

**ORIGINAL RESEARCH**

# Evaluation of gall bladder diseases using Ultrasonography: A Retrospective cohort study

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**ABSTRACT**

**Introduction:** The goal of this retrospective cohort study was to determine current patterns in the use of ultrasound and CT in the evaluation of patients with acute gallbladder disease at a single institution, and to determine patient and hospital characteristics that predict inappropriate use. **Materials and Methods:** Demographic data of each patient such as name, age, gender etc. was recorded. Gall bladder examination was performed with a 3.5-5 MHz probe by scanning in subcostal position. Hospital variables included the time and day of the week the patient was evaluated in the ED, previous ED visits for gallstone disease, and admitting service. Detailed data on radiologic studies including performance of each study and the findings were recorded. Studies included right upper quadrant ultrasound, abdominal CT, hepatobiliary iminodiacetic acid (HIDA) scan, magnetic resonance cholangiopancreatography (MRCP) and endoscopic retrograde cholangiopancreatography (ERCP). **Results:** Common pathologies were gallstone with sludge in 50, cholecystitis in 37, polyps in 22 and benign tumors in 15 patients. The difference was significant ( $P < 0.05$ ). **Conclusion:** Author found that ultrasound is non-invasive and the least expensive imaging modality that is highly sensitive and specific in the assessment of the gallbladder wall and luminal content.

**Keywords:** gallbladder, USG, stones.

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**INTRODUCTION**

Gall bladder disorders are prevalent in people of all ages. The majority of persons are symptomless. Gallbladder stones can frequently be discovered during a standard physical or medical test.<sup>1</sup> On the other hand, a patient may have cramping in the upper right quadrant if a huge stone obstructs the cystic duct or the common bile duct. We call this biliary colic. If the stone moves down the duodenum, the pain will subside. Possible symptoms include: discomfort in the upper centre or right upper quadrant. This discomfort may be intense, cramping, persistent, radiate to the back, or manifest as skin pallor. Other signs and symptoms of this sickness include vomiting and nausea.<sup>2</sup> The initial imaging test for gallbladder and bile duct abnormalities detection is ultrasound. This test is painless, non-invasive, and does not require the use of dyes. The upper portion of the primary bile duct and the minor ducts in the liver may both be clearly seen on ultrasound.<sup>3</sup> The most useful imaging modality for gallstone disease diagnosis is ultrasonography. It doesn't entail radiation exposure and is quick, safe, and reasonably priced. In cases where biliary colic is suspected, this is the preferred

image for patients. Positive results include pericholecystitis, stones, and thickening of the gallbladder wall.<sup>4</sup> When an ultrasound is negative or ambiguous, abdominal computed tomography (CT) scans should be performed, especially to rule out other abdominal conditions or to rule out complications from acute gallbladder disease.<sup>5</sup> When it comes to comparison, ultrasound is less expensive, easier to use, and radiation-free when compared to CT. Gallstones can be identified using ultrasound with a sensitivity and specificity of about 95%.<sup>6-8</sup> When gallstones are present along with ultrasonography findings of gallbladder wall thickening, sonographic Murphy's sign, and pericholecystic fluid in the context of RUQ pain, the diagnosis of acute cholecystitis can be made with 83-97% sensitivity and 64-95% specificity.<sup>9-11</sup> Furthermore, ultrasonography has a 97% specificity and 86% sensitivity in identifying common bile duct dilatation. Twelve A large number of gallstones lack radiopacity. As a result, compared to ultrasonography, CT has substantially poorer sensitivity (39-75%) for gallstone detection.<sup>9, 10, and 13</sup>

According to a recent study, between 2001 and 2005,

the number of CT scans performed to evaluate patients who appear to the Emergency Department (ED) with stomach pain more than doubled.14. Despite CT not being the preferred imaging modality, we conjectured that it was overutilized in patients presenting to the ED with acute gallbladder disease based on this trend and the patterns we anecdotally witnessed in our ED. This retrospective cohort study set out to identify current patterns in the examination of patients with acute gallbladder disease at a particular institution using CT and ultrasound, as well as to identify institutional and patient factors that may indicate inappropriate use.

