

Utilizing CT scan for Differential Diagnosis of Acute Abdominal Pain: A Retrospective Descriptive Study in King Khalid Hospital, Najran Province

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Abstract

The purpose: The objective of this study was to analyze the demographic characteristics, symptoms, indications, and CT scan findings of patients with acute abdominal pain. **Methods:** The study utilized a descriptive design and collected data from 50 patients. Information on demographic characteristics, symptoms, indications, abdominal quadrant pain, affected systems, CT scan protocols, contrast media use, primary CT scan diagnoses, and secondary CT scan diagnoses were recorded and analyzed. **Result:** The research examined a majority of male participants (66%) who were Saudi nationals (78%). In terms of age distribution, 34% of the participants were 30 years old or younger, 52% were between 30 and 60 years old, and 14% were 61 years old or older. The most commonly reported symptoms were stomachache and vomiting (40%), followed by distention (18%). Other symptoms included fatigue (14%), blood in urine (10%), fever (8%), diarrhea (6%), and constipation (4%). The most prevalent indication was upper abdominal pain (34%), followed by lower abdominal pain (24%). Additionally, cases of trauma due to road traffic accidents (14%), renal colic (12%), and trauma due to abdominal injury (8%) were reported. The left upper quadrant (LUQ) was the most frequently reported site of abdominal quadrant pain (40%), followed by the right lower quadrant (RLQ) (26%). The digestive system was the most commonly affected system (56%), followed by the urinary tract system (20%). The majority of CT scans focused on the abdomen and pelvis (86%), with only 14% solely focusing on the abdomen. 72% of the scans were performed without contrast media, while 28% involved its administration. Among the analyzed cases, 32% had normal CT scan results, while 68% were diagnosed with an abnormality. The most common secondary diagnoses from CT scans were digestive system problems (35%) and renal problems (20%). Less common secondary diagnoses included portal vein thrombosis (3%), lymphatic diseases (9%), liver diseases (12%), hernia (15%), bilobar pneumobilia (3%), and enlarged prostate (3%). **Conclusion:** this study provides valuable information on the demographic characteristics, symptoms, indications, and CT scan findings of patients with acute abdominal pain. This information can contribute to a better understanding of the condition and aid in its diagnosis and management.

Keyword: CT scan, differential diagnosis, acute abdominal pain, Najran Province, retrospective study

Introduction

Acute abdominal pain is a frequently encountered complaint in emergency departments worldwide. It may arise from various causes such as infection, inflammation, vascular occlusion, or obstruction. Typically, patients will experience a sudden onset of abdominal pain accompanied by feelings of nausea or vomiting (Patterson , Kashyap & Dominique 2024).

The precise and timely identification of the underlying cause of acute abdominal pain is crucial for effective management and optimal patient outcomes. However, due to the diverse

array of potential causes, many of which exhibit similar clinical features, assessing acute abdominal pain can be challenging. Therefore, it is imperative to adopt a systematic approach to the differential diagnosis in order to ensure accurate and efficient decision-making (Dolin, et al. 2019).

The utilization of computed tomography (CT) scan has become an indispensable asset in assessing individuals experiencing acute abdominal pain. This imaging technique offers comprehensive cross-sectional images of the abdomen, enabling the detection of any structural irregularities or pathological

conditions. By providing a quick and non-invasive evaluation of the abdominal organs, blood vessels, and adjacent structures, CT scan greatly assists in determining the root cause of acute abdominal pain (**Chin, et al., 2012**).

The diagnostic accuracy and patient management in cases of acute abdominal pain have been greatly enhanced by the use of CT scan. Numerous studies have shown that CT scan has a high sensitivity and specificity in detecting different abdominal pathologies such as appendicitis, diverticulitis, bowel obstruction, and abdominal aortic aneurysm (**Karia, et al., 2017**). Additionally, CT scan can assist in distinguishing between surgical and non-surgical causes of acute abdominal pain, thereby aiding in the decision-making process for surgical intervention (**Benjamin, et al., 2019**).

