Sudan University of Science and Technology

College of Graduate Studies

Assessment of Cut Cholecystitis Using Ultrasonography

تقيم التهاب المرارة الحاد باستخدام الموجات فوق الصوتية

Thesis Submitted for Partial Fulfillment of M.sc Degree in Medical Diagnostic Ultrasound

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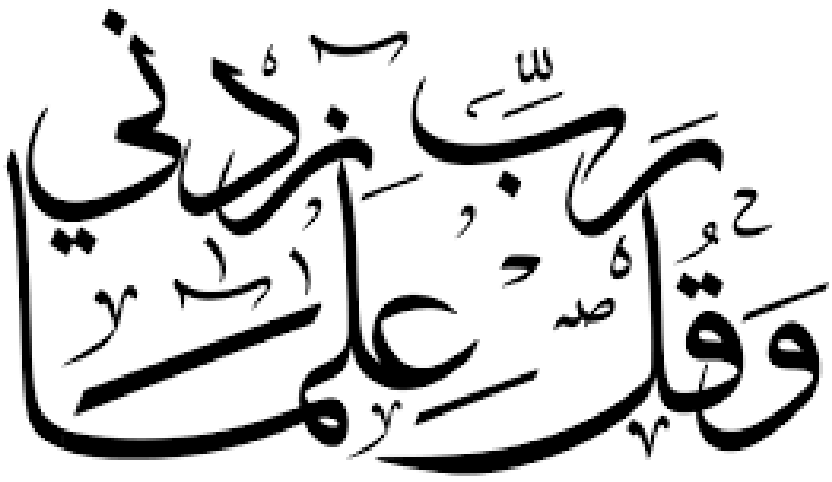
الاية

قال تعالى:



سورة طه ، الاية (144)

Dedication

I dedicated this work to:

- *My father and mother*
- *My wife, sons and daughter*
- *All Academics who helped me*
- *My colleagues*

Acknowledgement

Great thanks and gratitude to all academics who contributed to bring this work successfully in good image.

Firstly I would like to express my deep gratitude Dr. Raga Ahmad Abouradia my supervisor to her scientific help and advice and for giving me a part of her time.

Also a great thanks to Dr. Alsir Ali for his advice and help

Secondly great thanks to Dr.Ahmad Altaieb the leader of Alshifa Clinic for his help and advice, also a great thanks to Ultrasound department in Turkey Hospital and for all colleagues.

Abstract

This study was conducted in Khartoum state, Sudan, in the ultrasound departments of Turkey hospital and Elshifa clinic. The problem of the study is increasing the incidence of acute cholecystitis, and importance of early diagnosis for easy management to prevent the occurrence of complications. The aim of this study was to analyze the performance of Ultrasonography in the diagnoses of acute cholecystitis. The early diagnoses acute cholecystitis is essential to minimize the mortality and morbidity. This is descriptive cross sectional study carried out during the period from September 2015 to March 2016.The study was classified and analyzed by statistical package social science. The analysis of the results showed that from 82 patients with clinical suspected of acute cholecystits, 52 female and 30 male, their age ranged from 30 – 80 years. The study found that that the acute calculous cholecystitis was higher than acute a calculous cholecystitis .Also the study found that ultrasound is more sensitive for diagnosing gallbladder, wall thickening, murphy sign and distension of gallbladder. The study concluded that ultrasound at a great value in increasing accuracy in the diagnoses of acute cholecystitis and it decrease the false negative diagnostic rate and improve the clinical outcome. The study recommended that the service of the ultrasound department in hospitals must be available 24 hours because acute cholecystitis is an urgent case.

المستخلص

أجريت هذه الدراسة في ولاية الخرطوم - السودان باقسام الموجات فوق الصوتية بمستشفى التركي و عيادة الشفاء.

. تكمن مشكلة البحث في ان تزايد حالات التهاب المرارة الحاد و ضرورة التشخيص و العلاج المبكر حتى نقلل من حطورة مضاعفات المرض التي يمكن ان تؤدي الى الوفاة . الهدف من هذه الدراسة هو تأكيد دور و أداء الموجات فوق الصوتية في تشخيص التهاب المرارة الحاد . هذه الدراسة دراسة وصفية ، مقطعية أجريت في الفترة من سبتمبر 2015م حتى مارس 2016م . تم جمع البيانات ، تصنيفها وتحليلها بواسطة برنامج الحزم الإحصائية للعلوم الاجتماعية . تم جمع البيانات من 82 مريض حضروا لقسم الموجات فوق الصوتية بأعراض التهاب المرارة الحادو قد كان عدد النساء 52 مريضة و الرجال 30 مريض. و قد تراوحت أعمارهم بين 30-80 سنة.

افادت الدراسة أن التهاب المرارة الحاد مع حصوة المرارة هو الاعلى نسبة من التهب المرارة الحاد من غير حصوة. كذلك توصلت الدراسة الى أن الموجات فوق الصوتية ذات درجة عالية من الدقة في تشخيص زيادة سمك جدار المرارة، زيادة حجم المرارة، و الالم الحاد في منطقة الالتهاب.

و قد خلصت الدراسة الى ان للموجات فوق الصوتية دور عظيم و قيم في زيادة الدقة لتشخيص حالات التهاب المرارة الحاد و ان استخدام الموجات فوق الصوتية في تشخيص التهاب المرارة الحاد يؤدي الى نقص معدل التشخيص الخاطئ السالب و تزيد من دعم مخرجات التشخيص .

أوصت الدراسة بضرورة توفر خدمة الموجات فوق الصوتية بالمستشفيات على مدى 24 ساعة لأن التهاب المرارة الحاد من الحالات الطارئة.

Table of Contents

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List of abbreviations:

AC	Acute cholecystitis
GB	Gall Bladder
PHT	Portal Hypertension
PV	Portal Vein
RUQ	Right Upper Quadrant
UQP	Upper Quadrant Pain

Chapter One

Introduction

Chapter One: Introduction

1.1 Introduction:

A cute choleycystitis occurs as a result of inflammation of the gall bladder wall, usually cause by impaction of gallstone in the gall bladder neck obstructing the gall bladder.90 to 95% of acute choleycystitis patients have cholelithiasis (acute calculus choleycystitis), the remaining 5 to 10% have acute a calculouscho-leycystitis.

Acute emphysematous cholecystitis is another form of acute cholecystitis characterized by the presence of gas within the wall and/or lumen of the gall bladder.it occurs more commonly in diabetic men and less frequently in association with cholelithiasis .

Emphysematous cholecystitis is concider either a complication of Ac or a separate entity. The patient presents with fever, leukocytosis, biliary colic and right upper quadrant (RUQ) pain, the pain often begins after tatty meal.Risk factors for choleycystitis mirror those for cholelithiasis and include increasing age, female sex, certain ethnic groups, obesity or rapid weight loss, drugs, and pregnancy.

Complication of acute choleycystitis include emphysematous, perforation, pericholecystic abscess, and development of empyma.

Ultrasound significantly aid to the diagnose of acute choleycystitis, ultrasound is more sensitive and specific methods in diagnosing the gall bladder stones, gall bladder texture and gall baldder wall thickness, Murphy sign.

Ultrasound findings of acute calculouscholeycystitis are gall stone ,gall bladder wall thickness > 3 mm, positive sonographic murphy sign and distension of gall bladder.

Ultrasound findings of acute a calculouscholeycystitis are gall bladder wall thickness > 3 mm, positive sonographic murphy sign, pericholecystic fluid and intraluminal gas or membrane.

1.2 Problem of the study:

Increasing the incidence of acute choleycystitis, and importance of early diagnosis for easy management to prevent the occurrence of complications.

1.3 Objectives:

1.3.1 The general objective:

To find out the role of ultrasound in diagnosis of acute choleycystitis among Sudanese population.

1.3.2 Specific objectives:

1. To identify the main sonographic findings in acute cholecystitis among Sudanese population.
2. To find out the correlation acute cholecystitis with residence and age.
3. To find out the main complications of acute cholecystitis and correlate it with obesity.

1.4 Over view of the study:

This study was concerned with characterize of acutecholecystitissonographically. Using gall bladder texture and gall bladder wall thickness, murphy sign, analysis accordingly it falls into five chapters. Chapter one is an introduction which include introductory notes onacutecholecystitiscauses and complications,role of ultrasound as well as the problem and objectives, while chapter two include gall bladder anatomy, physiology and pathology, chapter three dealswith the methodology, were it provides of material and methods used to acquire the data in this study as well as the methods analysis approach.

While the results were presented in chapter four and finally chapter five include discussion of the results conclusion and recommendation followed by references and appendices.

Chapter Two

Literature review and background studies

Chapter Two
Literature review and background studies

2.The Gallbladder and bile ducts.

2.1 Anatomy:

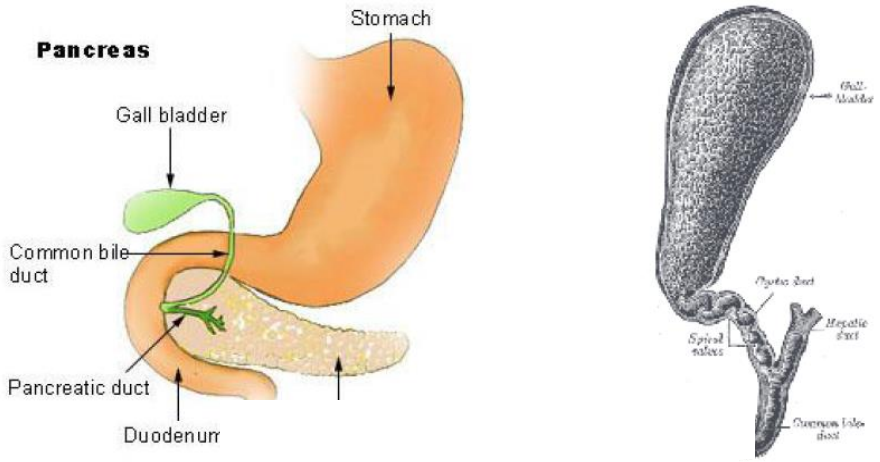
2.1.1 Normal anatomy:

The gallbladder is a pear-shaped organ which lies on the visceral inferior surface of the liver between segments IV and V of the liver. The first and second parts of the duodenum lie behind it and the transverse colon lies below. It is covered with peritoneum except where it is adherent to a depression in the liver surface known as the gallbladder fossa. The expanded lower end of the gallbladder, or fundus, may or may not project beyond the inferior border of the liver in the region of the right ninth costal cartilage and the body of the organ narrows to form the neck which terminates in the cystic duct. The dilated area proximal to the junction of the neck and cystic duct is known as Hartmann's pouch. The cystic duct arises from the neck of the gallbladder and joins the common hepatic duct. It is typically of 1-3 mm diameter although may be much wider in some individuals. The mucosa is arranged in spiral folds known as the valve of Heister. It most frequently is 3-4 cm in length and joins the common hepatic duct at a slight angle.

