بسم الله الرحمن الرحيم

Sudan University for Sciences and Technology

College of Graduate Studies

Evaluation of Underlying Causes of Epigastric Pain Using Abdominal Ultrasonography

تقييم أسباب ألم فوق المعدة باستخدام الموجات فوق الصوتية للبطن

A thesis Submitted For Partial Fulfillment of The Requirements of (M.Sc.) Degree in Medical Diagnostic Ultrasound

By:

Shaza Mukhtar Abdelbagi Ahmed

Supervisor:

Prof :Caroline Edwared Ayad Khilla

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بسم الله الرحمن الرحيم

(اللَّهُ لَا إِلَهَ إِلَّا هُوَ الْحَيُّ الْقَيُّومُ لَا تَأْخُذُهُ سِنَةٌ وَلَا نَوْمٌ لَهُ مَا فِي السَّمَوَاتِ وَمَا فِي الْأَرْضِ مَنْ ذَا الَّذِي يَشْفَعُ عِنْدَهُ إِلَّا بِإِذْنِهِ يَعْلَمُ مَا بَيْنَ أَيْدِيهِمْ وَمَا خَلْفَهُمْ وَلَا يُحِيطُونَ بِشَيْءٍ مِنْ عِلْمِهِ إِلَّا بِمَا شَاءَ وَسِعَ كُرْسِيُّهُ السَّمَاوَاتِ وَالْأَرْضَ وَلَا يَئُودُهُ حِفْظُهُمَا وَهُوَ الْعَلِيُّ الْعَظِيمُ).

(سورة البقرة الاية 255)

Dedication

To my parents who have never failed to give me financial and moral support, for giving all my need during the time I developed my stem.

To my brother and sisters, who have never left my side.

To my husband for his supporting.

To my daughter Reem

Finally, ask Allah to accept this work and add it to my good works

Acknowledgement

First full of thanks to Allah…

And a lot of thanks and great fullness to my supervisor **Prof :Caroline Edwared Ayad Khilla** for his help and guidance…

And also a lot of thanks and great fullness to **Dr. Mohammed Fadlalmoula** for his help in collecting of research data.

Abstract

This cross sectional descriptive study was carried out at Iskan medical center and Elgref garb ultrasound departments in Khartoum state Sudan during the period from September to December 2018.

The aims of the study are to find the underlying causes of epigastric pain .The study evaluated the epigastric pain using the standard abdominal ultrasound scan including gall bladder, liver, pancreas and spleen to determine the findings that may cause epigastric pain, as well as to assess most common affected age and gender .

The study was done on 69 participants complaining of epigastric pain. The results showed that the females were suffering from pain more than males, the most affected age group was 34-45 years and 52.2% of patients have history of epigastric pain.

The causes of epigastric pain was found to be: the gallbladder pathologies most common cause of epigastric pain constituting 61.3% ,(cholelithiasis 54.8% ,Gallbladder sludge 6.5%), fatty liver 19.4%, and splenomegaly 6.5%.

The study also revealed that ultrasound had ability to evaluate and detect the causes of epigastric pain and the standard ultrasound examination for abdomen is recommended to be done for every patient suffering from epigastric pain.

الخلاصة

هذه دراسة وصفية اجريت في مركز الاسكان الطبي ومركز صحي الجريف غرب بولاية الخرطوم في الفترة من سبتمر وحتى ديسمبر 2018 م والهدف من الدراسة معرفةالامراض التي تؤدي لالم فوق المعدة غيرأمراض المعدة وهل فحص الموجات فوق الصوتية مؤهل لاكتشاف ذلك.

الغرض من الدراسة تقييم الم فوق المعدةباستخدام الموجات فوق الصوتية للبطن وتشمل فحص المرارة والكبد والبنكرياس والطوحال لتحديد الامراض التي تسبب ذلك الالم والاعمار والجنس الاكثر تاثيرابالم فوق المعدة.وشملت هذه الدراسة 69 مريض يشكون من آلام فوق المعدة وكانت اكثر الفئات العمرية بين 13-80 سنة .ووجد ان 52.2% لديهم اعراض مزمنةوكانت 44%من الحالات اعطت نتائج ايجابية.

كانت نتائج الدراسة ان النساء اكثر شكوي من الرجال والفئات العمرية3545 سنةاكثرتعرضاللالم وتوصلت الدراسة الى ان اسباب آلام فوق المعدة شكلت 61.3% بسبب امراض الحويصلة الصفراوية (حصاوي بنسبة 54.8 % وترسبات صفراوية بنسبة 6.5%) وشكلت دهون الكبد نسبة 19.7% وتضخم الطوحال نسبة 6.5% .وهذه تثبت ان امراض المرارةهي الاكثر انتشارا لتسبب الالم وتليها الكبد.

أوصت الدراسة أن الموجات فوق الصوتية لها المقدرة علي أكتشاف مسببات ألم فوق المعدة وخاصة

في تقييم المرارة وأكتشاف الحصاوي المرارية والاثار الناتجة منها والتي بدورها تقلل الضرر والمخاطر علي المرضي,ونوصي بتحويل اي مريض يعاني من الالم فوق المعدةالي فحص الموجات

فوق الصوتية أولا قبل العلاج

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List of Abbreviations

Abbreviation	Meaning
AAL	anterior axillary line
CBD	common bile duct
GB	Gallbladder
ICS	Inter costal space
LS	longitudinal section
LUQ	left upper quadrant
RUQ	right upper quadrant
SNR	signal-to-noise ratio
TS	transverse section

Chapter One

1-1 Introduction

The epigastrium or epigastric above stomach region is the upper central portion of the abdomen. it is located between the costal arch (lower edge) of the thorax and sub- costal plane. (Testa et al., 2010)

The epigastric region contains the majority of the stomach, part of the liver, part of pancreas ,part of the duodenum, part of the spleen , and the adrenal glands. This region pushes out when the diaghragm contracts during breathing. (Karthick.P, et al 2010).

Epigastric pain is subject to contain abnormal reaction that are associated with several diseases of epigastrium.pain occurs regularly when the epigastrium is defective. this defect can be marked by action of diaphragm. The rectus abdominus create on out ward protruding of the upper wall of abdomen.

The sudden pain produces swift and forceful breath-exhalation .it brings with it a great sense of ineffectiveness and discomfort. in a nutshell, this pain can range from mild ach to sever pain in the abdominal region.

The epigastrium is the site where pain coming from both abdominal and extraabdominal organs is frequently referred. Although acute or chronic diseases of the stomach, duodenum, liver, pancreas and biliary tree are the most common causes of acute epigastric pain, several other entities, potentially more severe, should also be suspected and investigated. Clinical bedside ultrasonography (US) is actually the first-line imaging in acute epigastric pain patients presenting to the hospital Emergency Department (ED) because it is rapid, noninvasive, relatively

inexpensive and focused, repeatable and reliable. Moreover, the systematic use of emergency US as a complement to routine management might save economic resources by avoiding further costs for complications and substantially reducing the time for making an accurate diagnosis.(Testa et al., 2010)

The most certain symptomatic manifestation of gallstones is episodic upper abdominal pain. Characteristically, this pain is severe and located in the epigastrium and/or the right upper quadrant. (Diehl, 1992)

1-2 Problem of the study:

-Epigastric pain now days is common and affected most of patient. Many patient diagnosis as gastritis and ignore other differential diagnosis like gall bladder disease (stone and inflammation) liver disease, pancreas disease and spleen which can be easily diagnosis by ultrasound and decrease the complication.

-The question to be answered:

1-What is the causes of epigastric pain rather than the stomach.

2-Can ultrasound be able to detected the causes of epigastric pain.

1-3 Objectives:

1-3-1General objective:

To evaluate the epigastric pain using abdominal ultrasound scaning.

1-3-2 Specific objective:

1- To evaluate abdominal organs (gallbladder, Liver, pancreas and spleen) for the patients complain of epigastric pain.

2-To determine most findings that may cause the epigastric pain.

3-To assess most common age and gender affected by epigastric pain.

4- T0 correlate the finding with age , gender and treatment uses.

1-4 Over view of the study:-

This study was divided into 5 chapter:-

Chapter one deals with introduction of the study in which the proplem sated, objectives and methods of the study ,chapter two literature review for anatomy, physiology, pathology and normal sonographic appearances of liver, gallbladder, pancreas and spleen,and previous study, chapter three deal methodology, chapter four:-deal the results, chapter five deal the discussion, conclusion and recommendation. finally the references and appendices.

Chapter Two

Literature Review and previous study

2.1 Anatomy of the abdomen:

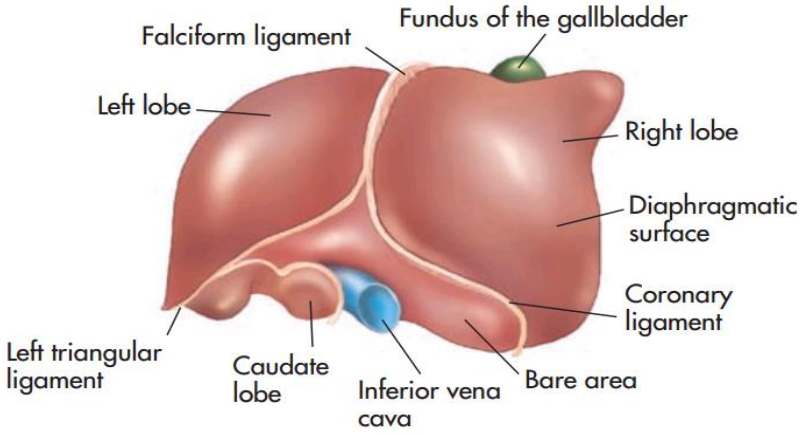
2.1.1 Anatomy of the liver:

The liver occupies almost all of the right hypochondrium**,** the greater part of the epigastrium**,** and the left hypochondriumas far as the mammillary line. The contour andshape of the liver vary according to the patient's habitus and lie. Its shape is also influenced by the lateral segment of the left lobe and the length of the right lobe of the liver. The liver lies inferior to the diaphragm. The ribs cover the greater part of the right lobe (usually a small part of the right lobe is in contact with the abdominal wall) .(Hagen-Ansert 2018)

In the epigastric region, the liver extends several centimeters below the xiphoid process. Most of the left lobe is covered by the rib cage. The fundus of the stomach lies posterior and lateral to the left lobe of the liver and may frequently be seen on transverse sonograms. The remainder of the stomach lies inferior to the liver The duodenum lies adjacent to the right lobe and medial segment of the left lobe of the liver. The body of the pancreas is usually seen just inferior to the left lobe of the liver. The posterior border of the liver contacts the right kidney, inferior vena cava, and aorta. The diaphragm covers the superior border of the liver .(Hagen-Ansert 2018)

The liver is suspended from the diaphragm and anterior abdominal wall by the falciform ligament and from the diaphragm by the reflections of the peritoneum. Most of the liver is covered by peritoneum, but a large area rests directly on the diaphragm; this is called the bare area.(Hagen-Ansert 2018)

The subphrenic space between the liver (or spleen) and the diaphragm is a common site for abscess formation. The right posterior subphrenic space lies between the right lobe of the liver, the right kidney, and the right colic flexure The lesser sac is an enclosed portion of the peritoneal space posterior to the liver and stomach. This sac communicates with the rest of the peritoneal space at a point near the head of the pancreas. It also may be a site for abscess formation. The right subhepatic space is located inferior to the right lobe of the liver and includes Morison's pouch, which lies between the posterior aspect of the right lobe and the upper pole of the right kidney. The posterior borders of the liver are in contact with the inferior vena cava, the gallbladder and cystic duct, the portal vein confluence, the hepatic artery, the right kidney, and the colon. (Hagen-Ansert 2018)



Figure(2-1) Superior view of the liver (Hagen-Ansert 2018)

2.1.1.1 Lobes of the Liver

The liver has been divided into four anatomic lobes: the left, right, quadrate, and caudate, with the falciform ligament separating the left from the right lobe. The functional division between the left and right lobes is based upon the vasculature, not the falciform ligament.