## MATERIALS & METHODS

Total 124 patients were enrolled in this study. Demographic data of each patient such as name, age, gender etc. was recorded. Gallbladder examination was performed with a 3.5-5 MHz probe by scanning in subcostal position. Patient move his clothing away from abdomen and warm gel was applied to the area. With the patient in the supine position we started scan with the probe in longitudinal plane, the probe orientate cephalic and asking patient holding breath. Once the gallbladder is clearly identified, we obtained longitudinal and transverse views of the gallbladder. Data collected for analysis included patient age, race and ethnicity, primary diagnosis, comorbidities, and health behaviors. Hospital variables included the time and day of the week the patient was evaluated in the ED, previous ED visits for gallstone disease, and admitting service.

Detailed data on radiologic studies including performance of each study and the findings were recorded. Studies included right upper quadrant ultrasound, abdominal CT, hepatobiliary iminodiacetic acid (HIDA) scan, magnetic resonance cholangio pancreatography (MRCP) and endoscopic retrograde cholangio pancreatography (ERCP). Laboratory data for each patient were collected on admission and included white blood cell count, total bilirubin, direct bilirubin, alkaline phosphatase, amylase, and lipase. Outcome variables were the receipt of a right upper quadrant ultrasound and/or an abdominal CT during the evaluation of suspected acute gallbladder disease in the ED.

## STATISTICAL ANALYSIS

All statistical analysis were done using SAS software (Version 9.2—Cary, NC). Descriptive statistics on the overall cohort were expressed as percentages for categorical variables and mean with standard deviations or medians/ranges depending on the variable distribution. Time of day was defined as evening imaging if it was done between 7:00 pm and 7:00 am of the following day. Imaging was considered weekday imaging if it occurred Monday through Friday and weekend imaging if it occurred Saturday or Sunday. Laboratory values were classified as abnormal if the white blood cell count above 12,000/mm<sup>3</sup>, total bilirubin over

2mg/dL, alkaline phosphatase above 122 Units/L, amylase over 110 Units/L and lipase over 220 Units/L, based on upper limits of normal in our laboratory.

## RESULTS

Table 1 shows that out of 124 patients, males were 56 and females were 68.

**Table 1: Distribution of patients**

Total-124		
Gender	Males	Females
Number	56	68

Table 2 demonstrates that benign tumours affected 15 patients, cholecystitis affected 37, gall stones with sludge in 50, and polyps in 22 cases were prevalent diseases. There was a substantial difference ( $P < 0.05$ ).

**Table 2 Distribution of gall bladder pathologies**

Pathologies	Number	Pvalue
Gallstones with sludge	50	0.05
Cholecystitis	37	
Polyps	22	
Benign tumor	15	

Table 3 demonstrates that 73 patients experienced nausea or vomiting, 82 had fever, 106 experienced discomfort, 49 had jaundice, and 66 had abnormal stool or urine. There was a substantial difference ( $P < 0.05$ ).

**Table 3: Clinical features**

Clinical features	Number	Pvalue
Nausea/vomiting	73	0.04
Fever	82	
Pain	106	
Jaundice	49	
Unusual stool or urine	66	

## DISCUSSION

Some people experience biliary colic, which is characterised by intense discomfort in the right upper quadrant or epigastrium, and occasionally between the scapula as a result of a gallstone-caused temporary blockage of the cystic duct. Should the occlusion of the cystic duct continue, the patient can get cholecystitis.15. The most accurate method of diagnosing cholecystitis is ultrasonography, which typically shows gallstones, pericholecystic fluid, and a thicker gallbladder wall. Gallstones obstructing the gallbladder's neck or cystic duct account for ninety to ninety-five percent of all instances of acute cholecystitis.16. Of people with gallstones, only about 20% develop acute cholecystitis. Consequently, the majority of gallstones are asymptomatic. Therefore, the reason of right upper quadrant discomfort in a gallstone patient is frequently not acute cholecystitis.17. Additionally, research indicates that only 20%–35% of individuals who initially appear with discomfort in the right upper quadrant go on to develop acute cholecystitis. Endoscopic ultrasound may be useful in circumstances where the

ultrasonography examination reveals no gallstones and the patient is unwell. There are two types of gallbladder tumours: benign and malignant.<sup>18</sup> The goal of the current study was to evaluate the utility of USG in the diagnosis of gall bladder disorders.