The main blood supply to the gallbladder is provided by the cystic artery, which cornrricr6 arises from the right branch of the hepatic artery posterior to the common hepatic duct 400,000. The cystic artery runs above and behind the cystic duct to reach the neck of the gall- bladder where it divides into an anterior and a posterior branch. The gallbladder also receives a variable blood supply from the liver through its bed.

A major portion of the venous drainage passes directly to the liver through the gallbladder fossa but veins may be .seen around the cystic artery and these drain directly into the portal vein.

The cystic lymph node lies adjacent to the cystic artery where it meets the gallbladder wall, and is therefore a useful landmark during cholecystectomy. Lymph from the gallbladder and bile ducts passes through the cystic node and into other hepatic nodes in the edge of the lesser omentum.



Richards Snell clinical anatomy

2.1.2 Bile ducts:

The right and left hepatic bile ducts fuse at a variable distance below the liver to form the common hepatic duct. The area between the common hepatic duct which lies within the edge of the lesser omentum, the liver and the cystic duct, is called Calot's triangle. Its contents are the cystic artery and lymph node and its accurate identification and dissection are crucial to the safe performance of cholecystectomy.(n.b.Calot actually described the triangle lying between the cystic artery, cystic duct and hepatic duct but the above description is the one usually referred to and of more practical relevance.

The hepatic artery lies on the left of the common hepatic duct and the portal vein lies posteriorly. The cystic duct joins the common hepatic duct to form the

common bile duct approximately 2cm above the duodenum. As it passes behind the first part of the duodenum and the head of the pancreas the bile duct loses its peritoneal covering, and it enters the duodenum through the posteromedial wall to join the main pancreatic duct within the ampulla of Vater, which then opens into the duodenum via a papilla in thesecond part of the duodenum approximately 10cm beyond the pylorus. Circular muscle fibres are present around the terminal portion of the bile and pancreatic ducts and their confluence at the ampulla. The combination of all these sphincteric mechanisms is known as the sphincter of Oddi. The blood supply to the bile ducts is complex and branches are received from the gastroduodenal, hepatic and cystic arteries, as well as the coeliac and superior mesenteric vessels. Two vessels run along the lateral borders of the supraduodenal segment and 60% of their blood supply is provided from arteries below, mainly from the retroduodenal and retroportal vessels. The right hepatic artery provides most of the blood supply of the main bile duct from above and only 2% of the blood is derived from the common hepatic artery. This arrangement of the blood supply suggests that bile duct damage during surgery can be minimized by restricting dissection at the lateral margins of the common bile duct so as to avoid damaging the axial vessels. Flush ligation of the cystic duct on the common bile duct is also best avoided for the same reason. Anastomotic complications after transplant surgery may also be related to arterial damage.

The nerves to the extrahepatic bile ducts are derived from segments 7-9 of the thoracic sympathetic chain and from the parasympathetic vagi. Afferent nerves which include pain fibers from the biliary tract run in sympathetic nerves and pass through the coeliac plexus and the greater splanchnic nerves to reach the thoracic spinal cord via the white rami communicantes and dorsal ganglia. The preganglionic efferent nerves from the spinal cord relay with cell bodies in the coeliac plexus and the post-ganglionic fibers run with the hepatic artery to supply

the biliary tract. A small contribution of pain afferents may travel within the right phrenic nerve and peritoneum below the right diaphragm. These fibers may account for the radiation of gallbladder pain to the right shoulder tip during attacks of gallstone colic. Vagal fibers supply the hilum of the liver and the bile ducts. Although vagal stimulation results in gallbladder contraction and relaxation of the sphincter of Oddi, the effects are overshadowed by the action of gastrointestinal hormones such as cholecystokinin.

2.1.3 Variations and anomalies of anatomy Gallbladder:

The gallbladder may rarely be absent or rudimentary, and when this occurs it may be associated with other congenital anomalies such as tracheo-oesophageal fistula or imperforate anus. Left-sided or intrahepatic gallbladders and double and triple gallbladders have also been reported. Discovery of duplications at operation, usually by operative cholangiography, should be followed by removal of both gallbladders. A second operation may be necessary later if only one organ is removed. The gallbladder may be abnormal in structure, for example the body may be divided completely or partially by a septum. Complete division may result in two separate cavities fused at their necks to form a single cystic duct or they may drain by two separate ducts. Partial separation of the fundus from the body seen at surgery or during pre-operative imaging is known as a Phrygian cap, and is caused by a localised thickening of the gallbladder wall. It is of little significance and gallbladder function is usually normal. Complete investment of the gallbladder with peritoneum can predispose to torsion around its associated mesentery, particularly when this is restricted to the neck of the organ so that the body and fundus remain free. Bile ducts Major variations in bile duct anatomy are common, and their frequency has been analyzed in a large series of operative cholangiograms. The most important anatomical variations from an operative viewpoint are those pertaining to the cystic duct (figure 2). The most important,

and potentially dangerous, variations involve different types of right subsegmental ducts and their drainage into the biliary tract via, or close to, the cystic duct.

A few examples of the commoner variations include:

1. A high insertion of the cystic duct into the region of the common bile duct bifurcation (3.1%).

2. An accessory hepatic duct, defined as a separate channel draining a segment of the right lobe of the liver into the common hepatic duct, cystic duct or gallbladder. The incidence is between 1 and 4% and it may be the only drainage from the relevant segment. An injury can easily occur to these ducts during cholecystectomy and may result in partial or total occlusion of a portion of the biliary tract as there is a lack of interductal communications within the liver.

3. The cystic duct entering the right hepatic duct. This is an uncommon variation (0.2%), but increases the risk of transection or ligation of the right duct during surgery.

4. The right and left hepatic ducts may join the common hepatic duct in a variable manner, and occasionally this junction may be truly intrahepatic. The right duct occasionally fuses with the cystic duct.

5. Duplication of the cystic ducts is very rare. Intraoperative cholangiography is used for the recognition of these anomalies. Accessory ducts may be tied off if small, but larger ducts should be preserved and implanted into a Roux loop if necessary. Bile peritonitis or fistula may be a consequence of the unrecognized division of such a duct Anomalies of the common bile duct itself are very rare but ectopic drainage of accessory ducts into the stomach has been described on five occasions, including an original report by Vesalius in 1543. The anomaly has been associated with symptomatic biliary gastritis. Occasionally during cholecystectomy an accessory duct (or ducts) is encountered in the gallbladder bed — a duct of Luschka. When missed these ducts may present as bile leaks in the post-operative

period. Once thought to be intrahepatic ducts draining directly into the gallbladder, anatomical studies and the common finding of two transacted ducts confirms that they are segmental or subsegmental ducts lying superficially in the gallbladder bed. They should be clipped or sutured to prevent leakage.

2.1.4 Hepatic and cystic arteries:

Major anomalies of vessel origin are particularly important during hepatectomy and pancreatectomy. The left hepatic artery arises from the left gastric, splenic or superior mesenteric in 3-6% of the population and may be especially at risk during gastrectomy and laparoscopic fundoplication. The right hepatic artery arises from the superior mesenteric artery in 10-20% and an accessory right hepatic artery arising from the superior mesenteric is found in 5% of patients. The right hepatic artery is particularly at risk during cholecystectomy if it takes a tortuous course close to the cystic duct and neck of the gallbladder, as the cystic artery may be very short in this variation. Anatomical variations of the cystic artery itself are common, and it may arise from the left, common or accessory hepatic arteries and pass anterior or posterior to the main bile duct. More than one cystic artery is present in some patients. The cystic artery not uncommonly runs in front of the common bile duct, which increases its risk of damage to the bile duct during cystic artery dissection and ligation.

2.2 Gallbladder physiology:

The gallbladder is a pear-shaped, hollow structure located under the liver and on the right side of the abdomen. Its primary function is to store and concentrate bile, a yellow-brown digestive enzyme produced by the liver. The gallbladder is part of the biliary tract.

The gallbladder serves as a reservoir for bile while it's not being used for digestion. The gallbladder's absorbent lining concentrates thestored bile. When food enters the small intestine, a hormone called cholecystokinin is released, signaling the

gallbladder to contract and secrete bile into the small intestine through the common bile duct.

The bile helps the digestive process by breaking up fats. It also drains waste products from the liver into the duodenum, a part of the small intestine.[6]

2.3 Gallbladder Pathology:

The term "Gallbladder Pathology" is used for several types of conditions that can affect your gallbladder. The gallbladder is a small pear-shaped sac located underneath your liver. Your gallbladder's main function is to store the bile produced by your liver and pass it along to the small intestine. Bile helps you digest fats in your small intestine. [8]

The majority of gallbladder diseases are caused by inflammation due to irritation of the gallbladder wall, which is known as cholecystitis. This inflammation is often due to gallstones blocking the ducts leading to the small intestine and causing bile to build up. It may eventually lead to necrosis (tissue destruction) or gangrene. Other diseases of the gallbladder include gallbladder polyps and gallbladder cancer.

2.3.1 Gallstones:

Gallstones develop when substances in the bile (such as cholesterol, bile salts, and calcium) form hard particles that block the passageway to the gallbladder.Gallstones also tend to form when the gallbladder doesn't empty completely or often enough. They can be as small as a grain of sand or as large as a golf ball.

Numerous factors contribute to your risk of gallstones.

These include:

1. Being overweight or obese.
2. Eating a high-fat or high-cholesterol diet.
3. Having diabetes.

4. Being age 60 or older.
5. Taking medications that contain estrogen.
6. Having a family history of gallstones.
7. being female

2.3.2 Cholecystitis:

Cholecystitis is the most common type of gallbladder disease. It presents itself as either an acute or chronic inflammation of the gallbladder.

2.3.2.1Acute Cholecystitis:

Acute cholecystitis is generally caused by gallstones, but it may also be the result of tumors or various other illnesses. It may present with pain in the upper right side or upper middle part of the abdomen. The pain tends to occur right after.a meal and ranges from sharp pangs to dull aches that can radiate to your right shoulder. Acute cholecystitis can also cause:

1. Fever.
2. Nausea.
3. Vomiting.
4. Jaundice.
5. Different colored stools

2.3.2.2 Chronic Cholecystitis:

After several attacks of acute cholecystitis, the gallbladder will shrink and lose its ability to store and release bile. Abdominal pain, nausea, and vomiting may occur.