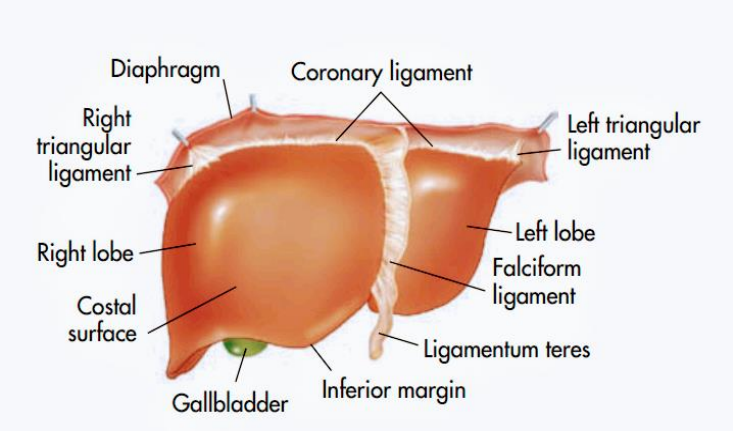


Figure (2. 2) Anterior view of the liver ((Hagen-Ansert 2018)

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The middle hepatic vein and the ascending section of the left portal vein divide the liver, functionally into a left lobe and a right lobe. This dividing line tends to be near the left edge of the inferior vena cava and the gallbladder fossa. The quadrate lobe is functionally part of the medial segment of the left lobe, which lies between the middle hepatic vein and the left hepatic vein. Using these functional divisions, the falciform ligament now belongs to the left lobe. It runs along the medial left lobe close to the border with the lateral left lobe.(Hagen-Ansert 2018)

2.1.1.2 Vascular Anatomy and Inter segmental Segments:

Understanding the vascular relationships within the hepatic segments is crucial for the surgical approach Theright hepatic vein courses within the

right inter segmental fissure to divide the right lobe into anterior and posterior segments. The middle hepatic vein courses within the main lobar fissure to separate the anterior segment of the right lobe from the medial segment of the left lobe. The left inter segmental fissure separates the medial segment of the left lobe from the lateral segment. This fissure is further divided into cranial, middle, and caudal sections. The left hepatic vein forms the boundary of the cranial third, the ascending branch of the left portal vein represents the middle third, and the fissure for the ligamentum teres forms the most caudal division of the left lobe. The major branches of the portal veins run centrally within the segments (intra segmental) with the exception of the ascending portion of the left portal vein, which runs in the left inter segmental fissure.(Hagen-Ansert 2018)

2.1.1.3 Ligaments and Fissures:

There are several important ligaments and fissures to remember in the liver: Glisson's capsule, main lobar fissure, falciform ligament, ligamentum teres (round ligament), and ligamentum venosum. These ligaments and fissures appear echogenic or hyperechoic because of the presence of collagen and fat within and around the structures.

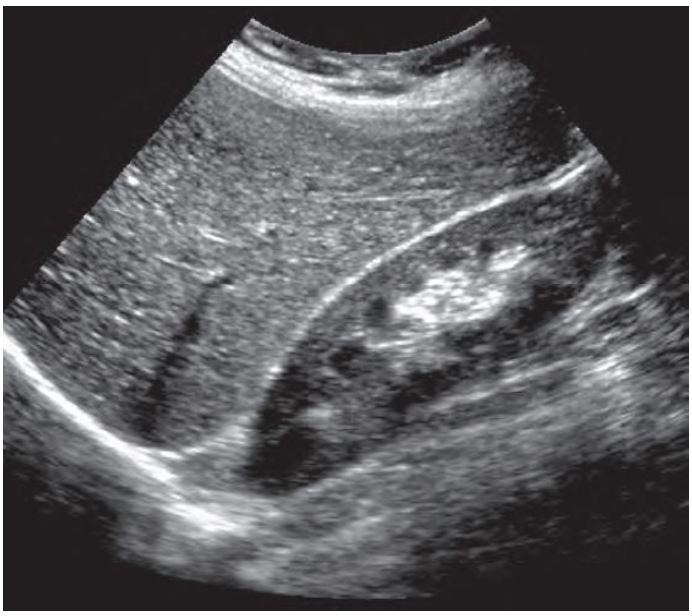
The liver is covered by a thin connective tissue layer called Glisson's capsule. This capsule completely surrounds the liver and is thickest around the inferior vena cava and portal hepatis. The hepatoduodenal ligament contains the main portal vein, the proper hepatic artery, and the common duct.(Hagen-Ansert 2018)

2.1.1.4 Vascular Supply

The liver receives blood supply from the portal veins and hepatic artery. (Hagen-Ansert 2018)

2.1.1.5 Sonography of the liver:

The normal liver is homogenous. Its echogenicity is either equal to or slightly greater than the parenchyma of the normal right kidney, and slightly less echogenic than the normal spleen. Also, when compared with the pancreas, the liver is slightly less echogenic in an adult.(Penny,Steven 2011)



Figure(2. 3) Normal liver echogenicity,The liver is more echogenic than the renal cortex(Rumack ,2011).

2.1.2 Anatomy of the biliary system:

The biliary apparatus consists of the right and left hepatic ducts, the common hepatic duct, the common bile duct, the pear-shaped gallbladder, and the cystic duct.

2.1.2.1 The Gallbladder:

The gallbladder is a pear-shaped organ that is found on the inferior margin of the liver between the right and left lobes of the liver. Two anatomic landmarks are used to locate the gallbladder. The middle hepatic vein is in alignment with the gallbladder fossa.The inter lobar fissure extends from the right portal vein to the gallbladder fossa. The gallbladder lies in the intra hepatic position, but as it migrates to the surface of the liver during embryologic development it acquires a peritoneal covering over most of its surface.

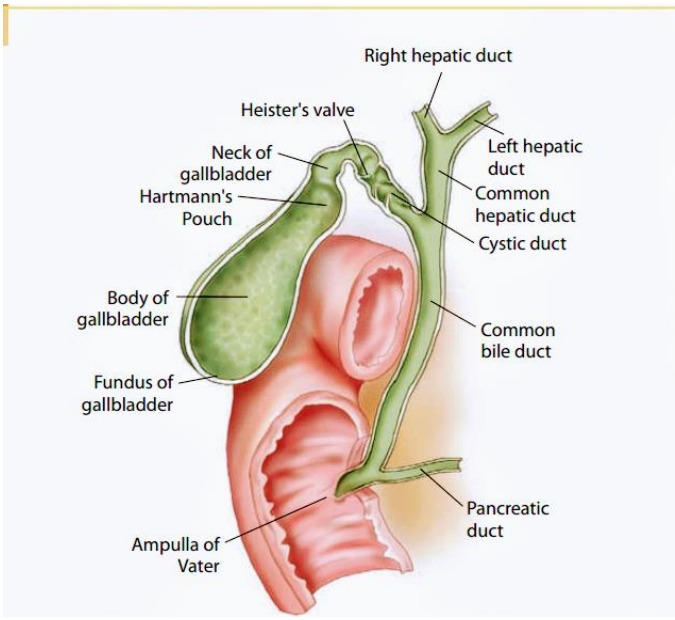


Figure (2.4) Gall bladder and Biliary tree (Hagen-Ansert 2018)

The remainder of the gallbladder surface is covered with adventitial tissue that merges with the connective tissue with the liver. The gallbladder has

been found to lie in various ectopic positions (supra hepatic, suprarenal, within the anterior abdominal wall, or in the falciform ligament).

Failure of the gallbladder to develop is rare; this is known as *agenesis* of the gallbladder.These patients may still have the biliary ductal system, which can become inflamed or filled with stones.The gallbladder is divided into the fundus, body, and neck The rounded fundus usually projects below theinferior margin of the liver, where it comes into contact withthe anterior abdominal wall at the level of the ninth right costalcartilage. The body generally lies in contact with the visceralsurface of the liver and is directed upward, backward, and to the left. The neck becomes continuous with the cystic duct, which turns into the lesser omentum to join the right side of the common hepatic duct to form the common bile duct. The neck of the gallbladder is oriented posteromedially toward the portahepatis. The fundus is situated lateral, caudal, and anterior to the neck.(Hagen-Ansert2018)

2.1.2.1.1 The size and shape of the gallbladder :

are variable. Generally the normal gallbladder measures approximately 2.5 to 4 cm in diameter and 7 to 10 cm in length. The walls are less than 3 mm thick. dilation of the gallbladder is known as hydrops**.** Several anatomic variations may occur within the gallbladder to give rise to its internal echo pattern on the sonogram.The gallbladder may have a small outpouch, also known as the infundibulum, forming Hartmann’s pouch; this is significant as gallstones may collect in this pouch other anomalies include partial septation, complete septation (double gallbladder), and folding of the fundus (Phrygian cap With a capacity of 50 ml, the gallbladder serves as a reservoir for bile. It also has the ability to concentrate the bile. To aid this process, its mucous membrane contains folds that unite with each other, giving the

surface a honeycomb appearance. Heister's valve in the neck of the gallbladder helps to prevent kinking of the duct. (Hagen-Ansert 2018)

The extrahepatic portion of the bile ducts includes the common hepatic duct, common bile duct, and a portion of the central right and left ducts. . The common hepatic duct is the segment above the cystic duct and the common bile duct is the segment below. The cystic duct may be difficult to image on sonography .**(**Hagen-Ansert 2018)

2.1.2.2 Common bile duct:

The normal common bile ducthas adiameter of up to 6 mm. The first part of the duct lies in theright free edge of the lesser omentum. Thesecond part of the duct is situated posterior to the first partof the duodenum. The third part lies in a groove on the posterior surface of the head of the pancreas. It ends by piercing the medial wall of the second part of the duodenum about halfway down the duodenal length. There the common bile duct is joined by the main pancreatic duct, and together theyopen through a small ampulla (the ampulla of Vater) into the duodenal wall. The end parts of both ducts (common bile duct and main pancreatic duct) and the ampulla are surrounded by circular muscle fibers known as the sphincter of Oddi. (Hagen-Ansert 2018)

2.1.2.3 Cystic duct:

The cystic duct is about 4 cm long and connects the neck of the gallbladder with the common hepatic duct to form the common bile duct. It is usually some what S-shaped and descends for a variable distance in the right free edge of the lesser omentum.(Hagen-Ansert 2018)

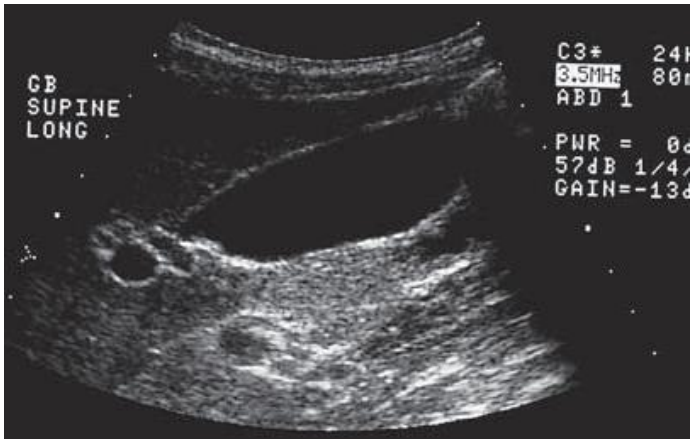
2.1.2.4Vascular Supply:

