ultrasound failed to provide a diagnosis among the elderly.

3. METHODOLOGY

A prospective study was conducted in Al-Hussein Teaching Hospital Thi-qar, Emergency Department. During the period from 1st of March 2023 to 1st of March 2024.

Seventy-two patients were above 60 years old and presented to the emergency department in Al-Hussein Teaching Hospital with non-traumatic acute abdominal conditions with uncertain cause despite detailed history and examination with negative or non-conclusive U/S, plain abdominal and chest X-ray findings.

Patients who were older than 60 years old, Patients with a history of recent abdominal trauma, Those who were diagnosed by abdominal ultrasound, and Patients with chronic abdominal pain were excluded from the study.

The official agreement was obtained from the scientific council of the College of Medicine/University of Thi-qar and Thi-qar Health Directorate on carrying out this study. The verbal and written consent of the enrolled patients had been secured before participation. The collected data was not used for any other purpose.

All patients were interviewed using a special questionnaire. The Patients' demographic characteristics include age, residency, occupation, and education. The Clinical profile includes The patient's past medical and surgical history.

All patients were examined for the following aspects: Plain X-rays of the abdomen, chest and abdominal U/S were performed for all patients.

Multidetector CT scan was performed for all those patients included in the study using the General Electric Healthcare Japan Corporation 128 AQUILION. The MDCT protocol should include a pre-contrast scan. If MDCT scans are done to reach the correct diagnosis or establish the extent of

disease whenever possible, the patients should receive intravenous CM. CM is essential for diagnosing vascular disease (aortic or splanchnic vessel bleeding) as well as for bowel ischemia. (16) Contrast-enhanced images help delineate the bowel wall in patients with poor fat planes and free fluid surrounding the bowel. (16) CT protocol was applied according to the clinical presentation of the patient. A non-enhanced CT scan was done first for all patients while the patient was lying in a supine position. If the Non-enhanced CT scan was not sufficient to reach the diagnosis in patients, then the contrast CT was used. Contrast materials were not used in those with a history of severe or anaphylactic reactions to contrast agents and renal impairment or failure. If mesenteric vessel pathology was suspected, CT angiography protocol was performed. The contrast agent used is iohexol given by automatic injector via wide bore cannula 20 gauge, at a rate of 3-5 cc/second with bullous tracking placed on the thoracic aorta, followed by normal saline infusion (half the volume of the consumed contrast) by another syringe in the same injector (dual injector), the scanning starts at density threshold of 120HU and patient asked to hold breathing.

The typical phases (time from injection): (17)

Early arterial phase: 15-25 seconds post-injection.

Late arterial phase: 30-40 seconds post-injection.

Portal venous phase: 70-90 seconds post-injection

Nephrogenic phase: 85-120 seconds post-injection

Excretory phase: 5-10 minutes post-injection.

Then the results of the CT scan were interpreted by a specialist radiologist taking into consideration the U/S and plain XR findings with the clinical data. The patients then followed up clinically to see if they were operated on or treated conservatively.

Data was entered using computerized statistical software; Statistical Package for Social Sciences (SPSS) version 26 was used. the result is presented as tables and/or graphs.

4. RESULTS

The result of 72 elderly patients who presented to the hospital with a non-traumatic acute abdomen were included in the study, male patients formed 58.3% of participants. Their mean age was 65.23 years. Regarding their residency, 42 patients lived in urban areas. Forty-one per cent of patients were illiterate and only six of them had a college education. Regarding their occupation, most of them were retired (41.7%). All these data are presented in Table (1).

Table 1. - The sociodemographic characteristics of the participants

Variable		No.	%
Sex	Male	42	58.3
	Female	30	41.7
Age	Range	60-78	
	Mean ± SD	65.23 ±4.91	
Residency	Rural	30	41.7
	Urban	42	58.3
Level of education	Illiterate	30	41.7
	Primary school	12	16.7
	Intermediate school	12	16.7
	Secondary school	12	16.7
	College	6	8.3
Occupation	Housewives	24	33.3

	Employed	12	16.7
	Self-employed	6	8.3
	Retired	30	41.7

Table (2) shows the medical characteristics of the participants, 66.7% of them mentioned a history of medical diseases. 44.4% of them had diabetes mellitus, and only five of them were anaemic.