2.3.3 Choledocholithiasis:

Gallstones may become lodged in the neck of the gallbladder or in the bile ducts. When the gallbladder is plugged in this way, bile can't exit. This may lead to the gallbladder becoming inflamed or distended. The plugged bile ducts will further prevent bile from traveling from the liver to the intestines. Choledocholithiasis can cause:

1. Extreme pain in the middle of your upper abdomen.
2. Fever.
3. Chills.
4. Nausea.
5. Vomiting.

2.3.4 Acalculous Gallbladder Disease:

Acalculous gallbladder disease, or biliary dyskinesia, occurs without the presence of gallstones. It can be chronic or acute and may result from the gallbladder muscles or valve not working properly. The symptoms can include abdominal pain on the right side of your body that radiates to your shoulder. Eating foods high in fat often triggers this. Related symptoms may include:

1. Nausea.
2. Vomiting.
3. Bloating.
4. Loose stools.

2.3.5 Sclerosing Cholangitis:

Inflammation, scarring, and damage to the bile ducts is referred to as sclerosing cholangitis. It's unknown what causes the disease. People with sclerosing cholangitis may have an enlarged liver or spleen along with a decrease in appetite and weight loss.

2.3.6 Gallbladder Cancer:

Cancer of the gallbladder is a relatively rare disease. If it's not treated, however, it can spread from the inner walls of the gallbladder to the outer layers and then to the other organs and ducts. The symptoms of gallbladder cancer may be similar to those of acute cholecystitis.

2.3.7 Gallbladder Polyps:

Gallbladder polyps are lesions or growths that occur on the gallbladder. They're usually benign and have no symptoms.

2.3.8 Gangrene of the Gallbladder:

Gangrene develops when the gallbladder stops functioning due to inadequate blood flow. This may occur due to infections, injury, diabetes, surgery or diseases related to blood circulation.

The symptoms of gallbladder gangrene can include:

1. Pain in the gallbladder region.
2. Fever.
3. Nausea or vomiting.
4. Gas disorientation.
5. Low blood pressure.

2.3.9 Abscess of the Gallbladder:

Abscess of the gallbladder results when an area of the body becomes inflamed with pus. Pus is the accumulation of white blood cells, dead tissue, and bacteria. It may present with upper right-sided pain in the abdomen.

2.4 Methods of Diagnosing acutecholecysitits:

Acute cholecysitits can be diagnosed by ultrasound, CT-scan, MRI.

2.4.1 ComputedTomography scan:

can be useful in diagnosing acutecholecysitits. Common C.T finding of acutecholecysitits include wallthickening, pericholecysticfluid, dissension, high attenution bile, and subserosaledome.When these findings are present the diagnosis of acute choleystits can be suggested.

2.4.2 Magnetic Resonance Imaging:

Has high degree of accuracy in diagnosingacutecholecysititsbased on the single finding of pericholecystic a similar level of accuracy is demonstrated in detecting gall bladder stones, biliary duct calculi are detected with evengreateraccuracy then with sonography in patients with acutecholecysitits.

2.4.3Ultrasound :

significantly aid in the diagnose of acutecholecysitits, ultrasound is more sensitive and specific method in diagnosing the gall bladder stones gall bladdertexture and gall bladder wallthickness, Murphysign.

2.4.3.1 Sonographics technique:

The gallbladder should be examined in numerouspatient positions: supine, left lateral decubitus, and the left posterior oblique position, in order to demonstrate stone mobility, scans may need to be performed in prone or erect position to show acousticshowing of calculi, it is essential to use the highest frequency possible and to have the transducerfocus in the region of the suspected caculi.The sound beam it directed through the most dependent portion of the gallbladder.In most supine position this is the region of the gall bladder neck and cystic duct.In prone and erected positions the fundus is the most dependent region. Every study of the gallbladder include an image demonstrating the gall bladder neck to prove or rule out the presence of a stone in this location.

"Scanning with high resolution high frequency curved linear or linear array transducers ismandatory in patient when gall stones are not detected, thisminimize missing tiny gallstones , especially in the fundus of superficial gallbladder.

The standard measurement of the gallbladder not exceed 4 cm in width (transverse diameter), thestandardmeasurement of the gallbladder wall not exceed 3 mm(the anterior wall) and thestandardmeasurement of the common bile duct not exceed 9 mm in diameter near it isentrance into the pancreas.

2.5 Sonographic appearance of the gall bladder with acute cholecystitis :

The two most useful secondary supporting signs in patients with suspected acutecholecystitis are gallbladder wall thickening (> 3mm) and a positive sonographic Murphy sign. A positive sonographic Murphy sign consists of maximum reproducible tenderness over the sonographically localized gallbladder. A negativesonographic Murphy sign is: absence of tenderness, diffuse tenderness, tenderness not localized to the GB or maximal tenderness is inconsistently present over the gallbladder.

In a patient with suspected acute cholecystitis the presence of gallstones plus either a thickened GB wall or a positive Murphy sign has a positive predictive value of greater than 99% for patients whose pain is cured by cholecystectomy.

http://www.radiologyassistant.nl

Figure (2-2) ultrasound image shows gallstones plus a thickened GB wall.

A negative Murphy sign can be extremely helpful since it redirects the search for other causes of the patient's symptoms. This is especially true when stones are imaged in the GB, since sonographic detection of gallstones might prematurely halt the investigation when another cause of pain is actually present.

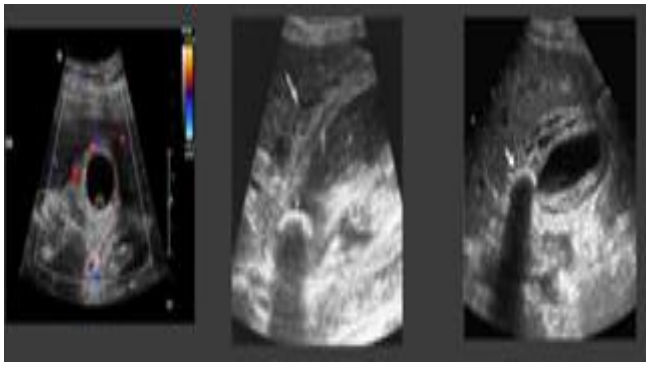
Ultrasound findings of acalculous cholecystitis are nonspecific. Whenever youhave a hospitalized patient who subsequently develops abdominal pain and they have one or more of the following criteria, consider acalculous cholecystitis:

1. Gallbladder wall thickening
2. A positive sonographic Murphy sign
3. pericholecystic fluid
4. Intraluminal gas or membranes.

If a suspected acalculous cholecystitis gallbladder appears normal, a 24 hour follow up scan is recommended to demonstrate possible wall thickening.Acute acalculous cholecystitis remains a difficult diagnosis from both an imaging andclinical perspective. CT scanning to detect pericholecystic abnormalities (indicative of small perforations) and progressive gallbladder wall thickening on serial sonographic examinations appear to be the most reliable signs of acute acalculous cholecystitis currently available.

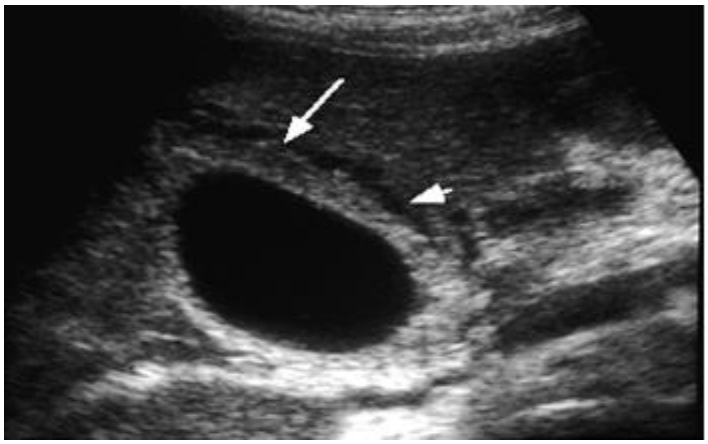
http://www.emedicine.medscape.com

Figure (2-3) ultrasound image shows gallbladder wall thickening with pericholecystic fluid



http://www.Slideshare.net

Figure (2-4) ultrasound image shows gallstones with edematous thickened GB wall.

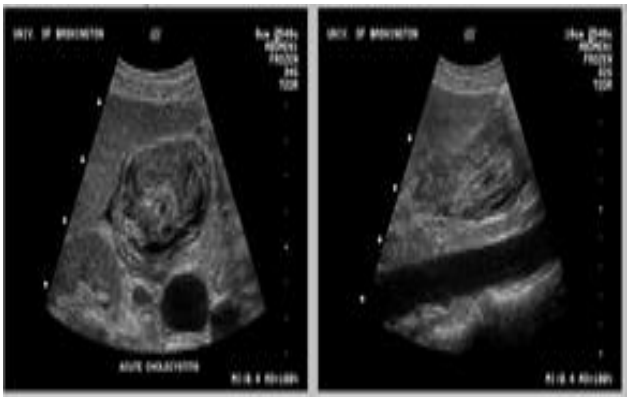


http://www. ualberta.ca

Figure (2-5) ultrasound image of right upper quadrant in patient with acute cholecystitis reveals edematous marked thickening of GB wall.

http://www.scielo.br

Figure (2-6) ultrasound image shows emphysematous cholecystitis. Observe echogenic parietal image of the GB with reverberation compatible with gas.



http://www.Slideplayer.com

Figure (2-7) Transverse and longitudinal ultrasound image demonstrate complex echo pattern in the area of the GB and pericholecystic fluid. Acute gangrenous cholecystitis

2.6 Previous studies:

2.6.1Theaccuracy of ultrasonography for diagnosing acutecholecystitis in the regional hospital. Dr. KrishnaKumar .29 oct.2015 uttarPredesh, India:

A total of 145 patient requiredan emergency cholecystectomy in the study period, 105 of them underwent ultrasonography, for cholelithiasis, ultrasonographyhad 100% sensitivity, when combined with positive murphy signand wall thickening and elevated neutrophil count, and ultrasound showing acutecholecystitis yield a sensitivity of 74% specificity of 62% positive predictive value of 80% and negative predict time valueof 53% for the diagnosis of acutecholecystitis.