The arterial supply of the gallbladder is from the cystic artery, which is a branch of the right hepatic artery. The cystic vein drains directly into the

portal vein. Smaller arteries and veins run between the liver and the gallbladder.(Hagen-Ansert 2018)

2.1. 2.1.2Sono graphy of the gall bladder :

Sonographically as an anechoic, pear-shaped structure. Often, it may be seen at the level of the main lobar fissure and portal vein. The size of gallbladder is variable, although the normal ranges are said to be 8–10 cm in length and no more than 5 cm in diameter. The gallbladder wall should measure no more than 3 mm in thickness.(Penny, Steven M (2011)



Figure(2.5)Longitudinal image Of the gallbladder including the neck**,**

(Rumack , 2011)

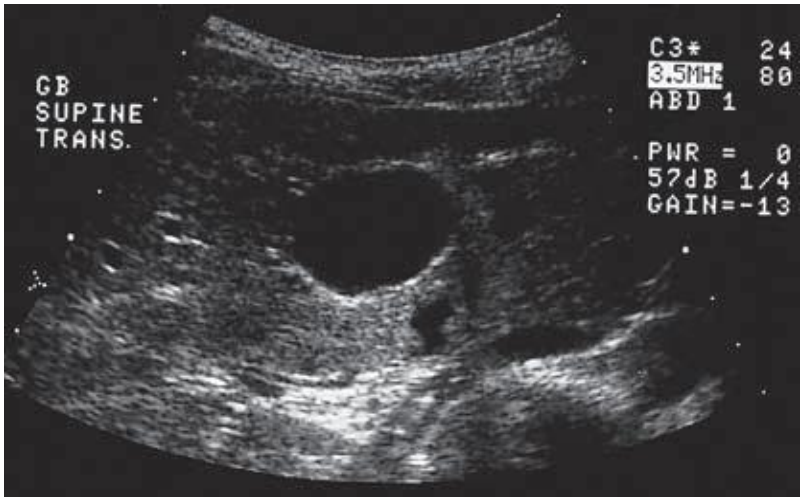


Figure (2. 6) Transverse scan of gallbladder (Rumack, 2011)

2.1.3 Anatomy of the pancreas:

The pancreas lies anterior to the first and second lumbar bodies located deep in the epigastrium and left hypochondrium, behind the lesser omental sac The major posterior vascular landmarks of the pancreas are the aorta and inferior vena cava. The pancreas most commonly extends in a horizontal oblique lie extending from the second portion of the duodenum to the splenic hilum diaphragm. The stomach, duodenum, and transverse colon form the superior and lateral borders of the pancreas, which makes visualization of the pancreas by ultrasound difficult (air and gas interference). (Hagen-Ansert 2018)

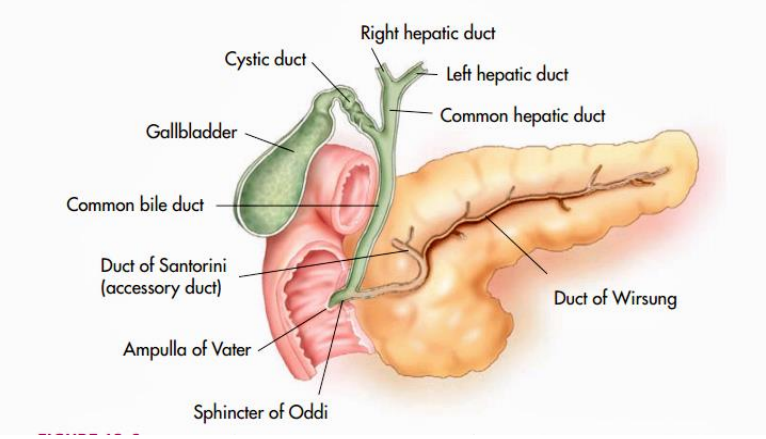


Figure (2.7)The head of the pancreas lies in the C-loop of the duodenum. The common bile duct passes posterior to the first part of the duodenum and courses through a groove posterior to the pancreatic head, where it meets the pancreatic duct to enter the duodenum through the ampulla of Vater. This opening is guarded by the sphincter of Oddi (Hagen-Ansert 2018)

The pancreas is divided into the following four areas: head, neck, body, and tail each area is discussed as it relates to its surrounding anatomy. The reader is referred to the multiple cross-sectional drawing to gain a relational understanding of the adjacent anatomy to the pancreas .(Hagen-Ansert 2018)

2.1.3.1 Pancreatic Ducts:

Two ducts are seen within the pancreas, the duct of Wirsung and the duct of Santorini. To aid in the transport of pancreatic fluid, the ducts have smooth muscle surrounding them. The duct of Wirsungis a primary duct extending the entire length of the gland. It receives tributaries from lobules at right angles and enters the medial second part of the duodenum with the common bile duct at the ampulla of Vater (guarded by the sphincter of Oddi) .(Hagen-Ansert 2018)

. 2.1.3.2 The duct of Santorini :

Is a secondary duct that drains the upper anterior head. It enters the duodenum at the minorpapilla about 2 cm proximal to the ampulla of Vater. The duct of Wirsung is easier to visualize on ultrasound as it courses through the midline of the body of the gland. It appears as an echogenic line or lucency bordered by two echogenic lines. The duct should measure less than 2 mm, with tapering as it reaches the tail. Color Doppler imaging may help distinguish the dilated pancreatic duct from the vascular structures (splenic vein and artery) in the area.

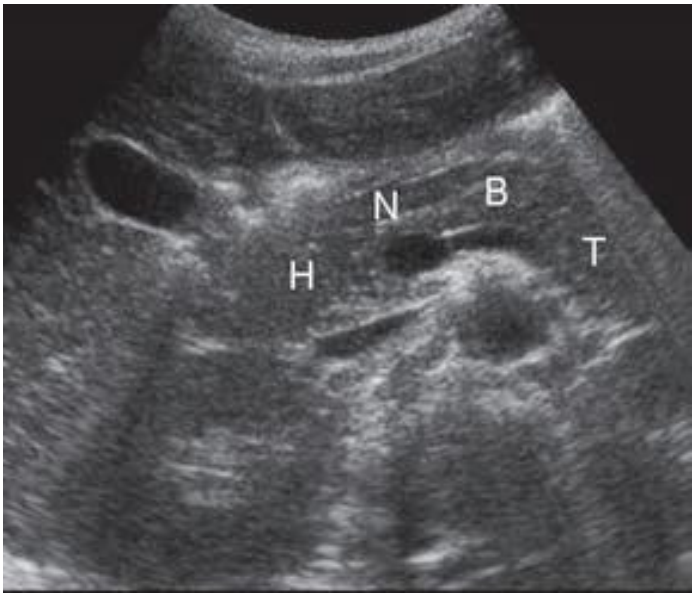
2.1.3.3 Vascular Supply:

The blood supply for the pancreas is the splenic artery and pancreatic doduodenal arteries.(Hagen-Ansert 2018)

2.1.3.4 Sono grahy of the pancreas:

The normal echogenicity of the pancreas is greater than that of the liver, and equal to, or greater than, that of the spleen in the adult. The pediatric

pancreas may appear more hypoechoic In the transvers plane, two round anechoic structures may be noted within the pancreatic head. The anterior structure is the gastro duodenal artery and the more posterior structure is the common bile duct. (Penny, Steven M (2011).



Figure(2.8) Transverse Epigastrium. Scan demonstrate a normal pancreas with an echogenicity greater than that of the adjacent normal liver(Devin dean,2005)

2.1.4 Anatomy of the spleen:

The spleen is an intra peritoneal organ covered with peritoneum over its entire extent, except for a small area at its hilum, where the vascular structures and lymph nodes are located. The spleen lies in the posterior left hypochondrium between the fundus of the stomach and the diaphragm. The splenic axis is along the shaft of the eight to tenth ribs with the lower pole extending forward as far as the mid axillaryline. The infero medial surface of the spleencomes into contact with the stomach, left kidney, pancreas, and

splenic flexure of the colon. In most adults, a portion of the splenic capsule is firmly adherent to the fused dorsal mesentery anterior to the upper pole of the left kidney, which produces a “bare area” of the spleen. This bare area can be helpful in distinguishing intra peritoneal from pleural fluid collections. (Hagen- Ansert 2018) .

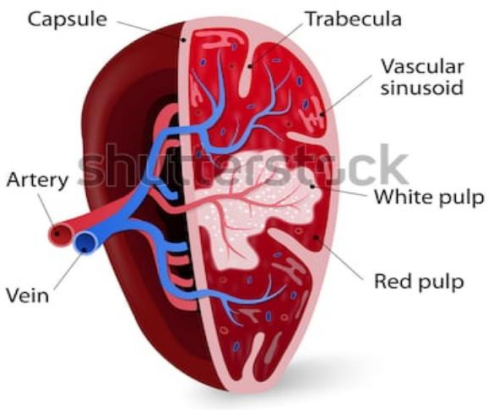


Figure (2.9) anatomy of spleen(Longnecker, Daniel 2014)

2.1.4.1 Size of spleen:

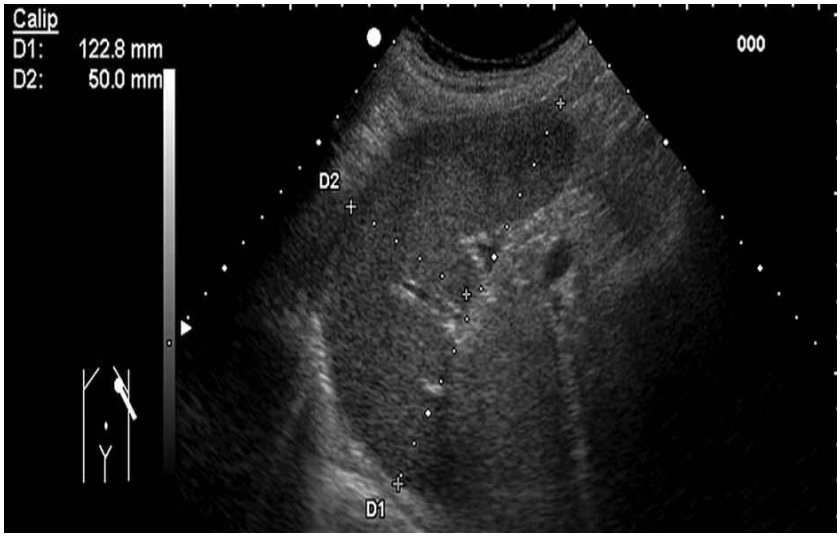
The spleen is of variable size and shape (e.g., “orange segment,”tetrahedral, triangular) but generally is considered to be ovoid with smooth, even borders and a convex superior and concave inferior surface Normal measurements for the average adult should be 8 to 13 cm in length, 7 cm in width, and 3 to 4 cm in thickness. The spleen decreases slightly in size with advancing age. The size of the spleen may vary in size in accordance with the nutritional status of the body.(Hagen-Ansert 2018)

2.1.4.2 Vascular Supply:

Blood is supplied to the spleen by the tortuous splenic artery. The splenic vein is formed by multiple branches spleen and leaves the hilum in a horizontal direction tospleen accompany the splenic artery and are derived from the celiac plexus. (Hagen-Ansert 2018)