The evaluation of acute abdominal pain poses a challenging task due to the wide array of potential causes. In this regard, computed tomography (CT) scan has emerged as a valuable tool, offering detailed anatomical information and aiding in the accurate diagnosis of various pathologies. CT scan plays a pivotal role in the differential diagnosis of conditions like appendicitis, diverticulitis, renal colic, gastrointestinal perforation, and mesenteric ischemia. Nevertheless, it is crucial to acknowledge the limitations of CT scan, which encompass radiation exposure and the requirement for intravenous contrast administration (**Linzay & Pandit, 2023**). Hence, a well-balanced approach that takes into account the clinical context and individual patient factors becomes imperative for the optimal utilization of CT scan in the differential diagnosis of acute abdominal pain (**Di Saverio, et al., 2020**) & (**Furukawa, et al., 2005**).

The field of radiology has been transformed by the introduction of CT scan, which has become an indispensable tool for assessing acute abdominal pain (**Olson., et al, 2019**). It surpasses other imaging techniques by offering intricate cross-sectional images of abdominal structures (**Patti & Leslie, 2024**). CT scan has the ability to identify subtle abnormalities that may go unnoticed by other imaging modalities, proving its value in cases where the cause of

abdominal pain is uncertain. According to a study conducted by Smith et al. in 2018, CT scan exhibited a remarkable level of sensitivity and specificity in pinpointing the underlying cause of abdominal pain, establishing its credibility as a dependable tool for differential diagnosis (**Smith et al. 2018**).

In situations where acute appendicitis is suspected, it is imperative to promptly diagnose the condition and proceed with surgical intervention. According to a study conducted by Ahmed et al. in 2017, CT scans have proven to be highly accurate in diagnosing acute appendicitis, thereby assisting in making informed decisions regarding surgical intervention (**Ahmed et al. 2017**). Acute abdominal pain can also be attributed to gastrointestinal bleeding, which is a frequent occurrence. A study conducted by Jones et al. in 2019 revealed that CT scans can effectively pinpoint the exact location of the bleeding, offering crucial information for subsequent management (**Jones et al., 2019**).

Aim of the study

The aim of this retrospective descriptive investigation is to assess the effectiveness of CT scan in distinguishing between various causes of sudden abdominal pain in patients at King Khalid Hospital in Najran Province.

Methods:

Study Design

This research employed a retrospective descriptive approach to examine the utilization of CT scan in distinguishing the causes of sudden abdominal pain in patients admitted to King Khalid Hospital in Najran Province. The objective of the study was to analyze various factors such as gender, age, nationality, symptoms, indication, pain location, system, protocol, contrast media, and diagnosis among the participants of the study.

Participants

During the study period, a total of 50 patients who were admitted to King Khalid Hospital with complaints of acute abdominal pain were included in the research. These patients underwent CT scans using two distinct CT scanners: the Siemens 32 multi-detector

computed tomography (MDCT) machine and the General Electric 64 multi-detector computed tomography (MDCT) machine.

Data Collection:

The study gathered data retrospectively from the medical records of the chosen patients. Pertinent details such as gender, age, nationality, symptoms, reason for CT scan, location of pain, affected system, CT scan procedure, contrast media employed, and ultimate diagnosis were extracted from the medical records.

Data Analysis

The data collected underwent analysis through the utilization of Microsoft Excel software. Descriptive statistics, encompassing frequency and percentage, were employed to summarize and present the data. The objective of the analysis was to ascertain the distribution of the variables and offer a comprehensive overview of the characteristics of the study participants.

Ethical consideration

This research was carried out in accordance with the ethical guidelines and principles set forth by the Research Ethics Committee of Najran University. Ethical approval was obtained for the study, and utmost care was taken to ensure patient confidentiality during the entire process of data collection and analysis.

Results:

Table 1: Demonstrates the demographic profile of the 50 individuals experiencing acute abdominal pain. A majority of the patients were male, making up 66% of the group, while females constituted 34%. Regarding age, 34% of the patients were 30 years old or younger, 52% fell between 30 and 60 years old, and 14% were 61 years old or above. In terms of nationality, 78% of the patients were Saudi, with the remaining 22% being non-Saudi.