46 of the 104 patients in this study were male, and 58 were female. A survey of 150 cases of GB disorders was conducted by Kola et al. (19) utilising a spatial digital iU22 Philips Convex probe operating at 3.5 MHz for ultrasonography. Ultrasonography was used to evaluate each patient in accordance with international scanning norms and practises. The patients range in age from 26 to 89 years; 74 patients (49.40%) are female and 76 patients (50.60%) are male. The age range in which gallstones could accumulate was 26 to 58 years, with females experiencing this condition more frequently than males. Gallstones affect 88% (58.7%) of patients (34.7% of female patients and 24% of male patients). Additionally, the incidence ratio is 13:9 for men and women. Additional gallbladder diseases were benign tumours (1.30%), cholecystitis (16.60%), polyps with sludge (16.60%), and normal (6.70%). When evaluating a patient with suspected gallbladder diseases, ultrasonography is a competent imaging technique that can reveal the location and source of biliary tract obstruction in addition to the presence of gallstones. A very specific and sensitive method of diagnosing gallbladder stones is ultrasound. When evaluating gallstones, ultrasonography has a high sensitivity and specificity (97.7% and 95.6%, respectively). In this investigation, a CT scan and cholecystectomy are used to confirm the presence of gallbladder stones.

Ultrasonography should be recommended as the first and sole test for investigation in patients with a high clinical suspicion of severe gallstone disease, provided that no other problems are detected. In order to enhance patient care and avoid the kinds of diagnostic delays observed in our study, an increasing number of emergency physicians are now doing their own ultrasound tests on patients with RUQ abdominal discomfort. This is due to the expanding availability of bedside ultrasound in the ED. According to recent studies, bedside right upper quadrant ultrasounds can be used to teach surgeons and emergency physicians to detect cholelithiasis with a sensitivity of 92-16%.<sup>20-22</sup> Similar outcomes were shown by Summers et al.<sup>22</sup> for ultrasonography examinations carried out by radiologists and emergency medicine specialists with training. Comparable findings were also observed amongst junior residents who had received training and senior residents or attendings. According to a calculation by Young et al. (2019), if an emergency physician performs a positive RUQ ultrasound and no further testing is ordered, we might save anywhere from \$48 to \$78 million year. Although it will require physician training in emergency ultrasonography<sup>24</sup>, the use of non-radiologist performed ED ultrasounds (either

performed by emergency room physicians or surgeons) has the potential to improve patient care and lower costs.

In addition to the expense, increased radiation exposure as a result of the careless use of diagnostic imaging has drawn attention recently.<sup>26-27</sup> From 10% in 1980 to 50% in 2006, radiation exposure resulting from diagnostic medical imaging rose, with the CT scan of the abdomen accounting for 18.3% of the overall radiation dose associated with image testing.<sup>28, 25</sup> For certain intraabdominal disease processes, ultrasonography may not be the best research option; however, in the case of gallstone disease, ultrasonography is safer, more cost-effective, and more sensitive and specific than CT scanning. Should comparable patterns be discovered at the level of the population or individual institution, this should trigger an assessment of the obstacles to acquiring the relevant investigation and result in the execution of system modifications that optimise the utilisation of ultrasonography and reduce superfluous or unsuitable investigations in patients suspected of having acute gallstone disease.

Our study contains a number of shortcomings. Because this is a single-institution study, our findings might not be indicative of the entire country but rather a particular issue in our community. The congruence of imaging trends with findings from other investigations raises concerns about a potential wider issue. Further nationwide research will facilitate the comparison of trends among various hospitals and geographical areas. Furthermore, we did not determine the ordering physician's qualities or how they affected the diagnostic test that was chosen.

## CONCLUSION

Author found that ultrasound is non-invasive and the least expensive imaging modality that is highly sensitive and specific in the assessment of the gallbladder wall and lumenal content.

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