Table 2. - The medical characteristics of the participants

Variable		No.	%
Any history of comorbidities	No	24	33.3
	Yes	48	66.7
	DM	32	44.4
	Anemia	5	6.9
	HTN	20	27.8
	COPD	11	15.3
	IHD	27	37.5

Figure (1) shows the frequency of diagnosis made by CT, tumors were found to be the major cause of acute abdomen, followed by intestinal obstruction, and those with no specific pathology formed 9.72%.

Only one case of acute cholecystitis and one case of abdominal aortic aneurysm were diagnosed by CT.

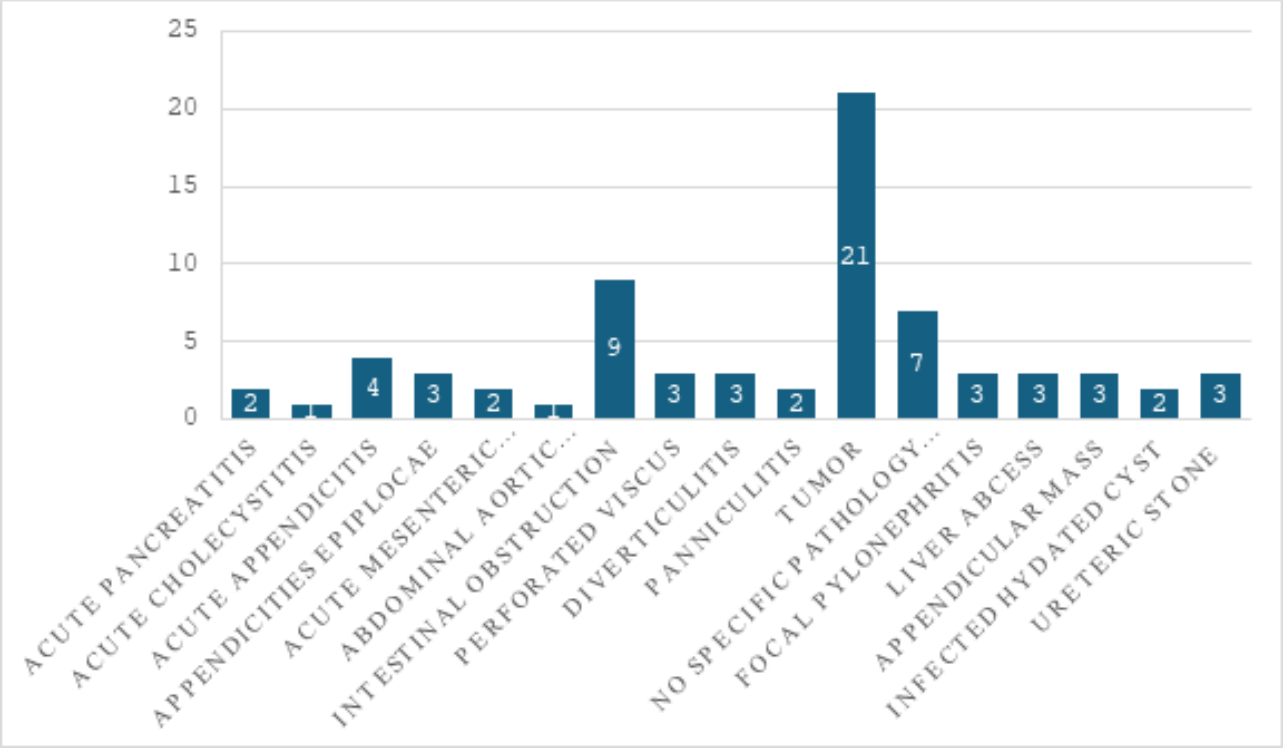

Figure 1. - the frequency of acute abdomen cases diagnosed by CT.