Table 2: Illustrates the distribution of symptoms reported by the patients with acute abdominal pain. The most prevalent symptom was stomach ache and vomiting, noted by 40% of the patients. Distention followed as the second most common symptom, reported by

18% of the patients. Fatigue, blood in urine, fever, diarrhea, and constipation were reported by 14%, 10%, 8%, 6%, and 4% of the patients, respectively.

Table 3 displays the distribution of indications for patients with acute abdominal pain. The primary indication was upper abdominal pain, noted by 34% of patients. Lower abdominal pain followed as the second most common indication, reported by 24% of patients. Trauma from road traffic accidents (RTA) was reported by 14% of patients, while renal colic and trauma from abdominal injury were reported by 12% and 8% of patients, respectively. Right iliac fossa (RIF) pain and right inguinal pain were each reported by 4% of patients.

Table 4 presents the distribution of abdominal quadrant pain among the study participants. A total of 50 patients reported experiencing abdominal pain, with varying distributions across different quadrants. The left upper quadrant (LUQ) was the most frequently reported site of pain, representing 40% of cases (n=20). The right lower quadrant (RLQ) followed as the second most common site, with 26% of patients (n=13) reporting pain in this area. The right upper quadrant (RUQ) accounted for 20% of cases (n=10), while the left lower quadrant (LLQ) represented 14% of cases (n=7).

Table 5 illustrates the distribution of patients affected systems. Out of the 50 participants, the digestive system was the most commonly affected, making up 56% of cases (n=28). Following this, the urinary tract system was reported in 20% of cases (n=10). The biliary system and male reproductive system were each reported in 10% of cases (n=5 and n=3, respectively). The lymphatic system and circulatory system were less commonly affected, each representing 6% of cases (n=3).

Table 6 showcases the distribution of CT scan protocols utilized in the study. The majority of CT scans were conducted on the abdomen and pelvis, accounting for 86% of all scans. A small percentage of scans focused solely on the abdomen, making up 14% of the total scans.

Table 7 presents the distribution of contrast media usage during the CT scans. The majority of scans were performed without the use of contrast media, representing 72% of all scans. In contrast, 28% of scans involved the administration of contrast media.

Table 8 displays the distribution of primary CT scan diagnoses for the 50 cases examined. Of these cases, 32% showed normal results, while the remaining 68% were found to have abnormalities.

Table 9: illustrates the distribution of secondary CT scan diagnoses. The most prevalent secondary diagnosis was related to digestive system issues, accounting for 35% of the cases. Renal problems followed as the second most common diagnosis, making up 20% of the cases. Less common secondary diagnoses included portal vein thrombosis (3%), lymphatic diseases (9%), liver diseases (12%), hernia (15%), bilobar pneumobilia (3%), and enlarged prostate (3%).

Table (1): Demographic characteristics of patients with acute abdominal pain

Gender	Frequency	%
M	33	66
F	17	34
Total	50	100
Age		
≤30	17	34
30-60	26	52
≥61	14	14
Total	50	100
Nationality		
Saudi patient	39	78%
Non-Saudi patient	11	22%
Total	50	100%

Table (2): Frequency distribution of patients Symptoms:

Symptoms	Frequency	%
Stomach ache and Vomiting	20	40
Distention	9	18
Fatigue	7	14
Blood in urine	5	10
Fever	4	8
Diarrhea	3	6
Constipation	2	4
Total	50	100

Table (3): Frequency distributions of patients Indications:

Indications	Frequency	Percentage
Upper abdominal pain	17	34%
Lower abdominal pain	12	24%
Trauma – RTA	7	14%
Renal Colic	6	12%
Trauma - ABD injury	4	8%
Right iliac fossa (RIF) pain	2	4%
Right inguinal pain	2	4%
Total	50	100%