2.1.4.3 Sono graphy of the spleen:

The sonographic appearance of the normal spleen is frequently isoechoic to the liver, although it may be slightly less echogenic. Some persons may have an accessory spleen. This small, round island of splenic tissue is located near the splenic hilum or possibly near the tail of the pancreas. An accessory spleen will appear isoechoic to the spleen (Penny, Steven M 2011)



Figure(2.10). Sonographic measurement of the spleen. D1 indicates length;and D2, width. (Benter andThomas,2011)

2.2 Physiology of the abdomen

2.2.1 liver Physiology:

The liver has many functions, including metabolism, digestion, storage, and detoxification . The liver is a major center of metabolism, which may be defined as the physical and chemical process whereby foodstuffs are synthesized into complex elements, complex substances are transformed into simple ones, and energy is made available for use by the organism. Through the process of digestion, the liver expels these waste products from the body via its excretory product, bile, which also plays an important role in fat absorption. Bilirubin is a pigment released when the red blood cells are broken down. The liver is a storage site for several compounds used in a variety of physiologic activities throughout the body . Finally, the liver is also a center for detoxification of the waste products of metabolism accumulated from other sources in the body and foreign chemicals (usually drugs) that enter the body. .(Hagen-Ansert 2018)

2.2 physiology of the gallbladder and biliary system :

The primary functions of the extra hepatic biliary tract are (1) the transportation of bile from the liver to the intestine and (2) the regulation of its flow. This is an important function as the liver secretes approximately 1 to 2 liters of bile per day. When the gallbladder and bile ducts are functioning normally, they respond in a fairly uniform manner in various phases of digestion. Concentration of bile in the gallbladder occurs during a state of fasting. It is forced into the gallbladder by an increased pressure

within the common bile duct, which is produced by the action of the sphincter of Oddi at the distal end of the gallbladder.

During the fasting state, very little bile flows into the duodenum .Stimulation produced by the influence of food causes the gallbladder to contract, resulting in an outpouring of bile into the duodenum. When the stomach is emptied, duodenal peristalsis diminishes, the gallbladder relaxes, the tonus of the sphincter of Oddi increases slightly, and thus very little bile passes into the duodenum. Small amounts of bile secreted by the liver are retained in the common duct and forced into the gallbladder. (Rumack,2011).

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2.2.3 Physiology of the pancreas:

The pancreas is both a digestive (exocrine) and hormonal (endocrine) gland. The primary exocrine function is to produce pancreatic juice, which enters the duodenum together with bile. The exocrine secretions of the pancreas and those of the liver, which are delivered into the duodenum through duct systems, are essential for normal intestinal digestion and absorption of food. Pancreatic secretion is under the control of the vagus nerve and two hormonal agents, secretin and pancreozymin, that are released when food enters the duodenum. The endocrine function controls the secretion of glucagons and insulin into the blood. Failure of the pancreas to furnish sufficient insulin leads to diabetes mellitus. .(Hagen-Ansert 2018)

2.2.4Physiology of the spleen:

The spleen is part of the reticulo endothelial system and is rarely the site of primary disease. It is commonly involved in metabolic, hematopoietic, and infectious disorders.. The spleen is active in the body’s defense against disease; its major function is to filter the peripheral blood. The spleen is also

considered the largest lymphatic organ. It begins to develop around the fifth week of gestation.1 In the fetus, it is responsible for erythropoiesis. In childhood, it plays an important role in the defense against infection, while in adults it produces lymphocytes and monocytes. Although red blood cell production in the adult is primarily performed by the red bone marrow, the spleen's hematopoietic function can return in cases of severe anemia. The spleen is composed of specialized tissues called whitepulp and red pulp. The lymphatic function of the spleen is performed by the white pulp, which produces lymphocytes to aid in the immune response. The red pulp performs the phagocytic function of the spleen. Phagocytes engulf and destroy pathogens. The spleen also removes irregular cells from the bloodstream and retains them through a process called culling. It can also clean red blood cells of unwanted material, a process called pitting. (Penny, Steven M 2011).

2.3 Pathology of the abdomen

2.3.1 Liver pathology:

2.3.1.1 Fatty Liver :

Fatty liver is a reversible disease characterized by deposits of fat within the hepatocytes. Causes of fatty liver include obesity, alcohol abuse, chemotherapy, diabetes mellitus, pregnancy, glycogen storage disease, and the use of some drugs. Although fatty liver is typically asymptomatic, patients may present clinically with elevated liver function tests. (Penny, Steven M 2011)

Fatty changes within the liver can be diffuse or focal. Diffuse infiltration will cause the liver to appear diffusely echogenic and it will be more difficult to penetrate. Frequently, in the presence of diffuse fatty infiltration, the walls of the hepatic vasculature and diaphragm will not be easily imaged, secondary to the attenuation of the sound beam. Sonographically, the liver segment affected by focal infiltration will appear as an area of increased echogenicity and can appear much like a solid, hyperechoicmass. Alternatively, focal fatty sparing of the liver can occur. In this circumstance, the liver is involved with diffuse fatty infiltration, with certain areas spared.
(Penny, Steven M 2011)

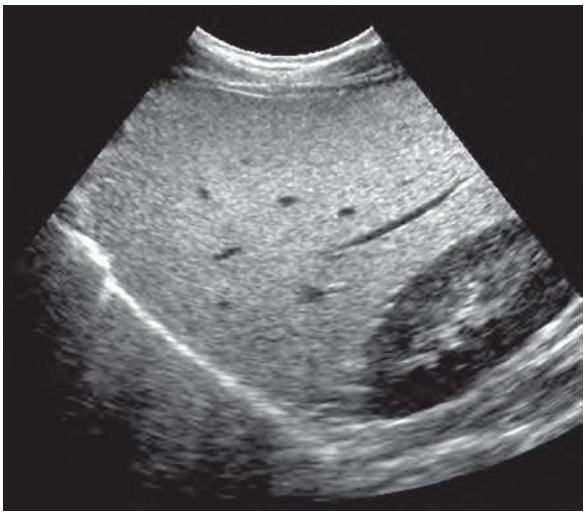


Figure (2. 11) Diffuse fat: spectrum of appearances. Mild fatty infiltration, sagittal right lobe.(Rumack,2011).

2.3.1.2 Hepatitis

Hepatitis is inflammation of the liver, which can ultimately lead to cirrhosis, portal hypertension, and hepatocellular carcinoma(HCC). Hepatitis can be acute or chronic, and come in many forms, including hepatitis A, B, C, D, E, and G. The two most common forms are hepatitis A and B.

Hepatitis A is spread by fecal–oral route in contaminated water or food. Hepatitis B is spread by contact with contaminated body fluids, mother-to-infant transmission, or inadvertent blood contact, as seen in the case of intravenous drug abuse or occupational exposure.

Hepatitis may also be triggered by reactions to viruses. Patients with any form of hepatitis can experience a wide range of clinical troubles including fever, chills, nausea, vomiting, fatigue, hepato splenomegaly, dark urine, and jaundice. However, the jaundice related to hepatitis is on a cellular level and is not associated with biliary obstruction.

Sonographically: a patient with hepatitis may initially With time, hepatomegaly and splenomegaly can be observed with sonography. As the liver enlarges, it tends to become more hypoechoic. Periportal cuffing may be seen in some patients with hepatitis. This is described as an increase in the echogenicity of the walls of the portal triads. The sonographic manifestation of this phenomenon is referred to as the “starry sky” sign. The gallbladder wall may also be thickened in the presence. .(Hagen-Ansert 2018)

Figure(2.12). Acute hepatitis ,Sagittal image of the left lobe of and echogenicity of the soft tissue surrounding the portal vein branch, called periportal cuffing.(Rumack,2011).

2.3.1.3 Hepatic Cysts

True hepatic cysts are usually not encountered until middle age. They are often associated with autosomal dominant polycystic kidney disease.

Clinically, hepatic cysts are asymptomatic and they do not alter liver function tests.

2.3.1.3.1 Sono graphy of hepatic cyst:

Anechoic mass or masses with smooth walls and posterior enhancement.

2.3.1.4 Hydatid Liver cyts:

A hydatid liver cyst may also be referred to as an echinococcal cyst. These cysts develop most commonly from a parasite referred to as Echinococcus granulosus**.** This parasite is a tapeworm that lives in dog feces. Food contaminated by the infected feces is consumed indirectly by sheep, cattle, goat, and possibly humans. Therefore, there is a higher prevalence of hydatid disease in sheep- and cattle-raising countries such as the Middle East, Australia, and the Mediterranean,The parasite moves from the bowel through the portal vein to enter the liver.

Several reports describe the sonographic features of hepatic hydatid disease proposed the following four groups for hydatid cysts: Simple cysts containing no internal architecture except sand , cysts with detached endocyst secondary to rupture ,cysts with daughter cyst matrix (echogenic material between daughtercysts. densely calcified masse.(Rumack,2011).

Figure(2.13) Hydatid cyst.The detached endocyst is floating within the lesion.(Rumack,2011).

2.3.2 Pathology of the gallgladder:

2.3.2.1 Cholecystitis:

Cholecystitis is an inflammation of the gallbladder that may have one of several forms: acute or chronic, acalculous, emphysematous, or gangrenous).

2.3.2.1.1 Acute Cholecystitis:

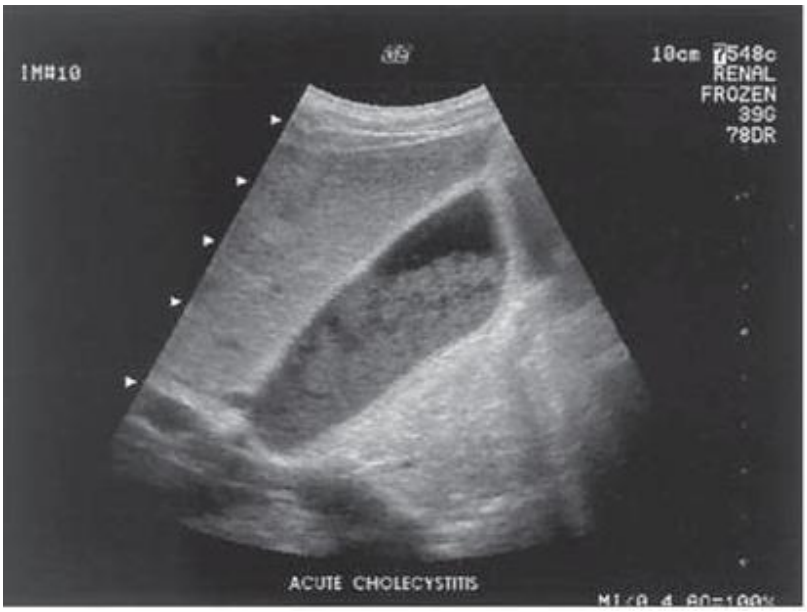
The most common cause of acute cholecystitis occurs from persistent obstruction of the cystic duct or gallbladder neck by an impacted gallstone. When stones become impacted in the cystic duct or in the neck of the gallbladder (Hartmann's pouch), it results in obstruction with distention of the lumen, ischemia, and infection (cholecystitis) with eventual necrosis of the gallbladder. .(Hagen-Ansert 2018)

Acute cholecystitis is found three times more frequently in females than in males over 50, but it has a similar incidence at higher age-groups.

2.3.2.1.1.1 Sono graphic Findings:

Acute cholecystitis has very specific findings on sonography.