Table (3) shows the frequency of conditions diagnosed by CT and the methods of treatment. Tumor was the most common cause of acute abdomen among the elderly (29.17%), followed by intestinal obstruction in 12.5% of patients.

The CT was unable to diagnose the underlying pathology among 7 patients, 4 of them responded very well to the supportive therapy and were treated conservatively while three of them needed surgery which revealed focal inflammation and small bowel necrosis. Two cases were diagnosed as acute pancreatitis and both of them were treated conservatively. Acute cholecystitis was diagnosed in one patient only.

Of those 4 cases of appendicitis, 3 need urgent surgical intervention while Appendicitis epiplocae is treated conservatively. Acute mesenteric ischaemia and abdominal aortic aneurysm were diagnosed in 3 patients and needed surgery.

Focal pyelonephritis, Liver abscess, Appendicular mass, Infected hydatid cyst Ureteric stone, Perforated viscus, Diverticulitis, and Panniculitis were diagnosed among some patients.

Out of a total of 72 patients, 40 needed surgical intervention and 32 patients were treated conservatively.

Table 3.- The frequency of conditions diagnosed by CT and the methods of treatment

Diagnosis	No.	%	Method of treatment
Acute pancreatitis	2	2.78	2 Conserviteve
Acute cholecystitis	1	1.39	1 Conservative
Acute appendicitis	4	5.56	1 conservative 3 surgery
Appendicitis epiplocae	3	4.17	3 conservative
Acute mesenteric ischaemia	2	2.77	2 Surgery
abdominal aortic aneurysm	1	1.39	1 surgery
Intestinal obstruction	9	12.5	7 surgery 2 conservative
Perforated viscus	3	4.17	3 surgery
Diverticulitis	3	4.17	2 Conservative
Panniculitis	2	2.77	2 conservative
Tumor	21	29.17	17 surgery 4 conservative
No specific pathology detected	7	9.72	4 conservative 3 surgery
Focal pyelonephritis	3	4.17	3 Conservative
Liver abscess	3	4.17	3 Surgery
Appendicular mass	3	4.17	2 Conservative Surgery
Infected hydatid cyst	2	2.78	2 Surgery
Ureteric stone	3	4.17	2 conservative 1 surgery

Table (4) shows the place of data collection and the duration of patients' admission. The highest percentage of the patients needed ward admission and only 5 patients needed an ICU admission with a mean hospital stay of 3.3 days.

Table 4.- the site of data collection and duration of admission

Variables		No.	%
Place of admission	No need for admission	32	44.5
	Ward	35	48.6
	ICU	5	6.9
Duration of admission in days	Mean± SD	3.3 ± 1.5	

5. DISCUSSION

The field of medical imaging is undergoing significant evolution as a result of the use of powerful computer applications. Non-traumatic acute abdominal pain is a prevalent symptom among people seeking medical attention at the emergency department. (5)

Interestingly, in the present investigation, tumours were shown to be the most common diagnosis established by CT scans in older individuals with acute abdominal problems. Caraiani et al., (2020) found that CT imaging is a very efficient method for identifying and pinpointing tumours inside the abdomen. It can precisely detect the existence of anomalous tissue proliferation in several abdominal organs including the liver, pancreas, kidneys, spleen, and gastrointestinal system. (18)

CT scans in this investigation revealed that intestinal blockage is the second most prevalent abnormality. Research conducted by Singh et al. in 2018 showed that CT scans are very effective in identifying small intestinal obstruction, with a sensitivity of up to 93% and a specificity of 100%. The accuracy of CT scans in diagnosing small intestine blockage is around 94%. (19) This makes CT scans more effective in identifying and locating bowel blockage, as well as detecting the underlying reason for the obstruction.