2.6.2Role of ultrasonography for acutecholecystitic conditions in the emergency room.Goleaadela , Rado ion BadeaTitus Suteu. 2010 Romania.:

The study group included 179 patient with a mean age of 59.31 + 15.82 years ultrasanography is a method of high accuracy diagnosing of gallbladder lithiasis (93.39%), wall thickening of gallbladder. The increased risk of developing severe form of acutecholecystitis inpatient without documented lithiasisproves the essential contribution of ultrasanography in optimizing emergency surgicaldecision and therapy.

2.6.3Diagnosis of acutecholecystitis using ultrasonography. Mawia Gamerelden . Saliman Mohamed.Abd al Rahim Suliman. Mohammed Yousif.May – june 2013. Sudan:

The aim of this study was to analyse the performance of ultrasonography in the diagnoses of acutecholecystitis.The study included 100 patients with clinical suspected of acutecholecystitis were randomized into two groups the first group included these patients with finaldiagnoses of acutecholecystitis and other group included patients with final alternative diagnoses of acutecholecystitis. The study found that the incidence of acutecholecystitisis high in obese , acutecholecystitisincidence is higher within age of 41.50, female (57%) more

affected,Khartoum population suffermore that Omdurmanand Kasala (71%), also tenderness is observed on examination within (30%).

It concluded that ultrasound had a great value in increasing accuracy in diagnosis of acutecholecystitis, and it decrease the false negative diagnostic rate and improves the clinical outcome.

2.6.4Does ultrasonographyaccurately diagnoseacutecholecystitis. Hamish Howong, Marc, Jason doyle. June 2014. Canadian journal of emergency:

A total of 107 patient presented during the study period: 69 woman and 38 men with mean aged of55.5 year.For cholelithiasis,ultrasonography had 100% sensitivity, followed by positive Murphy sign (64%) and elevated total white blood cellcount (62%), saw ultrasound help in diagnoses of acutecholecystitis and improve the clinical outcome.

2.6.5 Sonographic diagnosis of gangrenous cholecystitis. Ronald R. Townsend. 2016. University of Colarado.:

Gangrenous cholecystitis is an advanced form of acutecholecystitis that is associated with an increased complication rate. The study has done in total of 50 patients. Ultrasound play an important role is this situation by helping to differentiate thosepatients who required emergency surgical form those who do not.

Chapter Three

Methodology

Chapter three: methodology

3.1Type of the study:

This is retrospective cross sectional study was conducted in Turkey hospital and Elshifa clinic, in the department of the ultrasound.

3.2Study area :

Turkey hospital and tibia medical center in Khartoum state.

3.3Duration of the study:

The study duration from January 2016 to June 2016 and the data were collected from January to June 2016.

3.4 Population of the study:

82 patients that were clinically suspected of having acute cholecystitis and were emitted to the area of the study.

3.5 Inclusion criteria:

The patient were come with right upper quadrant (RUQ) pain. Positive Murphy sign, fever perform by surgical or physician who estimated the patient suggested having acute cholecystitis with more assessment including laboratory investigation (elevated white blood cells).

3.6 Exclusion criteria: patients not presented by clinical diagnosis of acute cholecystitis and children.

3.7 Sampling:

The sample of this study is a convenience sample takes those patients which were accessible at the area and duration of the study.

3.8 Data collection:

The data was collected using the following variables:

Size and texture of gallbladder (Ultrasound findings):

- Gallbladder wall measurement.
- Murphy sign.
- Patient's age, gender and residence.

- Association of other Pathology.

3.8.1:Equipment used:

Ultrasound machines with transducer frequency 3.5 MHz, our examinations were done by:

1. MINDRAY ultrasound machine.
2. Model DP 2200.2008 – 05made in Germany with convex transducer 3.5MHz.
3. FUKUDA 4100 ultrasound machine
4. made in Japan .1995 with Convex transducer 3.5 MHz.
5. coupling gel and TV card with 16 bit to capture the ultrasound image using the personal computer.

3.8.2Sonographic technique:

We have examined gallbladder in numerous patient positions: supine, left lateral decubitus and left posterior oblique position in order to demonstrate stone mobility, scans may need to be performed in prone position or erect position to show acoustic shadow of calculi it is essential to use the highest frequency possible and to have the transducer focused in the region of the suspected calculi. The sound beam is directed through the most depended portion of the gallbladder. In most supine patients this is the region of the gall bladder neck and cystic duct. In prone and erect positions the fundus is the most depended region. Every study of the gallbladder was included an image demonstrating the gallbladder neck to prove or rule out the presence of a stone in this location. **Dean Devin 2005**

Scanning with high resolution high frequency curved liner or linear array transducers is mandatory in patents when gall stones are not detected, this minimizes missing tiny stone ,especially in the fundus of superficial gall bladder.

The standard measurement of the gallbladder not exceed 4cm in width (transverse diameters). **Dean Devin 2005**

The standard measurement of the gall bladder wall not exceed 3mm (the anterior wall) **Dean Devin 2005**

The standard measurement of the common bile duct not exceed 9 mm in diameter near it is entrance into pancreas **Dean Devin2005**

Compression as the right upper quadrant has beam done to detect murphy's sign.

Presents of gall bladder stone manly impacted stone in the gall bladder neck was detected. **Dean Devin2005**

Ultrasound finding of acute calculous cholecystitis:

1. gall stone.
2. gall bladder wall thickening >3 mm.
3. Positive sonographic murphy sign.
4. distention of gall bladder. **Dean Devin2005**

Ultrasound findings of acute a calculus cholecystitis:

1. gall bladder wall thickness > 3 mm.
2. positiv sonrographic murphy sign.
3. Pericholecystic fluid.
4. intra luminal gas or membrane. **Dean Devin2005**

3.9The data analysis:

The data was analyzed by using statistical packaged for social science (SPSS) and excel under windows.

3.10 Ethical consideration:

The procedure of the scanning with ultrasound was explained to the patient and the purpose of incorporating his data in the study. Permission from the hospital and the department was granted.

Chapter Four

Results

Chapter Four: Results
Part One: Frequency Distribution

Table (4-1): Frequency distribution according to gender

Gender	Frequency	%
Males	30	36.59
Females	52	63.41
Total	**82**	**100**

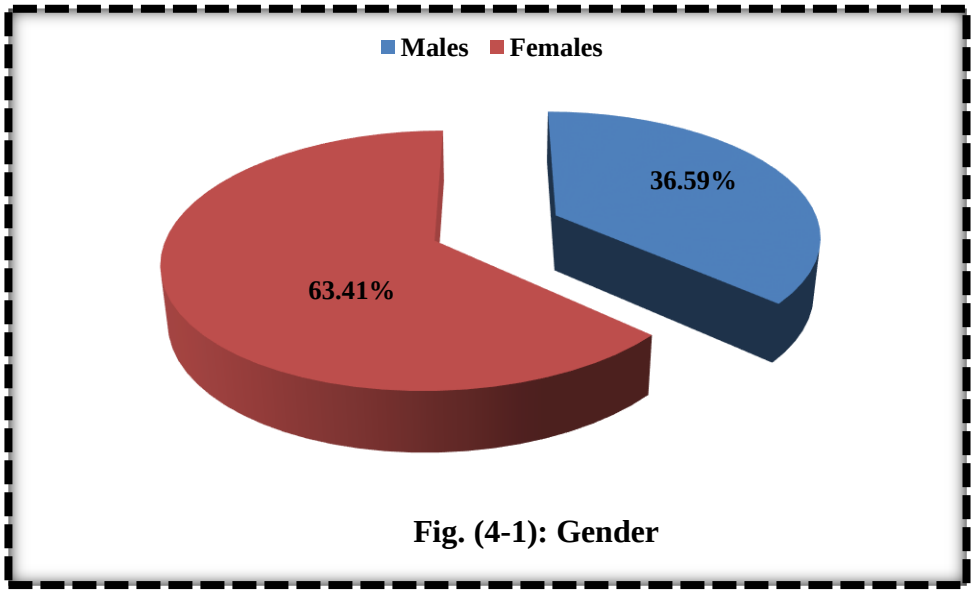


Fig. (4-1): Gender

Table (4-2): Frequency distribution according to pregnancy

Pregnancy	Frequency	%
Pregnant	-	-
Not pregnant	52	100
Total	**52**	**100**

Table (4-3): Frequency distribution according to age

Age group (years)	Frequency	%
<30	1	1.22
30-39	13	15.85
40-49	28	34.15
50-59	25	30.49
60-69	11	13.41
≥70	4	4.88
Total	**82**	**100**

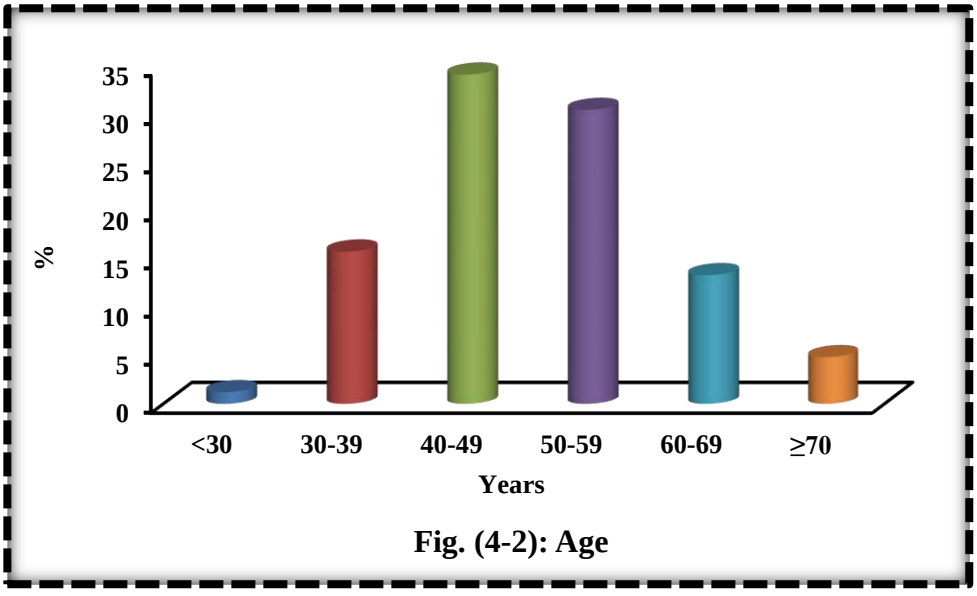


Fig. (4-2): Age

Table (4-4): Frequency distribution according to residence

Residence	Frequency	%
Northern States	15	18.29
Central States	49	59.76
Eastern States	2	2.44
Western States	16	19.51
Total	**82**	**100**