The patient will have a positive Murphy's sign making the area of the gallbladder extremely sensitive to touch. There is a thickened gallbladder wall greater than 3 mm. This should be measured at the anterior wall with the wall parallel to the transducer. A distended gallbladder lumen greater than 4 cm is present. Gallstones are usually present and the sonographer should search for an impacted stone in Hartmann's pouch or cystic duct. Increased Thesonographic appearance of acute cholecystitis is identifiedas a gallbladder with an irregular outline of a thickened wall.(Hagen-Ansert2018)



Figure(2.14)Acute cholecystitis,sluge filled lumen.(Hagen-Ansert 2018)

2.3.2.1.2 AcalculousCholecystitis:

This uncommon condition is an acute inflammation of the gallbladder in the absence of acute cholecystitis. It may develop secondary to gallbladder wall infection, ischemia, chemical toxicity to the gallbladder wall, and
cystic duct obstruction. It is most likely caused by decreased blood flow through the cystic artery. Clinically the patient has a positive Murphy's sign.

2.3.2.1.2.1 Sono graphic Findings:

The gallbladder wall is extremely thickened (greater than 4 to 5 mm), and echogenic sludge is seen within a dilated gallbladder the presence of pericholecystic fluid within ascites or subserosal edema .(Hagen-Ansert 2018)

Figure(2.15)Acalculouscholecystitis with thickening of thegallbladder wall secondary to edema and inflammation.(Hagen-Ansert 2018)

2.3.2.1.3 Chronic Cholecystitis:

Chronic cholecystitis is the most common form of gallbladder inflammation. This is the result of numerous attacks of acute cholecystitis with subsequent fibrosis of the gallbladder wall. Clinically the patients may have some transient right-upper-quadrant pain, but not the tenderness as experienced with acute cholecystitis

Figure(2.16) Chronic Cholecystitis. Small contracted gallbladder containing a stone. Note shadow posterior to stone. (Devin dean,2005)

2.3.2.2 Cholelithiasis, or gallstones:

in the gallbladder, is frequently found in a contracted gallbladder with coarse gallbladder wall thickening. The wall, echo, shadow (WES) sign is described as a contracted bright gallbladderwith posterior shadowing caused by a packed bag of stones When the gallbladder is completely packedfull of stones, the sonographer will only be able to image the anterior border of the gallbladder, with the stones casting a distinct acoustic shadow (the WES sign). The WES sign consists of three arc-shaped lines followed by a shadow. The first line is echogenic and represents the pericholecystic fat, as well the interface between the gallbladder wall and the liver. The second line is hypoechoic and represents the gallbladder. The third line is echogenic, reflecting the packed bag of stones within the gallbladder. The acoustic shadow is seen posterior to this third line. .(Rumack,2011).

Cholelithiasis is the most common disease of the gallbladder. In cholelithiasis there may be a single large gallstone or hundreds of tiny ones. The tiny stones are the most dangerous because they can enter the bile ducts

and obstruct the outflow of bile The “five F” risk factors for the patient with cholelithiasis are fat, female, forty, fertile, and fair. In addition, many other factors lead to the development of gallstones that include pregnancy, diabetes, oral contraceptive use, hemolytic diseases, diet induced weight loss, and total parenteral nutrition. Patients may be asymptomatic until a stone lodges in the cystic or common duct, which causes biliary colic. Acute right-upper-quadrant or epigastric pain with radiation to the shoulder after a high-fat meal, nausea, and vomiting is a typical presentation for cholelithiasis. This pain may last for up to 6 hours and only ends when the stone disimpacts from the gallbladder neck or passes completely through the cystic duct. .(Hagen-Ansert 2018)

2.3.2.2.1 Sono graphic Findings*:*

The gallbladder is evaluated for increased wall thickness, presence

of internal reflections within the lumen with posterior acoustic shadowing. Gallstones appear as mobile, echogenic intraluminal structures that cast acoustic shadows. Frequently, patients with gallstones have an enlarged gallbladder lumen Differential diagnoses of cholelithiasis include gallbladder polyps and sludge balls. .(Hagen-Ansert 2018)

Figure(2.17)Solitary stone with posterior shadow (Hagen-Ansert 2018)

2.3.3 Pathology of the pancreas

2.3.3.1 Pancreatitis:

Pancreatitis is inflammation of the pancreas; this condition may be chronic or acute. Pancreatitis occurs when the pancreas becomes damaged and malfunctions as a result of increased secretion and blockage of ducts.

2.3.3.1.1 Acute Pancreatitis:

Acute pancreatitis is an inflammation of the pancreas caused by the inflamed acini releasing pancreatic enzymes into the surrounding pancreatic tissue The classification of acute pancreatitis is further divided into the following three categories: mild acute pancreatitis, moderately severe acute pancreatitis and severe acute pancreatitis. (Rumack,2011).

Most patients present with acute onset of persistent, severe epigastric pain accompanied by nausea and vomiting. In patients with gallstone pancreatitis, the pain is well localized and the onset of pain is rapid, reaching maximum intensity in 10 to 20 minutes.

Alcohol abuse is the second most common cause of pancreatitis.Other less common causes include trauma, inflammation from adjacent peptic ulcer or abdominal infection, pregnancy,mumps, tumors, congenital causes, vascular thrombosis orembolism, and drugs.

Acute pancreatitis may be mild to severe Damage to the acinar tissue and ductal system results either in exudation of pancreatic juice into the gland's interstitium, leakage of secretions into the peripancreatic tissues, or both.. The formation of apseudocyst may develop secondary to acute pancreatitis. .(Rumack,2011).

Figure(2.18) Acute pancreatitis ,Transverse view shows thickening of the pancreatic body.(Barbara and William, 2016)

2.3.3.1.2 Chronic Pancreatitis:

Chronic pancreatitis results from recurrent attacks of acute pancreatitis and causes continuing destruction of the pancreatic parenchyma that result in structural damage, which can lead to impairment of exocrine and endocrine function There are several features to distinguish chronic from acute pancreatitis. Acute pancreatitis is most always associated with epigastric pain.. Characteristically, chronic pancreatitis presents with patchy focal fibrotic disease, whereas acute pancreatitis usually involves the entire gland.

The abdominal pain is epigastric, radiating to the back, and may be associated with nausea and vomiting. Patients with severe pancreatic exocrine dysfunction cannot properly digest complex foods or absorb partially digested breakdown products. may develop pseudocysts, adilated common bile duct, or thrombosis of the splenic vein with extension into the portal vein. on pathologic examination, the pancreas shows an increase in

the interlobular fibrous tissue and chronic inflammatory infiltration changes. Stones of calcium carbonate may be found inside the ductal system, and pseudocysts are common .

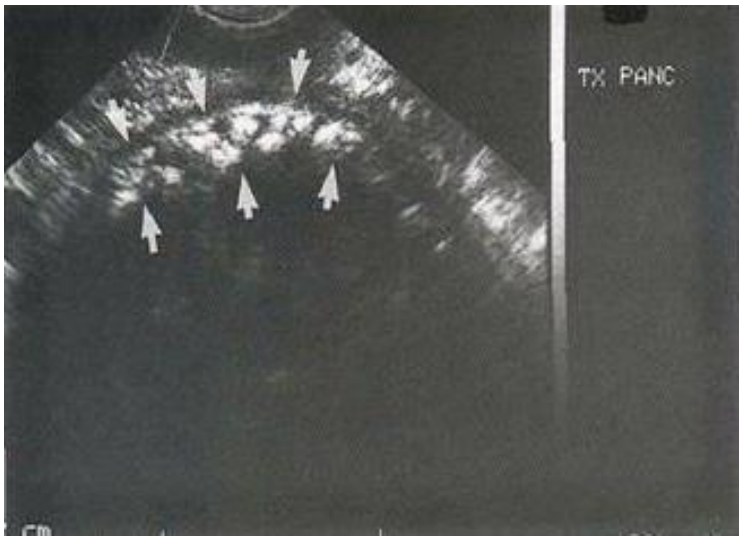


Figure (2.19) Chronic Pancreatitis: Transverse Scan pancreas has,hyperechoic appearance due to calcium depositions and fibrosis. (Devin dean,2005*)*

2.3.4 Spleen pathology

2.3.4.1 Splenomegaly:

The most common abnormality of the spleen is splenomegaly. Enlargement of the spleen can be manually suspected on physical examination and subsequently confirmed using sonography. Although the splenic size varies with age and sex, the spleen should never measure more than 12 cm in length and 5 cm in thickness. The most common cause of splenomegaly is portal hypertension. other causes of splenomegaly include acquired immunodeficiency syndrome (AIDS), mononucleosis, leukemia, lymphoma, infection, a pediatric sickle cell anemia crisis, and trauma. When portal hypertension is suspected, the sonographer should evaluate the splenic hilum closely for the associated abdominal varices seen in this condition. It is important to note that massive splenomegaly can lead to spontaneous splenic rupture.

2.3.4.1.1 Sono graphy of splenomegaly :

Enlargement of the spleen to greater than 12 cmlength or 5 cm thickning

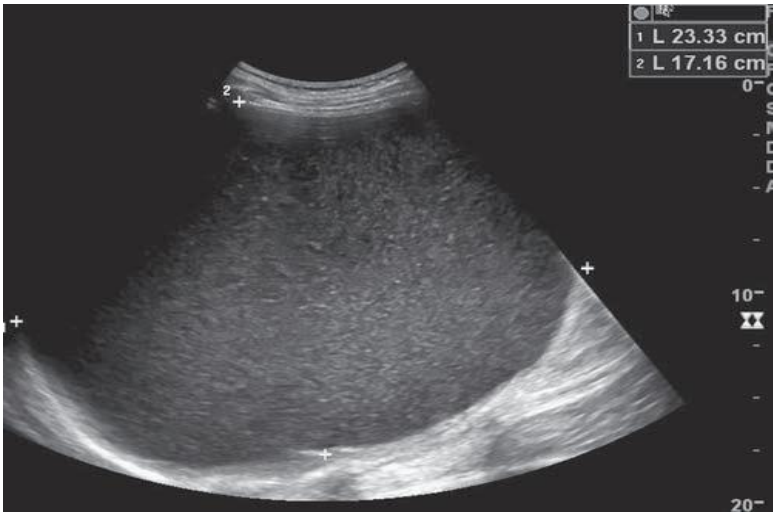


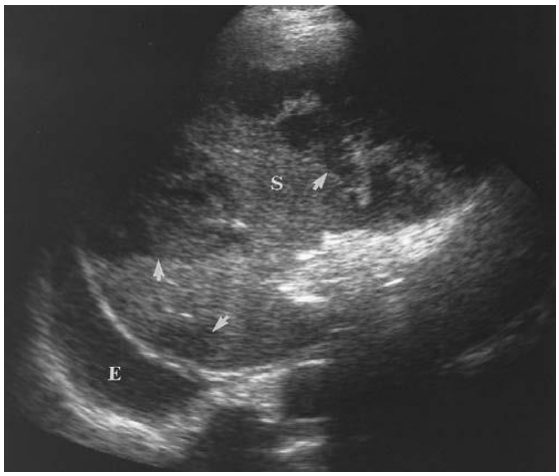
Figure (2.20)longitudinal scan, the enlarged spleen.(Rumack,2011).