The sensitivity and specificity of computed tomography (CT) in adults for the diagnosis of appendicitis are significantly elevated. Unenhanced standard-dose CT exhibits reduced sensitivity compared to standard-dose CT with the addition of intravenous, rectal, or oral and intravenous contrast enhancement. (20) The present investigation successfully identified 4 instances (5.56%) of appendicitis by CT which is much lower than the percentage reported by a meta-analysis performed by van Randen et al., (2018) which is equal to 50% and this could be due to variation in sample size and the inclusion criteria. (21)

A study conducted by Aljiffry et al. (2023) in Saudia Arabia found that 3.4% of patients presenting with abdominal pain were diagnosed with acute pancreatitis. (22) This percentage is closely comparable to the percentage reported in our study, which was less than 3%. The decreasing prevalence of acute pancreatitis in our area may be ascribed to reduced alcohol use, which is the primary cause of pancreatitis globally. This trend is not in line with the increasing occurrence of acute pancreatitis in Western countries over the last twenty years. (23) The variation in this occurrence across nations may be partially due to differences in alcohol consumption rates. (24)

In addition, Akool and colleagues (2016) found that a significant proportion of cases, namely 14 patients (17.5%), had no identifiable pathology, which aligns with our result. However, our reported percentage of nonspecific pathology was somewhat lower, at less than 10%. (25)

Weizman et al. (2011) documented a percentage of less than 5 with diverticulitis that was treated non-surgically, consistent with Jacobs's (2017) findings of a low occurrence of spontaneous rupture. Both studies highlight the effectiveness of CT in precisely identifying perforations. (26,27)

Nevertheless, our research did not particularly detect instances of perforated diverticulitis. However, it successfully identified 4.17% of cases of diverticulitis, which is a proportion that may be compared to others. Akool et al.'s investigation identified six instances (7.5%) of perforated peptic ulcers that need surgical intervention. This discovery demonstrates the grave severity of gastrointestinal perforation, which is often caused by peptic ulcers and diverticulitis, as emphasised in other studies. (25) However, it is important to note that our research did not include precise data on perforated peptic ulcers. Nonetheless, we did observe a prevalence of 4.17% of perforated viscus cases, all of which were treated with surgical intervention. In contrast, Stoker et al. (2009) found that the occurrence of perforated peptic ulcers has decreased as a result of the increased availability of advanced medical treatments. (28)

Oliva et al., (2013) found that acute mesenteric ischemia is often caused by acute embolism in the superior mesenteric artery (SMA), which accounts for about 40%-50% of cases. (29) Contrary to these data, Akool et al.'s (2016) research revealed that 10% of all patients had portal or mesenteric vein thrombosis, whereas 5% had mesenteric arterial thrombosis. We recorded a significantly reduced proportion, equivalent to 2.77. (25)

In addition, we discovered a solitary instance of acute cholecystitis (1.39%). Stoker et al. (2009) estimated that about 5% of patients who come to the emergency department with acute abdominal pain have acute cholecystitis. (28) Diagnosis of this condition normally depends on factors such as medical history, clinical examination, and ultrasound results. Our study reported a lower percentage than what is reported by the above-mentioned study.

In a research conducted by Bennett et al. (2012), CT imaging showed high accuracy in detecting renal abnormalities, with a sensitivity of 92% and a specificity of 99%. (30) It was found that patients with renal disorders did not have unexplained acute abdominal discomfort. This suggests that the diagnosis of renal issues usually depends on factors such as medical history, physical examination, laboratory testing, and ultrasound examination. (1) We successfully detected three instances of ureteric stones, which account for 4.17% of the total cases.

6. CONCLUSION

CT imaging has become an essential tool for identifying many acute abdominal diseases in elderly individuals, in addition to clinical evaluation and ultrasound findings. The research revealed a significant occurrence of tumours and intestinal obstructions as the main reasons for sudden abdominal discomfort in this population, emphasising the need for timely and precise diagnosis. Although CT scans are useful for diagnosis, they may not always be able to identify underlying medical conditions. This highlights the need to use a complete diagnostic strategy that includes clinical correlation and other types of imaging tests.

RECOMMENDATION

Improving the education and knowledge of healthcare providers on the many causes and diagnostic methods such as CT scans for acute abdominal problems in senior people might help in diagnosing them quickly and accurately, resulting in better patient outcomes and satisfaction. Also Performing multicenter studies that include a variety of healthcare settings and bigger groups of patients will help us get a more thorough knowledge of acute abdominal disorders in the aged population.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest

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