Table (4): Frequency distributions of The Abdominal Quadrants pain

Abdominal Quadrants pain	Frequency	Percentage
Left upper quadrant (LUQ)	20	40%
Right lower quadrant (RLQ)	13	26%
Right upper quadrant (RUQ)	10	20%
Left lower quadrant (LLQ)	7	14%
Total	50	100%

Table (5): Frequency distributions of patients affected system:

Affected system	Frequency	Percentage
Digestive system	28	56%
Urinary tract system	10	20%
Biliary system	5	10%
Male reproductive system	3	6%
Lymphatic system	3	6%
Circulatory system	1	2%
Total	50	100%

Table (6): The Frequency distributions of CT scan protocols:

CT Scan protocols	Frequency	Percentage
Abdomen and pelvis	43	86%
Abdomen only	7	14%
Total	50	100%

Table (7): Frequency distributions of Contrast mediause:

Contrast media	Frequency	Percentage
Without CM	36	72%
With CM	14	28%
Total	50	100%

Table (8): Frequency distributions Primary CT Scan diagnosis distribution:

Cases	Frequency	Percentage
Normal	16	32%
Abnormal	34	68%
Total	50	100%

Table (9): Frequency distributions Secondary CT Scan diagnosis distribution data:

CT diagnosis	Frequency	Percentage
Digestive system problems	12	35%
renal problems	7	20%
Portal vein thrombosis	1	3%
Lymphatic diseases	3	9%
Liver diseases	4	12%
Hernia	5	15%
Bilobar pneumobilia	1	3%
Enlarged prostate	1	3%
Total	34	100%

Discussion:

The findings of this research offer significant perspectives on the demographic attributes, symptoms, and signs of individuals experiencing sudden abdominal discomfort. Most of the individuals involved in the study were male, aligning with prior research that has identified a greater occurrence of acute abdominal pain among males. This higher prevalence among males might be linked to factors like increased alcohol consumption and smoking, both of which are recognized as risk factors for abdominal pain (Smith, Duell & Martin, 2016).

The research reveals that individuals aged between 30 and 60 are more prone to experiencing acute abdominal pain. This particular age group is more susceptible to conditions like appendicitis, cholecystitis, and diverticulitis, which are recognized as common causes of acute abdominal pain. The increased occurrence of acute abdominal pain in this age group can also be linked to lifestyle factors, including unhealthy eating habits and a sedentary lifestyle, which are known to elevate the risk of abdominal pain (Bickell, Aufses Jr & Rojas, 2006).

The findings further emphasize the prevalence of Saudi patients in the group experiencing acute abdominal pain. This observation could be attributed to the demographic composition of the study setting, where the Saudi population constitutes the majority. The increased occurrence of acute abdominal pain in Saudi patients might also be influenced by cultural and genetic factors, along with disparities in healthcare-seeking patterns (Al-Quaiz, Raheel, & Abdelgadir, 2012).

The patients in this study frequently reported experiencing stomach ache and vomiting, which aligns with previous research that has identified these symptoms as common in cases of acute abdominal pain (Jones et al., 2019).

Additionally, the presence of distention as the second most common symptom is consistent with previous findings, as abdominal distention is often associated with conditions like bowel obstruction and gastrointestinal perforation. Regarding indications, the findings suggest that upper abdominal pain is the most prevalent indication among patients with acute abdominal

pain. This corresponds with previous studies that have identified upper abdominal pain as a common manifestation of conditions such as gastritis, peptic ulcer disease, and pancreatitis. The high occurrence of lower abdominal pain may indicate conditions like appendicitis, pelvic inflammatory disease, and urinary tract infections (Bickell, Aufses Jr & Rojas, 2006).

It is important to note that trauma resulting from road traffic accidents (RTA) is a significant factor in acute abdominal pain. This emphasizes the need to consider traumatic causes of abdominal pain, particularly in emergency department settings where patients with acute abdominal pain are frequently seen. Additionally, these findings highlight the importance of utilizing appropriate diagnostic approaches, such as imaging studies, to accurately determine the cause of abdominal pain in trauma patients (Ahmed et al. 2017).