2.3.4.2 Splenic Infarction:

Splenic infarction is the most common cause of focal splenic lesions resulting from occlusion of the major splenic artery or any of its branches. They are almost always the result of emboli that arise in the heart, produced from mural thrombi or from vegetation on the valves of the left side of the heart. Other causes include septic emboli and local thrombosis in patients with pancreatitis, leukemia, lymphomatous disorders, sickle cell anemia, sarcoidosis, or polyarteritisnodosa. (Penny, Steven M 2011)

2.3.4.2.1 Sonographic Findings:

Splenomegaly is not present with a splenic infarction. Sonography may show a localized hypoechoic area, depending on the time of onset. Fresh hemorrhage has a hypoechoic appearance; healed infarctions appear as echogenic, peripheral wedge-shaped lesions with their base toward the subcapsular surface of the spleen The infarction may become nodular or hyperechoic with time. The entire spleen or focal segmental areas may be affected. The infarcted segment will be avascular. (Penny, Steven M 2011)



Figure(2.21) Splenic infarct. Infarcts often appear aswedge-shaped hypoechoic areas (arrows) within thespleen(Wilkins, 2001:91.)

2.4 Previous Studies :

Study done by Eltyib et ,al.(2014) ,was carried out at King Abdulaziz University Hospital to discuss the protocol of ultrasound scanning in demonstrating incidence and complication of Gall-bladder (GB) pathologies .Known cases of GB pathologies (100 patients) were surveyed by ultrasound using spatial digital iU22 Philips Convex probe 3.5 MHz. All patients were evaluated with ultrasonogphy following the international scanning guidelines and protocols. The age of the patients is between (9 - 90) years, 68 Patients (68%) were females and 32 patients (32%) were males. Range of age group of accumulation for gallstone presence was (35- 50) years in females and above 50 years in males. Incidence of gallbladder pathologies are 59% (female 46% and 13% male). Incidence of gallstone is 37%, and ratio of incidence is between male to female 1:3. Other pathologies of gallbladder were found to be acute cholecystities 12%, chronic cholocystities 5%, sludge 2%, carcinoma of the Gall-bladder 1%, Gall-bladder polyps 1% and Emphysematous choleycystities 1%.

Study done by(TOMIZAWA, et ,al .2015) include only those patients who underwent abdominal US to diagnose abdominal symptoms were included in the present study. All patients with prior diagnostic imaging examination findings were excluded from the study in order to reduce bias of results. The analyzed patients included 39 males with an average (mean ± standard deviation) age of 65.8±18.8 years and 37 females with an average age of 53.7±19.3 years. Diagnosis with abdominal US was in agreement with the final diagnosis in 66 of the 76 patients. Final diagnosis of symptoms by abdominal US was not successful in the remaining 10 patients who required further investigation. Acute cholangitis, acute cholecystitis, acute

pancreatitis, acute appendicitis, colonic diverticulitis and spleen rupture were correctly diagnosed. Different types of cancer, including colorectal cancer, were also successfully diagnosed.

Study done by (Americotesta ,2010) ,performed a focused protocol, named the ‘‘$ approach’’that, using seven consecutive US bedside scanning from the epigastrium to the right lower quadrant allows us to investigate the major part of the organs potentially responsible for EP onset. In our preliminary study, we haves tudied 180 adult patients with acute EP consecutively admitted to ED, employing a 2–5 MHz convex probe. Emergency US as a complement to routine management independently achieved a definite diagnosis in 42% of patients, significantly higher than in patients not receiving routine bedside US in our experience and according to the previous reports collecting routine use of US by radiologists [47–49] or surgeons [5, 50]: biliary diseases (63.6%), acute pancreatitis (10.4%), liver diseases (6.5), pancreatic cancer (1.3%), pericarditis(1.3%)(personal communication).(Stefanidis et al., 2009)

Study done by (Adhikari, et al .2009) study was prospective observational study of adult patients presenting to two academic EDs with isolated epigastric pain. Patients were enrolled if an emergency physician other than the study investigator determined that patient had isolated epigastric pain and tenderness. emergency physician investigators who were not involved in the clinical care of these patients performed bedside biliary US using either a GE Logiq or Philips Envisor system with a 5-2 MHz curvilinear probe. Descriptive statistics are used to analyze the data. Continuous data are presented as means with standard deviations and dichotomous data are

presented as percent frequency of occurrence with 95% confidence intervals. Results: A total of 33 patients (female-25, male-8) were enrolled. The mean age of the patients was 36 years± 14.9 (SD). 15/33 (45% CI 28-62%) reported similar symptoms in the past. 22/33 (67% CI 50-82%) had associated vomiting. All subjects had isolated epigastric tenderness. Gallstones were found in 9/33 (27% CI 12-42%) on bedside US. Three of these patients had sonographic signs of chloecystitis. All 9 patients had normal liver function tests and only 2 had leucocytosis. The treatingemergency physician's initial evaluation didn't include an US in 6/9 (67% CI 36- 97%) patients with cholelithiasis on bedside US. Three of these 6 patients were hospitalized. All 9 patients were initially given GI cocktail by the treating emergency physician. There is 100% agreement between emergency physician investigator and blinded sonologist US interpretations. Conclusion: Bedside biliary ultrasound detected gallstones in almost one-third of our ED patients with isolated epigastric pain. It can avoid misdiagnosis and expedite management in these patients.

Chapter Three

Materials and Methods

3.1 Materials

3.1.1 Type of study:

This is cross sectional descriptive study with known cases of epigastric pain that come for ultrasound department.

3-1.2 Area and duration of study:

The study was started in September to December 2018,In Khartoum state sudan in different hospitals.

3.1. 3Study population :

All patients with epigastric pain

3.1.4Study Sample:

69 cases Sudanese patients suffering from epigastric pain were included.

(i) Inclusion Criteria:

The study includes all patient suffering from epigastric pain in both genders (13-80 years).

(ii) Exclusion Criteria:

Patients with cholecystectomy , splenoctomy ,Trauma , surgery and pregnant lady.

3.1.5 Instrumentations:

Real time MINDRY Ultrasound machine with Transducer 3.5MHZ.

3.2 Methods

3.2.1 Sonographic Technique

The scaning technique used in this study conduct to(Alty , Edward et al 2014). Patient position Supine, Preparation: Nil by mouth or just clear fluids for 8 hours, Probe: Low-frequency (3–5 MHz) curvilinear.

3.2.1.1 Liver and CBD Technique:

the probe TS and in the midline. Scan through the whole of the left lobe of the liver by angling the probe cranially then caudally. If there is difficulty in viewing the liver clearly, ask the patient to take a deep breath in to push the liver down. Turn the probe clockwise through 90ؑ into LS and place it just left of the midline. Examine the left lobe of the liver by sweeping the probe towards the LUQ. Make sure to scan completely off the liver edge, as this is a common place for metastases to 'hide'. LS and move the probe further to the patient's right. Look for the portal vein and follow its course into the liver. The porta hepatis is the region where the vein enters the liver. At this point, look for the CBD by rotating the probe slightly anticlockwise and looking anterior to the portal vein. The hepatic artery runs between the duct and the portal vein (usually). Follow the course of the CBD, looking for any calculi or obstruction.

3.2.1.2 Gall bladder technique:

Scan in the RUQ to find the GB – position varies in different patients.

Rotate the probe so that the GB is imaged in its long axis. Now keep the probe face over the same area of skin, but angle the probe handle backwards and forwards to scan through the whole GB.

If something can be seen within the GB, try moving the patient and rescanning to see if it has moved with gravity (calculi/sludge vs polyp/ mass). Scan the GB in TS: to do this, first scan it in LS and then rotate the probe anticlockwise through 90ؑ to image in TS. Now keep the probe face over the same area of skin, but angle the probe handle backwards and forwards to scan through the whole GB in TS.

3.2.1.3 Spleen technique:

Ask the patient to lie either 45ؑ onto the right side or supine. It is best to scan the spleen with the patient gently breathing. To find the spleen, place the probe in the 9th ICS AAL. Sweep the probe posteriorly and anteriorly to scan through the whole spleen in LS. Measure the spleen size from tip to tip. Find the spleen in LS and then rotate the probe through 90ؑ anticlockwise to image it in TS. Sweep the probe superiorly and inferiorly to scan through the whole spleen ,Measure any abnormalities seen.

3.2.1.4 Pancreas technique:

Place the probe perpendicular to the upper abdomen in the midline. Look for the ‘tadpole’ shape of the splenic vein (tail) and portal confluence (head), and then look anterior to this to locate the pancreas. Scan through the whole pancreas by angling the probe cranially then caudally. Turn the probe clockwise through 90ؑ in order to scan in LS. Look for the splenic vein and then look anterior to this to locate the pancreas.

Scan through the whole pancreas by angling the probe laterally right and left. If the pancreas cannot be found, try scanning: again at the end of the examination after filling the stomach with water with the patient in the lateral decubitus position to move overlying bowel out of the way with the patient sitting erect.

3.2.2 Data Collection:

The data were collected by data collecting sheet design especially for the study and including study variables gender, age, pain duration, treatment and finding.

3.2.3 Data Analysis:

The data were analyzed by spss and results were presented in form of tables and graphs.

-Then cross tabulation to assess the relation between study variables should be done.

3.2.4 Data storage :

The data were storage on:

Personal computer

Patient data collection sheets

3.2. 5 Ethical consideration:

No identification or individual details were published and no information or patient detail were disclosed or used for other reasons than the study.

Chapter Four

Results

Table (4.1) frequency distribution of gender

Gender	Frequency	Percent
Female	52	75.4
Male	17	24.6
Total	69	100.0

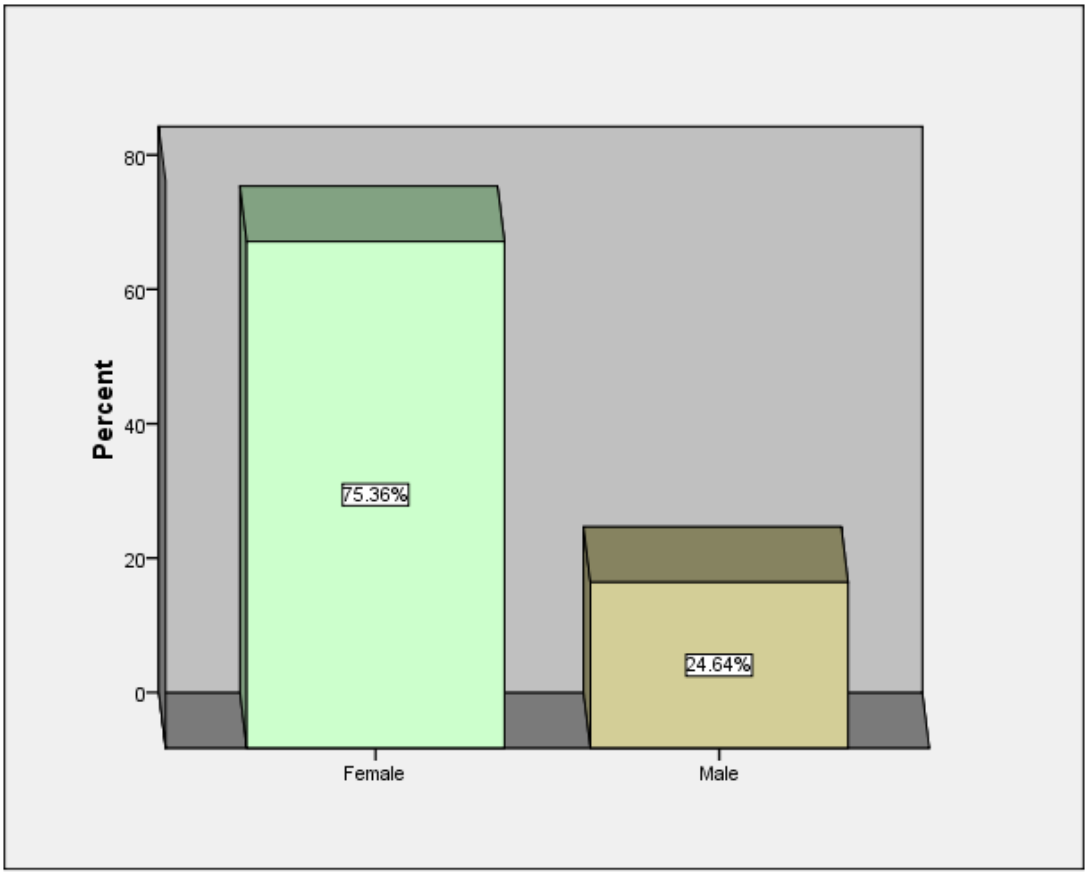


Figure (4.1) frequency distribution of gender

Table (4.2) frequency distribution of age group

Age group \years	Frequency	Percent
13-23	8	11.6
24-34	16	23.2
35-45	21	30.4
46-56	9	13.0
57-67	10	14.5
68-78	4	5.8
more than 78	1	1.4
Total	69	100.0
Minimum=13, maximum=80,means =41.36±15.21 years		