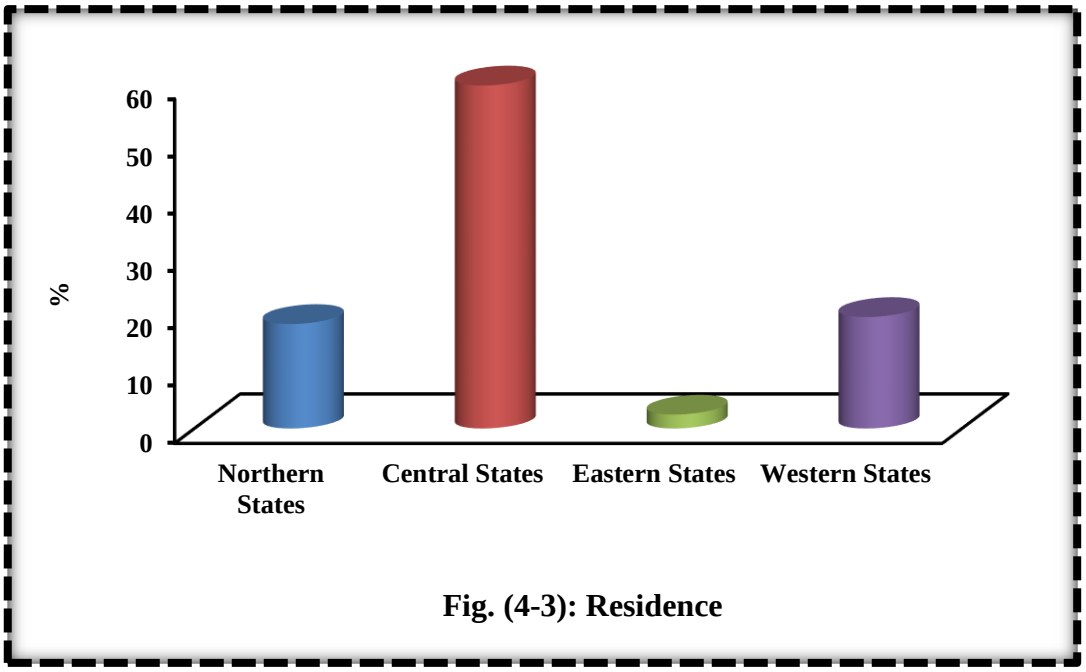


Fig. (4-3): Residence

Table (4-5): Frequency distribution according to other pathology

Other pathology	Frequency	%
Diabetic	5	6.10
Jundace	3	3.66
Ascitis + PV dilation	1	1.22
Jundace + PHT + ascitis + plural effusion	1	1.22
Free from other pathology	72	87.80
Total	**82**	**100**

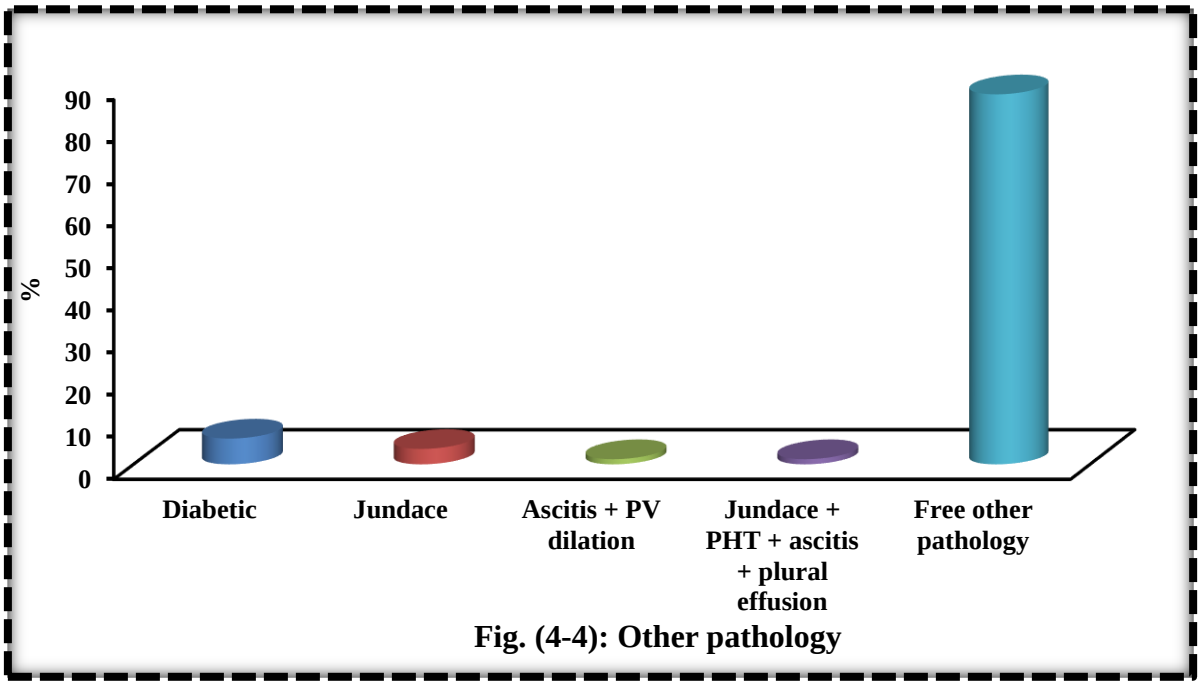


Fig. (4-4): Other pathology

Table (4-6): Frequency distribution according to obesity

Obesity	Frequency	%
Obese	13	15.85
None	69	84.15
Total	**82**	**100**

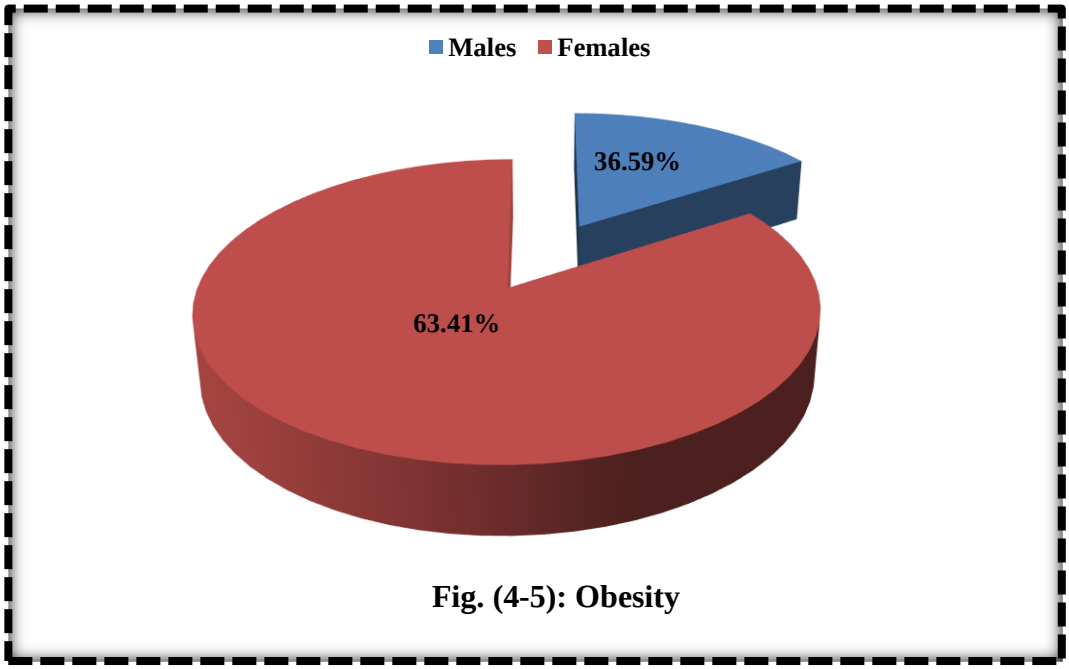


Fig. (4-5): Obesity

Table (4-7): Frequency distribution according to ultrasound findings

U/S findings	Frequency	%
Gall stone + gall bladder wall thickness >3 mm + positive sonographic Murphy sign + distension of gall bladder	48	58.53
Gall bladder wall thickness >3 mm + positive sonographic Murphy sign	15	18.29
Gall stone + gall bladder wall thickness >3 mm + positive sonographic Murphy sign	9	10.98
Gall bladder wall thickness >3 mm + positive sonographic Murphy sign + distension of gall bladder + periecholecystic fluid	2	2.44
Gall bladder wall thickness >3 mm + positive sonographic Murphy sign + periecholecystic fluid	3	3.66
Others*	5	6.10
Total	**82**	**100**