Previous studies have also shown a higher prevalence of pathologies in the left upper quadrant (LUQ), which aligns with the high frequency of abdominal pain in this region. (Smith Rattner & Norton, 2017). The left upper quadrant (LUQ) houses organs like the stomach, spleen, and pancreas, making them prone to different diseases and conditions. On the other hand, the right lower quadrant (RLQ), which consists of the appendix and ascending colon, showed the second highest rate of affliction. This discovery aligns with existing research on appendicitis, a prevalent source of discomfort in that region. (Liu, Fogg & Nagele 2018) The right upper quadrant (RUQ) and left lower quadrant (LLQ) experienced less frequent occurrences of pain, possibly due to a lower prevalence of pathologies impacting these areas.

The prevalence of abdominal pain caused by digestive system disorders is consistent with previous research findings (Patel, Sharma & Dupuy 2018). The digestive system comprises various organs, including the liver, gallbladder, and intestines, which are susceptible to a wide range of conditions such as gastritis, cholecystitis, and inflammatory bowel disease. The high incidence of abdominal pain caused by urinary tract system disorders supports the findings of studies that have highlighted the significant burden of urinary tract infections and kidney stones (Gupta, Hooton & Naber, 2011). The

involvement of the biliary system in a considerable number of cases emphasizes the importance of considering gallbladder and bile duct pathologies when assessing abdominal pain (Tiselius, Alken & Buck, 2019).

The reasons behind the relatively low occurrence of abdominal pain caused by male reproductive system, lymphatic system, and circulatory system disorders could be attributed to either the specific population being studied or the limited size of the sample. To gain a better understanding of these connections, further research is required, particularly in larger and more diverse populations.

According to the findings of this study, the majority of CT scans focused on the abdomen and pelvis, while a smaller proportion solely targeted the abdomen. Approximately one-fourth of the scans utilized contrast media. The primary diagnoses from the CT scans indicated a higher prevalence of abnormalities compared to normal results. The secondary diagnoses from the CT scans encompassed a range of conditions, with digestive system issues being the most frequently identified.

These findings are consistent with previous research on CT scan utilization and diagnoses. For instance, a study by Smith et al. (2018) found similar proportions of CT scans performed on the abdomen and pelvis, as well as the use of contrast media. Additionally, their study reported a higher prevalence of abnormal CT scan results compared to normal results, supporting the findings of the current study.

The high frequency of abnormal CT scan diagnoses in this study may be attributed to the specific patient population included. It is important to note that the study sample consisted of individuals referred for CT scans due to suspected or known medical conditions. As a result, the prevalence of abnormalities may be higher compared to a general population sample. The secondary CT scan diagnoses distribution mirrors the array of conditions that can be detected using this imaging technique. The results are consistent with earlier research studies that have highlighted digestive system issues and renal diseases as frequent secondary CT scan diagnoses (Jones et al., 2016) & (Brown, et al., 2019). Nevertheless, the occurrence of less common conditions like portal vein thrombosis

and lymphatic diseases may differ among various populations and settings.

Limitation of the study:

There are several factors that need to be taken into account when interpreting the results of this study. Initially, the study's retrospective design restricts control over data collection and the potential for missing or incomplete information. Additionally, the study was conducted solely in one hospital, which may restrict the applicability of the findings to other contexts. Lastly, the sample size was relatively small, which could impact the statistical power and generalizability of the outcomes.

Conclusions and recommendation :

To summarize, this research offers valuable insights into the demographic characteristics, symptoms, indications, affected systems, CT scan protocols, and diagnoses of individuals experiencing acute abdominal pain. The findings underscore the diverse nature of this condition and stress the significance of a comprehensive assessment for accurate diagnosis and effective management. The outcomes of this study can inform clinical practice and contribute to the development of evidence-based guidelines for evaluating and treating patients with acute abdominal pain. Additional research is necessary to investigate the underlying causes and prognostic factors associated with this condition in order to enhance patient care and outcomes. It is recommended to conduct further studies with a larger sample size and across multiple hospitals.

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