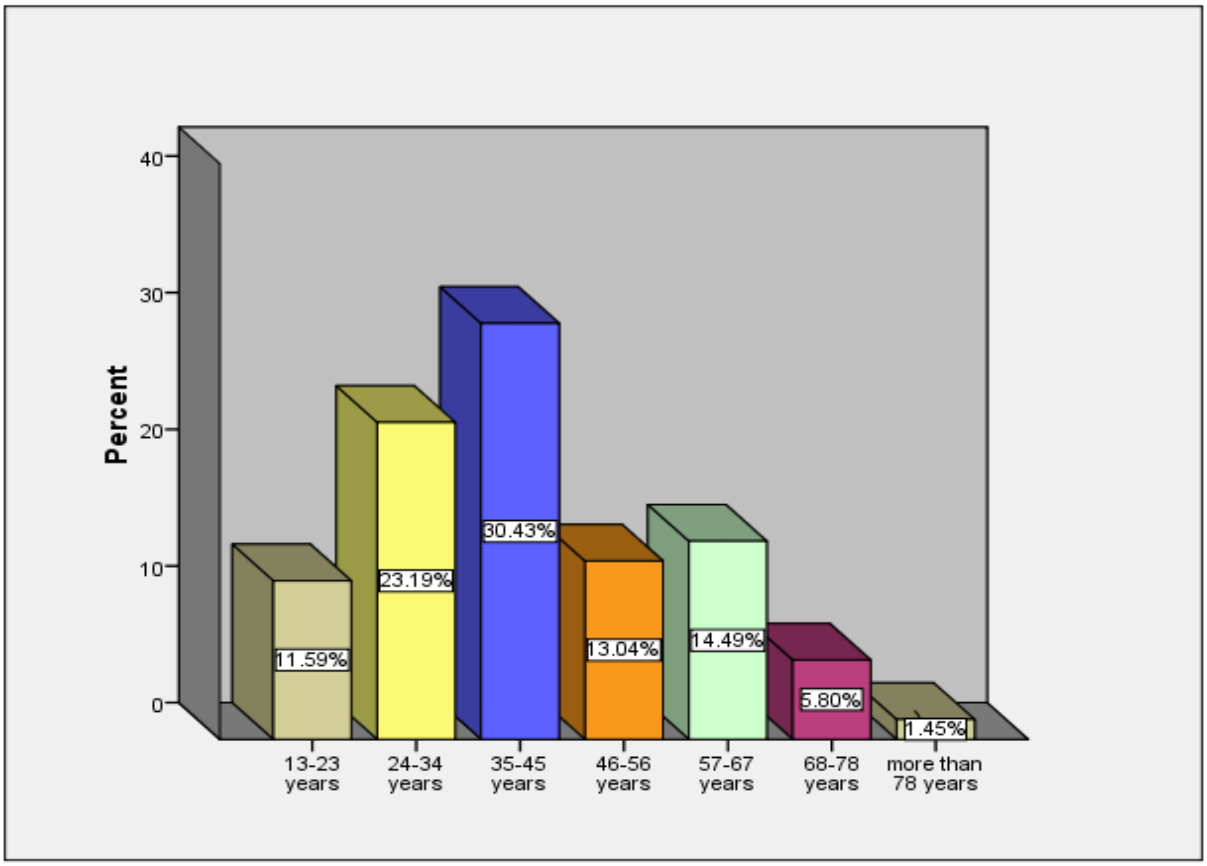


Figure (4.2) frequency distribution of age group

Table (4.3) frequency distribution of type of pain

Pain	Frequency	Percent
Acute	33	47.8
Chronic	36	52.2
Total	69	100.0

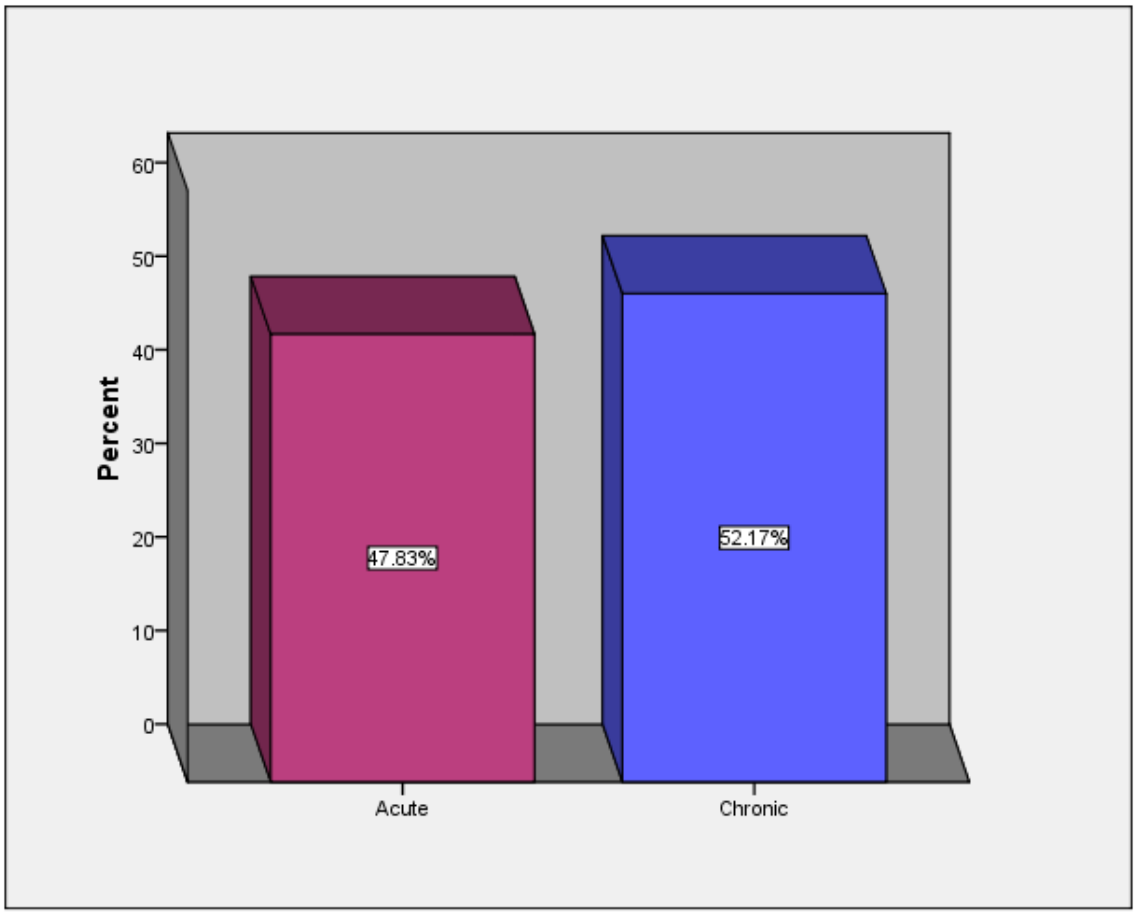


Figure (4.3) frequency distribution of type of pain

Table (4.4) frequency distribution of usage of treatment:

Treatment	Frequency	Percent
No	29	42.0
Yes	40	58.0
Total	69	100.0

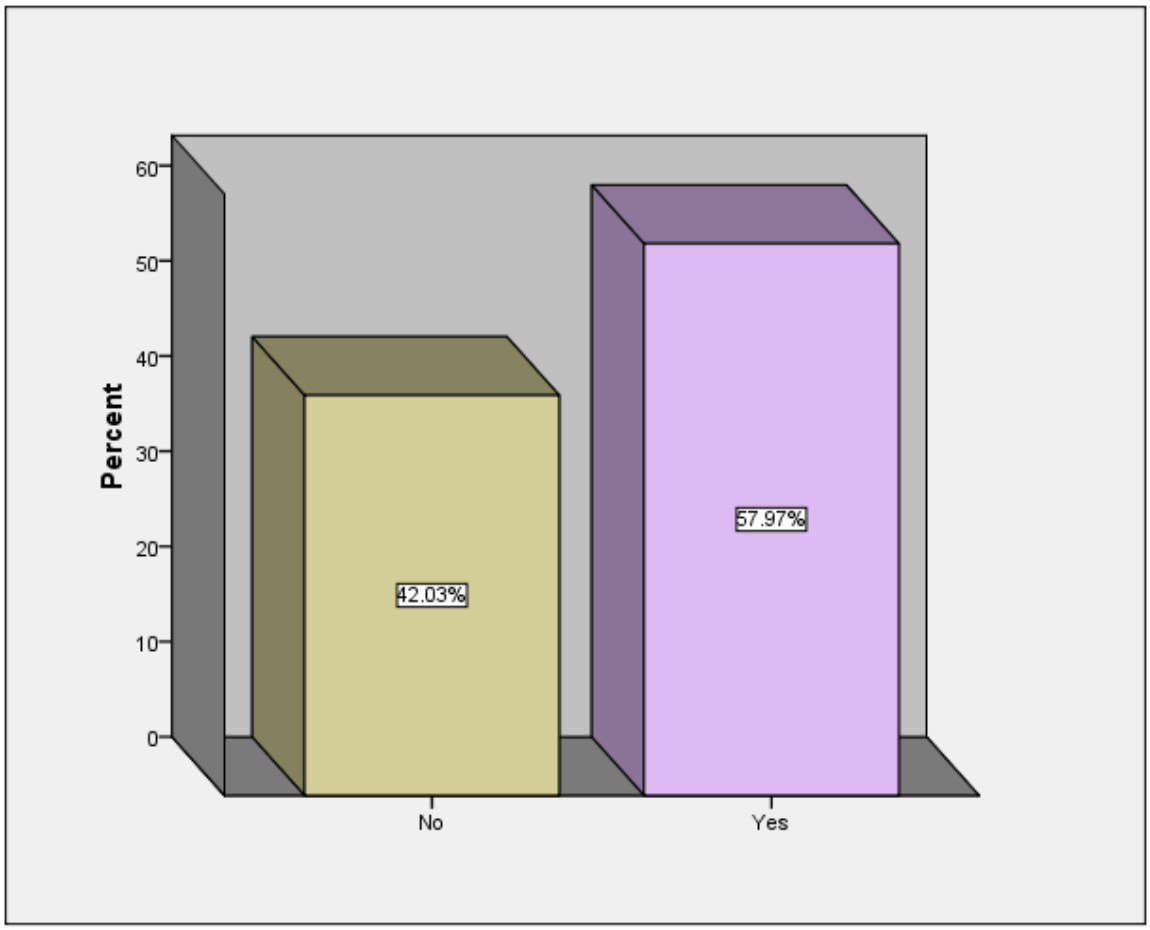


Figure (4.4) frequency distribution of usage of treatment

Table (4.5) frequency distribution of presence of causes of epigastric pain which detected by ultrasound