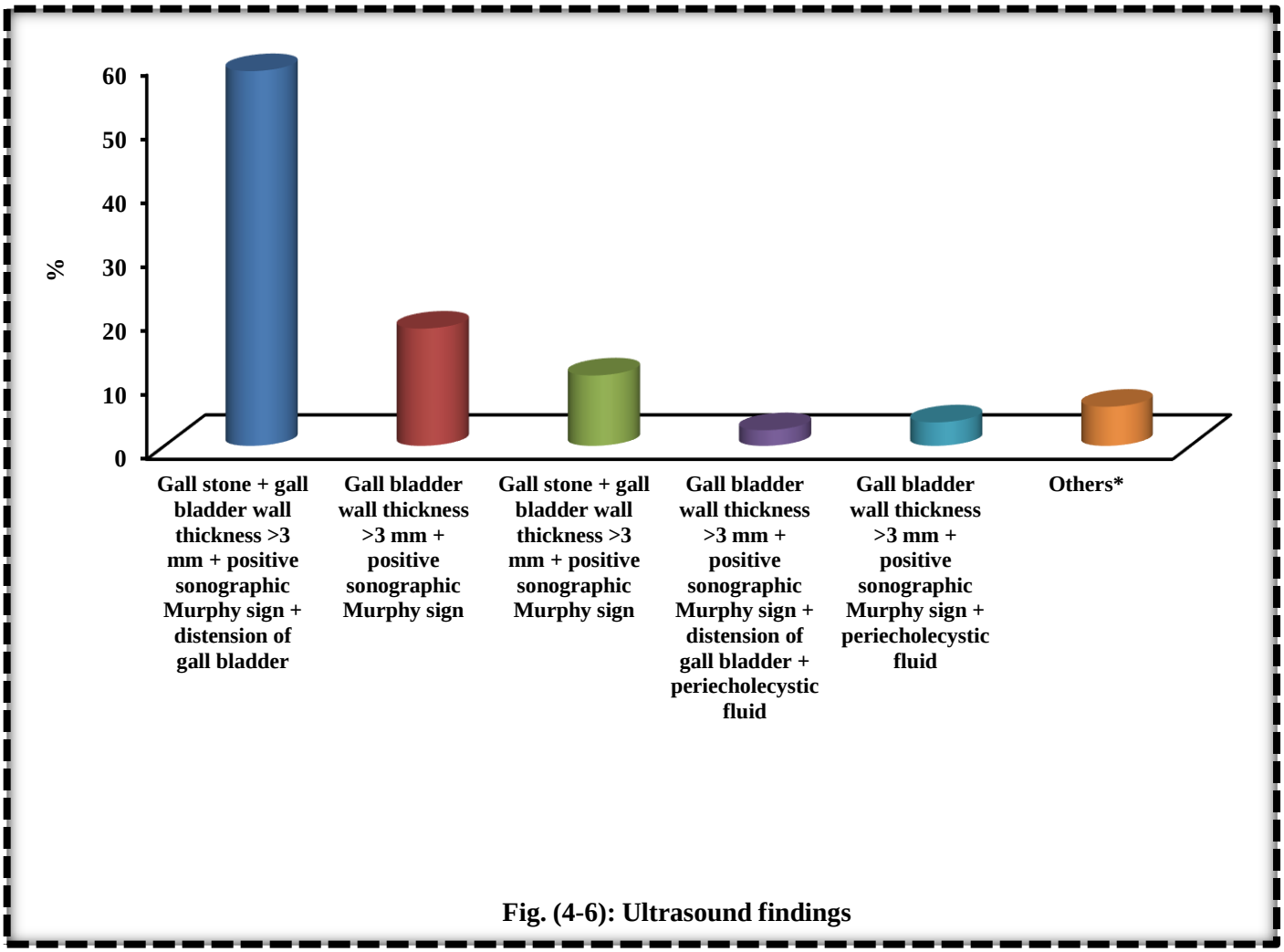


Fig. (4-6): Ultrasound findings

Table (4-8): Frequency distribution according to final diagnosis

Final diagnosis	Frequency	%
Acute calculous cholecystitis	61	74.39
Acute a calculous cholecystitis	21	25.61
Total	**82**	**100**

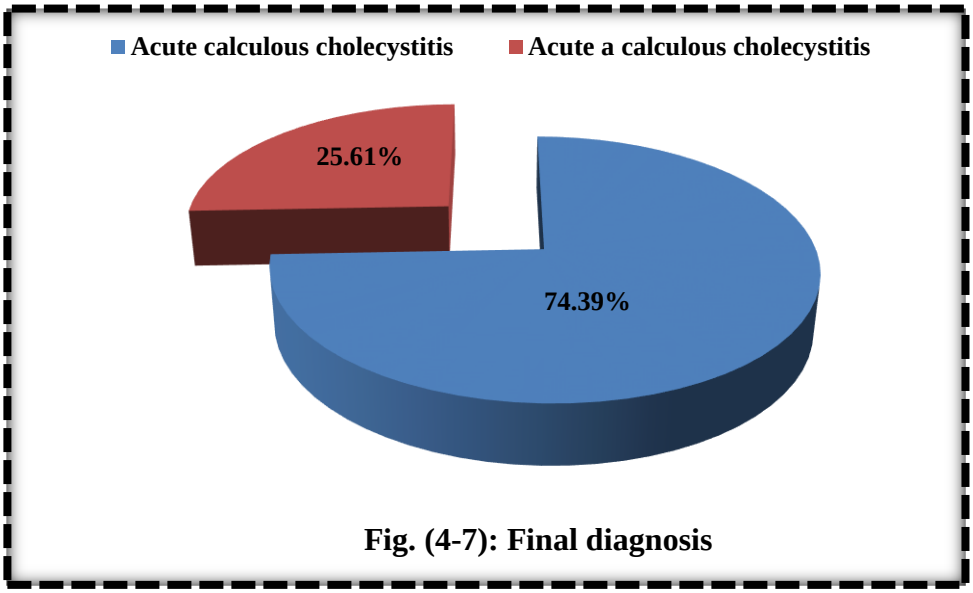


Fig. (4-7): Final diagnosis

Table (4-9): Frequency distribution according to complications

Complications	Frequency	%
Emphysematous cholecystitis	3	3.66
Perforation of the gall bladder	1	1.22
Pericholecystic fluid collection	8	9.76
Free complications	70	85.36
Total	**82**	**100**

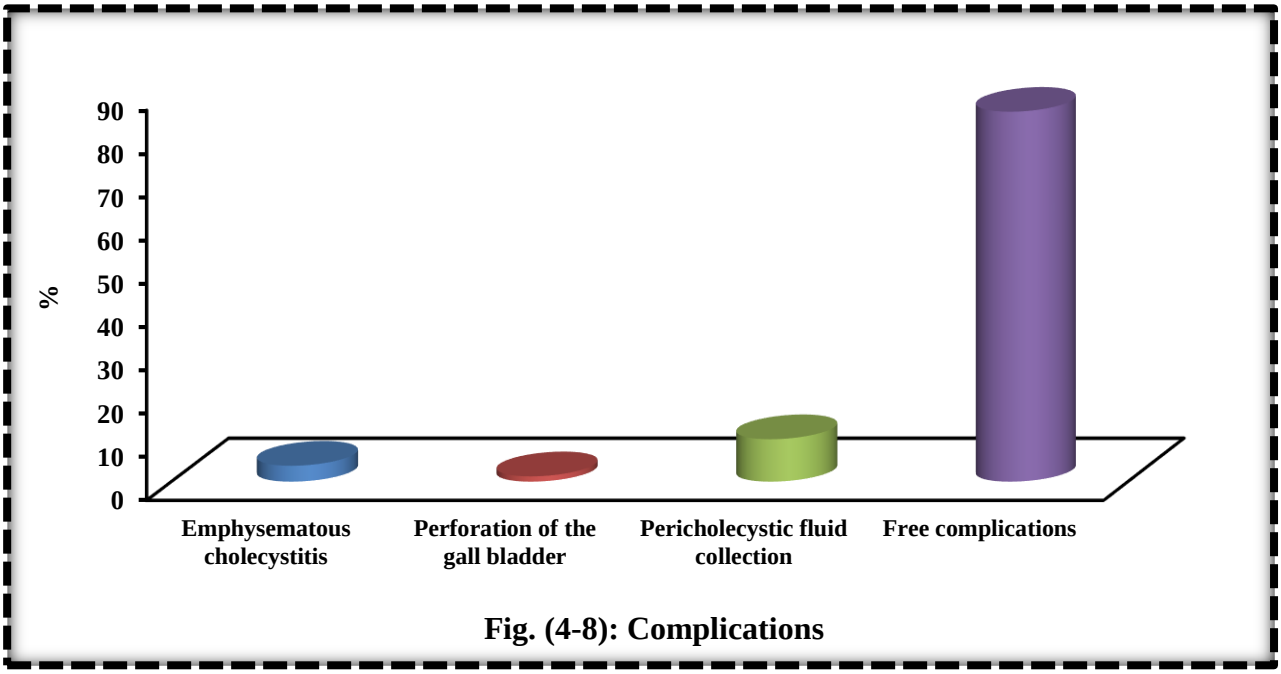


Fig. (4-8): Complications

Part Two: Relationships

Table (4-10): Chi-square test of the final diagnosis with age

Age group (years)	Final diagnosis	
	Acute calculous cholecystitis (n=59)	Acute a calculous cholecystitis (n=21)
<30 (n=1)	1(1.25%)	-
30-39 (n=13)	8(10.00%)	5(6.25%)
40-49 (n=28)	21(25.61%)	7(8.54%)
50-59 (n=25)	19(23.75%)	6(7.50%)
60-69 (n=11)	9(11.25%)	2(2.50%)
≥70 (n=41)	2(2.50%)	2(2.50%)
Chi-square test	27.64	
P-value	0.039*	

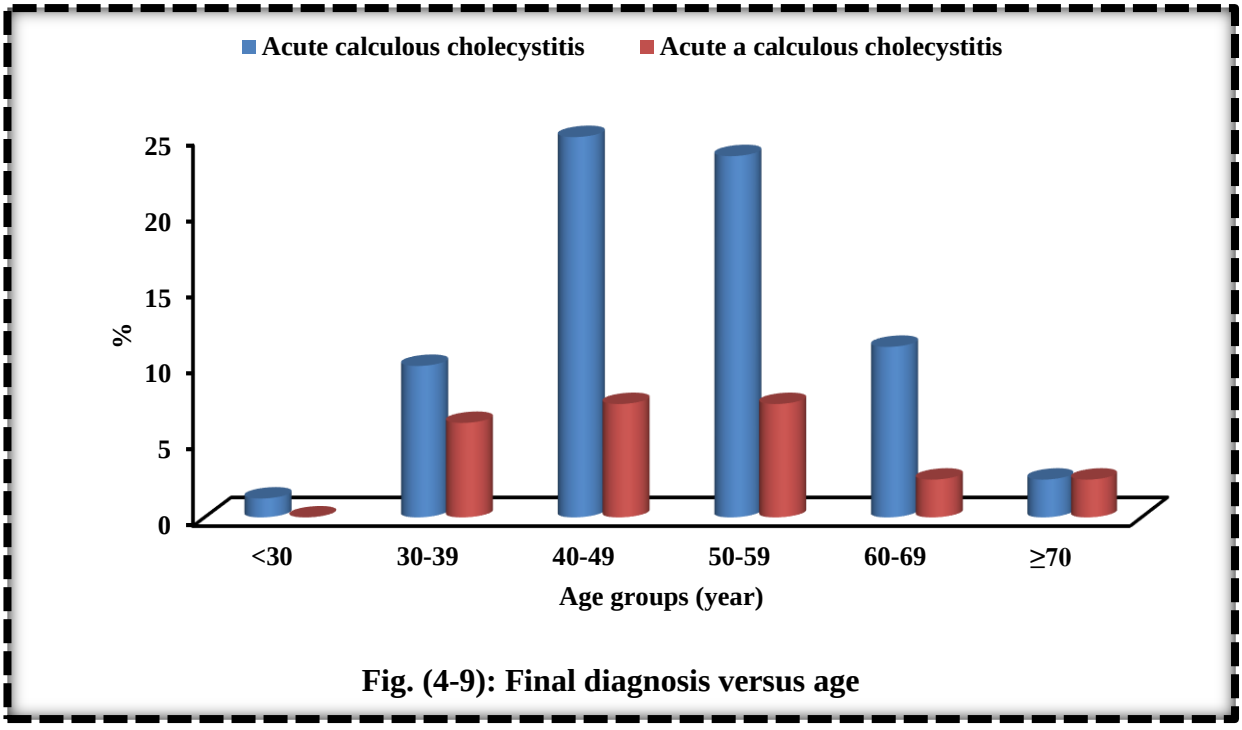


Fig. (4-9): Final diagnosis versus age

Table (4-11): Chi-square test of the final diagnosis with gender

Gender	Final diagnosis	
	Acute calculous cholecystitis (n=61)	Acute a calculous cholecystitis (n=21)
Males (n=30)	21(25.61%)	9(10.98%)
Females (n=52)	40(48.78%)	12(14.63%)
Chi-square test	18.47	
P-value	0.039*	

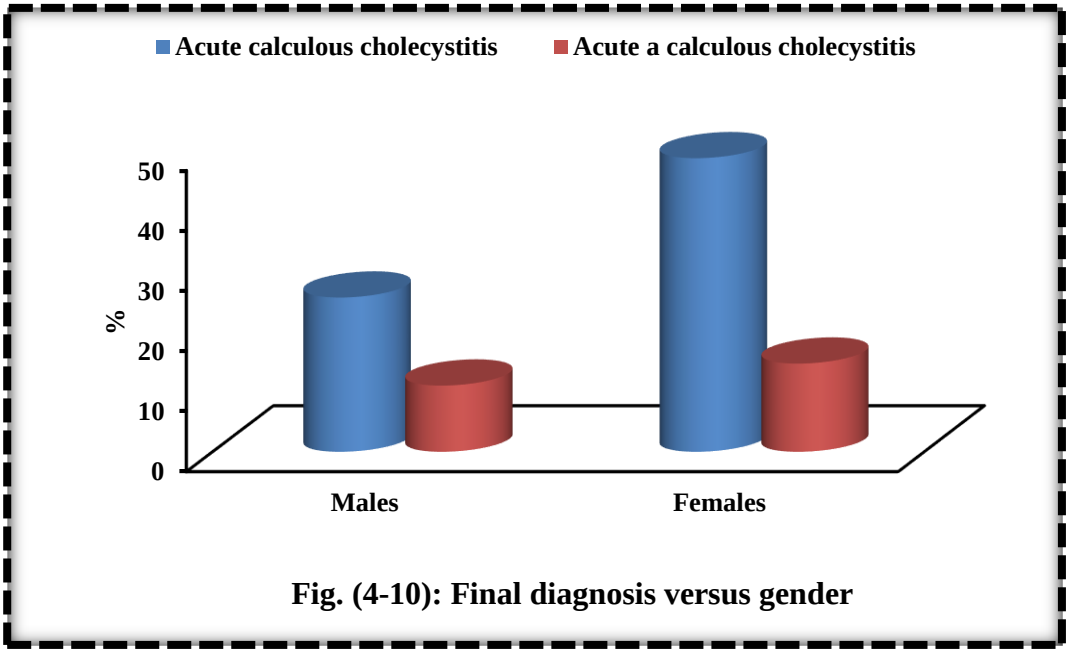


Fig. (4-10): Final diagnosis versus gender

Table (4-12): Chi-square test of the final diagnosis with other pathology

Other pathology	Final diagnosis	
	Acute calculous cholecystitis (n=8)	Acute a calculous cholecystitis (n=2)
Diabetic (n=5)	4(40%)	1(10%)
Jundace (n=3)	3(30%)	-
Ascitis + PV dilation (n=1)	-	1(10%)
Jundace + PHT + ascitis + plural effusion (n=1)	1(10%)	-
Chi-square test	50.19	
P-value	0.0001**	

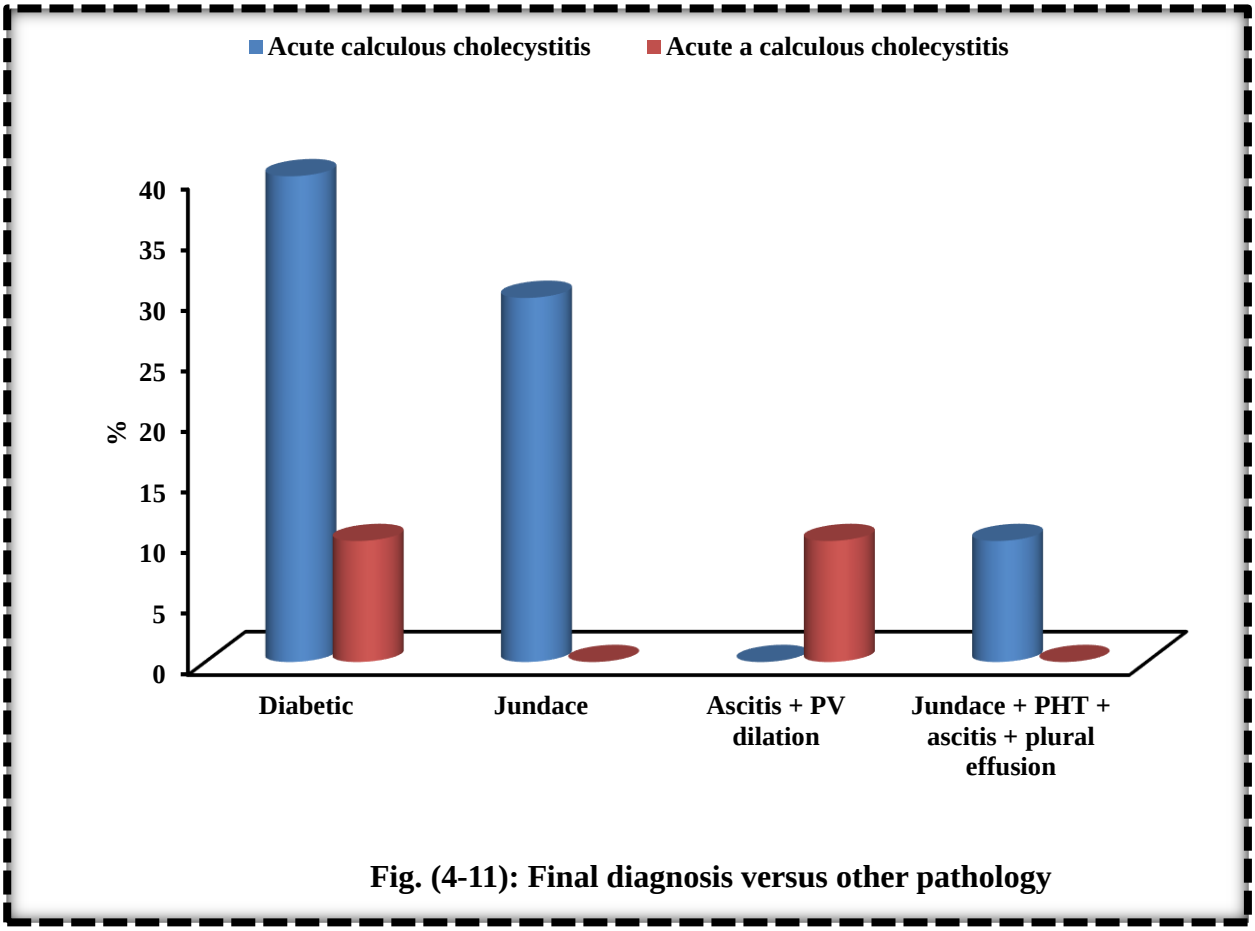


Fig. (4-11): Final diagnosis versus other pathology

Table (4-13): Chi-square test of the final diagnosis with obesity

Obesity	Final diagnosis	
	Acute calculous cholecystitis (n=10)	Acute a calculous cholecystitis (n=3)
Obese (n=13)	10(76.92%)	3(23.08%)
Chi-square test	26.85	
P-value	0.0068**	

Table (4-14): Chi-square test of the complications with obesity

Obesity	Obesity	
	Obese	Not obese
Emphysematous cholecystitis	2(33.33%)	-
Perforation of the gall bladder	1(16.67%)	-
Pericholecystic fluid collection	3(50.00%)	-
Chi-square test	58.64	
P-value	0.0001**	

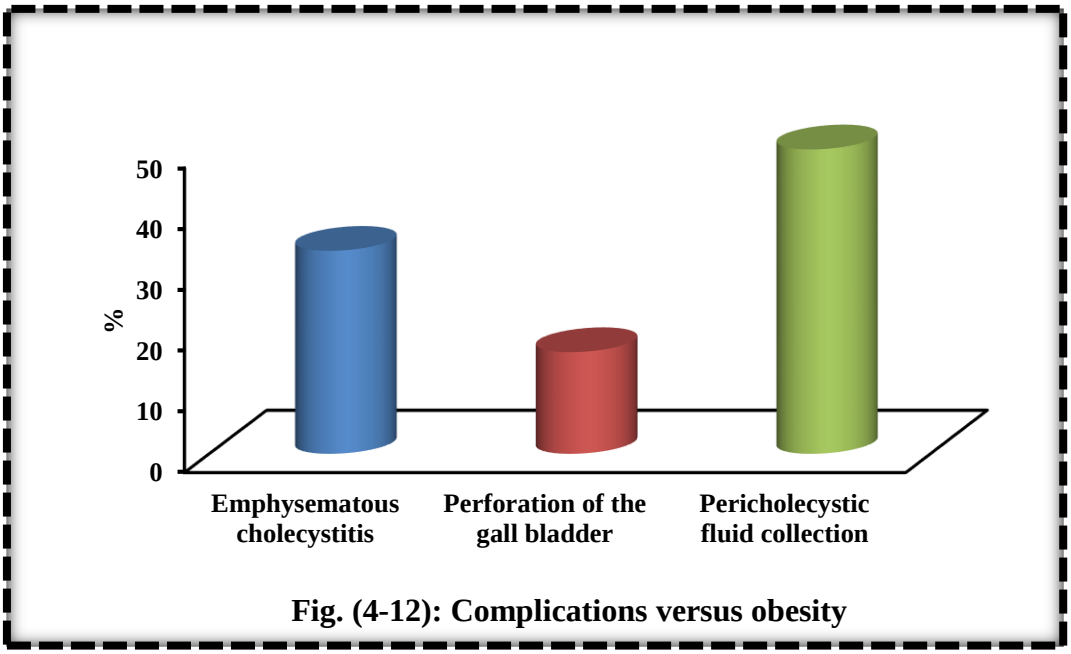


Fig. (4-12): Complications versus obesity

Table (4-15): Chi-square test between final diagnosis and residence

Residence	Final diagnosis	
	Acute calculous cholecystitis (n=10)	Acute a calculous cholecystitis (n=3)
Central Sudan (n=49)	36(42.86%)	13(14.29%)
Western Sudan (n=16)	12(15.58%)	4(5.19%)
Northern Sudan (n=15)	12(15.58%)	3(3.90%)
Eastern Sudan (n=2)	1(1.30%)	1(1.30%)
Chi-square test	28.53	
P-value	0.025*	

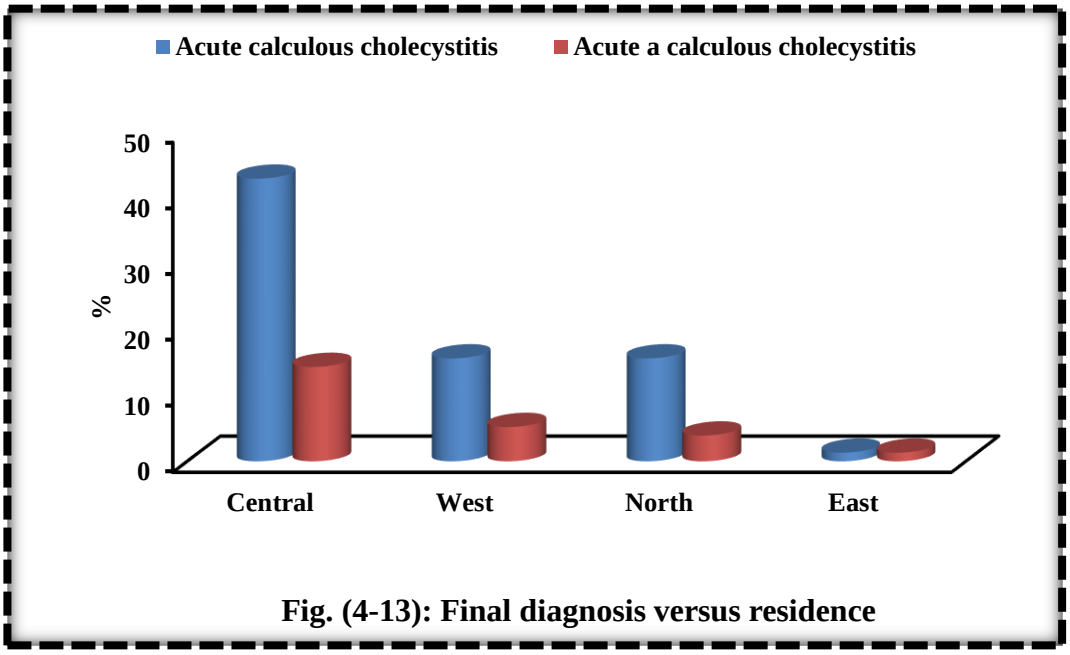


Fig. (4-13): Final diagnosis versus residence

Chapter Five

Discussion, Conclusion &Recommendations

Chapter Five
Discussion, conclusion and recommendations
5.1 Discussion:

As shown in Table (4-1) and Fig. (4-1), 30 out of 82 (36.59%) were males and the rest 52 out of 82 (63.41%) were females.This result agrees with study done by MawiaGamerelden et.aland Hamish Howong et.al they found that female more affected by acute cholecystitis.)

Age of patients was illustrated in Table (4-3) and Fig. (4-2). 1 out of 82 (1.22%) below 30 years, 13 out of 82 (15.85%) between 30-39 years, 28 out of 82 (31.71%) between 40-49 years, 25 out of 82 (32.93%) between 50-59 years, 11 out of 82 (13.41%) between 60-69 years and 4 out of 82 (4.88%) were 70 years or above. This result agrees with study done by Mawia Gamerelden et.al they found that acute cholecystitis incidence is higher within age of 41.50. ·

The ultrasound findings shows that ultrasonography is excellent and more sensitive modality for the diagnosis of gall stone and more sensitive in diagnosis of gallbladder wall thickening, positive sonographic murphy sign, distension of gall bladder as shown in Table (4-7) and Fig. (4-6). This result agrees with Goleaadela et.al, Krishna Kumar andHamishHowonget.al.

Final diagnosis of patients understudy was shown in Table (4-8) and Fig. (4-7). the majority, 61 out of 82 (74.39%) were acute calculous cholecystitis and the rest 21 out of 82 (25.61%) were acute a calculous cholecystitis.

According to complications was illustrated in Table (4-9) and Fig. (4-8). 3 out of 82 (3.66%) were emphysematous cholecystitis, 1 out of 82 (1.22%) were perforation of the gall bladder, 8 out of 82 (9.76%) were pericholecystic fluid collection, while the majority 70 out of 82 (82.36%) had no complications.

As shown in Table (4-10) and Fig. (4-9), Chi-square test shows significant difference (P=0.039) for the relationship between age and final diagnosis.This result is agrees with Goleaadelaet.al,Krishna Kumarand Hamish Howong et.al

that shows the high percentage of patients with acute cholecystits have cholithiasis (acute calculous cholecystits).

Relationship between final diagnoses with gender was shown in Table (4-11) and Fig. (4-10), Chi-square test shows significant difference (P=0.039) for the relationship between gender and final diagnosis.

The study findings also show that ultrasound can diagnose other pathology with acute cholecystits, e.g. Jaundice, ascites, plural effusion, portal hypertension (dilated portal vein + splenomegaly) as demonstrated in table (4-12) and fig (4-11).

The study also reflects that complications of acute cholecystitis mainly on obese patients as shown in table (4-14) and fig (4-12) shows significant difference (p-value 0.0001) for the relationship between complications of acute cholecystitis and obesity this agrees with stuy done by MawiaGamerelden et.al. The study shows the incidence of acute cholecystits was higher in patients from the central of Sudan that other as shown in table (4-15) and fig (4-13) shows significant difference (p-value = 0.025). This result agrees with study done by MawiaGamerelden et.al that Khartoum population suffer from acute cholecystitis

5.2 conclusion:

The study shows that the acute calculus cholecystitis is higher than acute a calculus.The incidence of acute cholecystitis in the studied group is higher in females that males. The study also reflects that complications of acute cholecystitis mainly on obese patients.

The incidence of acute cholecystitisis higher in patients from central Sudan.

Ultrasound is a method of high accuracy for the diagnoses of cholelithiasis. It has a great value in increasing accuracy in the diagnoses of acute cholecystitis and improves the clinical outcome.

5.3 Recommendations:

- Easy and immediate ultrasound technique should be used to diagnose acute cholecystitis.
- Adequate and good sonographic technique with more experience should be applied because ultrasound is operator dependent.
- Modern diagnostic instruments should be used to increase the accuracy outcome in diagnoses of acute cholecystitis.
- C-T scan should be done in cases with complicated acute cholecystitiseg. Gangrenous cholecystitis, emphysematous, perforated cholecystitis .
- The service of the ultrasound department in hospitals must be available 24 hours because acute cholecystitis is an urgent case.
- Further studies with large sample volume is recommended.

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Appendices

Appendix I: ultrasound images from the sample of the study:

Female with age 53 years

Image (1): Longitudinal transabdominal scan shows gall stone, wall thickening and distension of the gallbladder.

Male with age 42

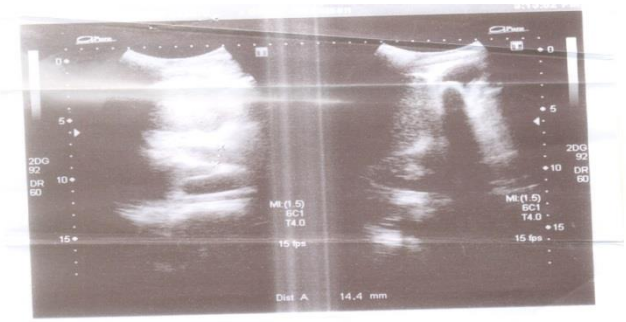
Image (2): Longitudinal transabdominal scan shows gall stone, at the neck of the gallbladder and wall thickening.

Obese Female with age 50

Image (3): Longitudinal transabdominal scan shows distension of the gallbladder, wall thickening, and small gallstones.

Female with age 41 years

Image [(4)]: Transverse transabdominal scan shows gallstone, wall thickening



Male with age 45 years

Image (5): Transabdominal scan shows gallstone wall thickening, dilation of portal vein

Female with age 40 years

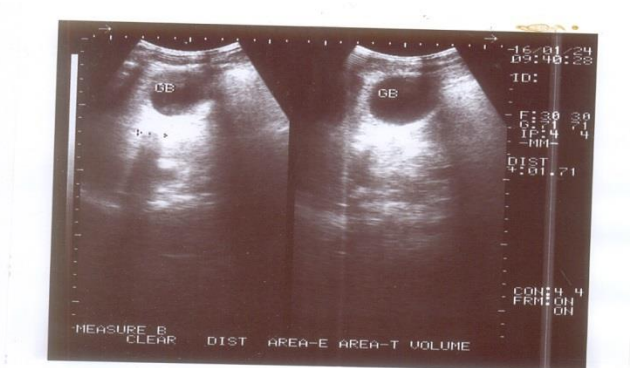
Image (6): Transverse transabdominal scan shows gallstone, distension of gallbladder, wall thickening

Male with age 37 years

Image (7): Longitudinal transabdominal scan shows stone at the neck of the gall bladder, wall thickening

Female with age 43 years

Image (8): Longitudinal transabdominal scan shows gall stone, wall thickening.



Male with age 44 years

Image (9): Transverse transabdominal scan shows gall stone, wall thickening, distension in gallbladder.

Female with age 60 years

Image (10): Longitudinal transabdominal scan shows wall thickening, distension in gallbladder, periecholecysitic fluid

Female with age 70 years

Image (11): Transverse and longitudinal transabdominal scan shows wall thickening, distension in gallbladder, intraluminal gas.

Female with age 43 years

Image (12): Transverse and longitudinal transabdominal scan shows stone at the neck of gallbladder, wall thickening, distension of gallbladder.

Appendix II:

Data collection sheet

Patient Name:

Patient gender: Male:

Female: pregnant: not pregnant:

Patient age:

Patient Residence: North Central East West

Other Pathology: diabetic jaund ascites

PHT

Ultrasound Findings:

Ultrasound findings of acute calculous choleycystitis:

- Gall stone.
- Gall bladder wall thickness > 3 mm.
- Positive sonographic Murphy sign.
- Distension of gall baldder.

Ultrasound findings of acute a calculous choleycystitis:

- Gall bladder wall thickness > 3 mm.
- Positive sonographic Murphy sign.
- Pericholecystic fluid.
- Intraluminal gas or membrane.

Final diagnose:

- Acute calculous cholecystitis
- Acute a calculous cholecystitis
- Emphysematous cholecystitis
- Perforation of the gallbladder
- Pericholecystic fluid collection