Causes by ultrasound	Frequency	Percentage
Presence	31	44%
Absence	38	55%

Table (4.6) frequency distribution of abdominal organ which affected by pathology and caused the epigastric pain

Organ	Frequency	Percent	Valid Percent
GB	19	27.5	61.3
Liver	6	8.7	19.4
Spleen	2	2.9	6.5
GB and liver	4	5.8	12.9
Total	31	44.9	100.0

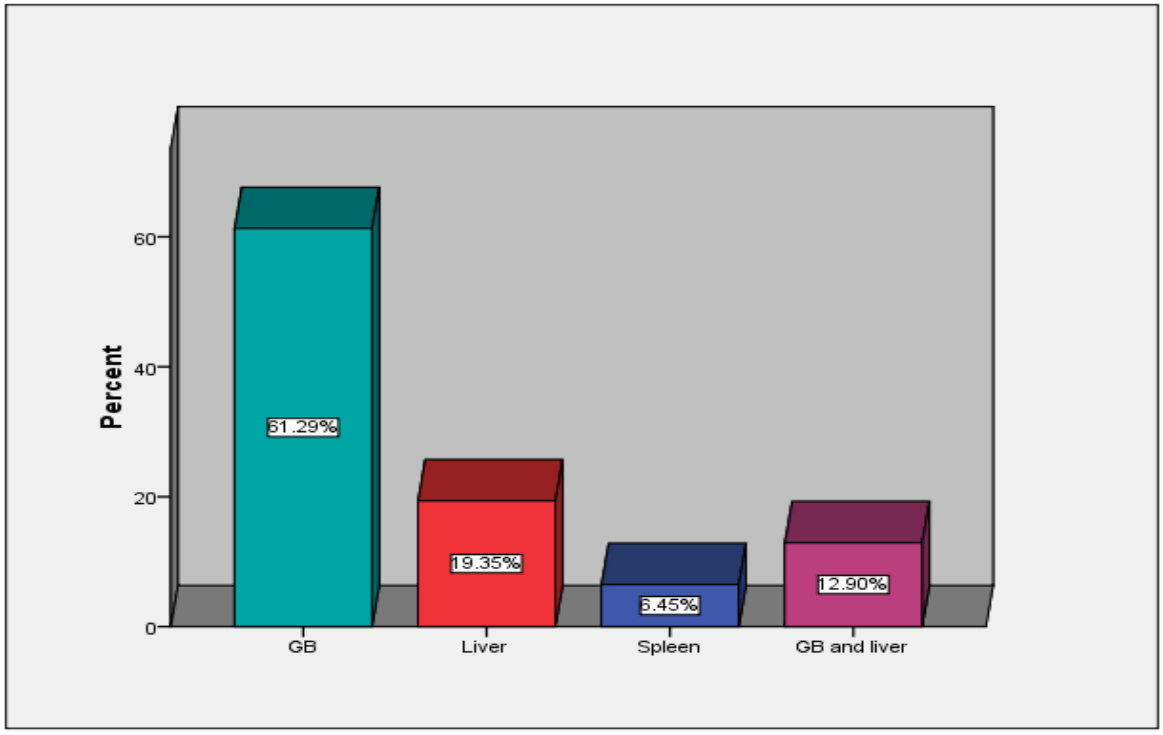


Figure (4.6) frequency distribution of abdominal organ which affected by pathology and causes the epigastric pain

Table (4.7) frequency distribution of ultrasound findings

Finding	Frequency	Percent	Valid Percent	Cumulative Percent
GB stones	17	24.6	54.8	54.8
GB Sludge	2	2.9	6.5	61.3
GB stone + Fatty liver	4	5.8	12.9	74.2
Fatty liver	6	8.7	19.4	93.5
Splenomegaly	2	2.9	6.5	100.0
Total	31	44.9	100.0	

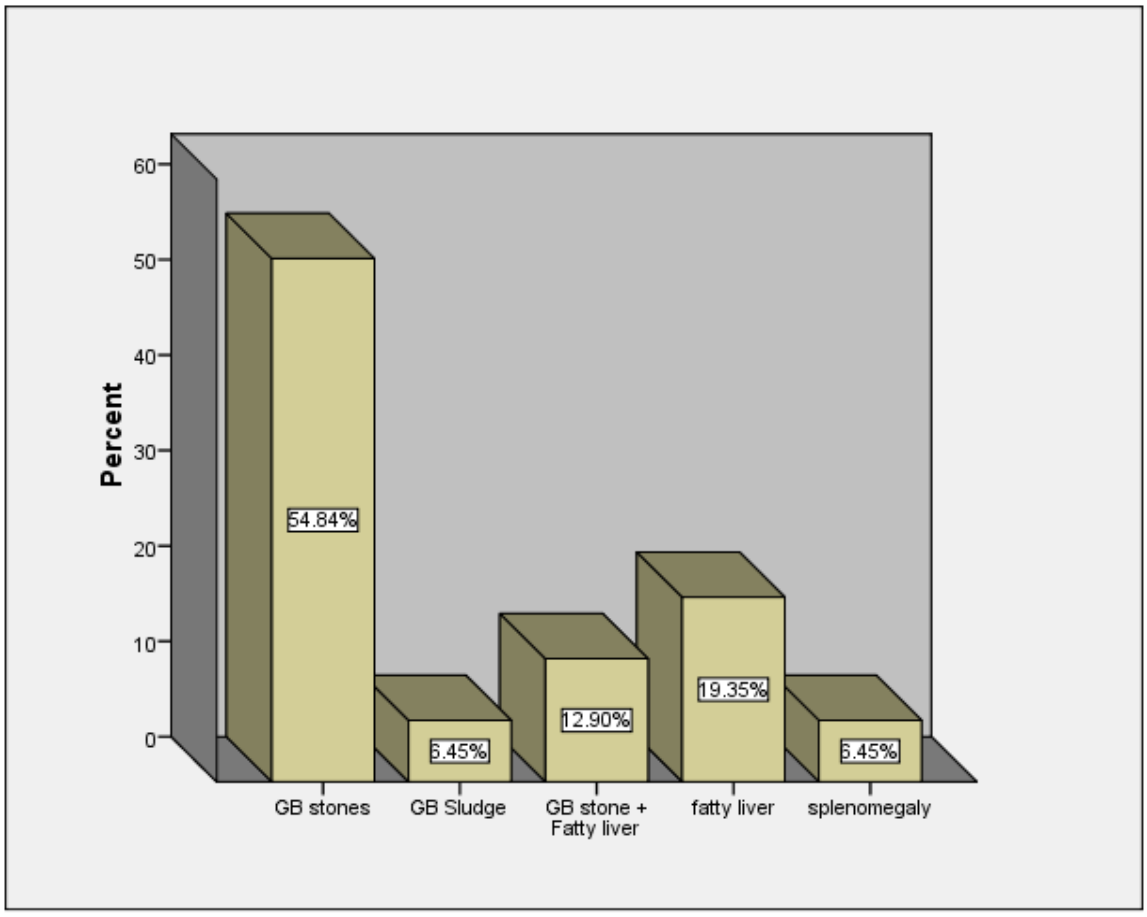


Figure (4.7) frequency distribution of ultrasound findings

Table (4.8) cross tabulation ultrasound findings and gender

Finding	Gender		Total
	Female	Male	
GB stones	14	3	17
GB Sludge	2	0	2
GB stone + Fatty liver	3	1	4
fatty liver	5	1	6
Splenomegaly	2	0	2
Total	26	5	31
P = 0.905			

Table (4.9) cross tabulation ultrasound findings and age

Age	Findings					Total
	GB stones	GB Sludge	GB stone + Fatty liver	fatty liver	splenomegaly	
13-23 years	1	0	0	0	0	1
24-34 years	0	0	0	1	1	2
35-45 years	8	1	2	3	1	15
46-56 years	3	0	0	1	0	4
57-67 years	1	1	1	1	0	4
68-78 years	3	0	1	0	0	4
more than 78 years	1	0	0	0	0	1
Total	17	2	4	6	2	31
P = 0.849						

Table (4.10) cross tabulation ultrasound findings and pain type

Pain	Finding					Total
	GB stones	GB Sludge	GB stone + Fatty liver	fatty liver	Splenomegaly	
Acute	8	0	1	3	1	13
Chronic	9	2	3	3	1	18
Total	17	2	4	6	2	31
P value =0.678						

Table (4.11) cross tabulation ultrasound findings and treatments

Treatments	Finding					Total
	GB stones	GB Sludge	GB stone + Fatty liver	fatty liver	Splenomegaly	
No	6	0	1	3	2	12
Yes	11	2	3	3	0	19
Total	17	2	4	6	2	31
P = 0.272						

Chapter Five

5.1 Discussion

The study includes 69 patients (females were 52 and males 17), were enrolled. The mean age of the patients was 41.4 years ±15.2years(SD).

The epigastric pain affected female more than male 75.4% versus 24.4% respectively in table(4-1).this result go on line with (Adhikari ,al et .2009) and (Eltyib et ,al 2014) .

The most affected age group by epigastric pain was35-45 years (30.4%) followed by 24-34 years(23.2%) this results go on line with (Eltyib et ,al 2014).as shown in table (4-2).

The results revealed that the patient came with chronic duration epigastric Pain (52%) and acute duration of epigastric pain (47.8%).(table 4.3).

The study clarify that 44.9% of patients suffering for epigastric pain had positive ultrasound finding(abnormalities detected by u\s) while 55.1% had no abnormalities seen in table (4-5).

The result showed that most of patient came with epigastric pain had previous treatment before ultrasound scan (58%).

The most affected organs which causes epigastric pain are ,gall bladder (61.3%), (GB cholelithiasis 54.8%and sludge 5.6%),followed by liver (8.7),(fatty liver 19.4%), spleen disease (2.9%), (splenomegaly 5.6%).this result agree with(Testa et al .2010), (Eltyib et ,al. 2014) and(Adhikari , et al.2009) as shown in Table (4.6 and 4.7).

No significant relation between ultrasound finding for patients came with epigastric pain and gender ,age , pain types and treatment .as shown in(table 4.8, 4.9, 4.10 and 4.11).p values more than 0.05.

5.2 Conclusion

The study shows that:

-Female suffering from epigastric pain more than male.

-The most affected age grop was 34-45 years.

-The gallbladder pathologies is most common cause of epigastric pain with stone is commonst pathology and fatty liver.

-No significant correlate between causes gender,age and treatment.

5.3 Recommendation:

1-Ultrasound should be used early as possible in patient suspicious of epigastric pain to detect early the disease affected to minimize the complications.

2-Every patient affected with epigastric pain ,the gallbladder, liver, pancreas and spleen should be evaluate.

3-For more studies should be done with large sample volume.

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Appendices

Appendix 1

Sudan University for Sciences and Technology

College of Graduate Studies

Evaluation of Epigastric Pain Using Abdominal Ultrasound Scaning

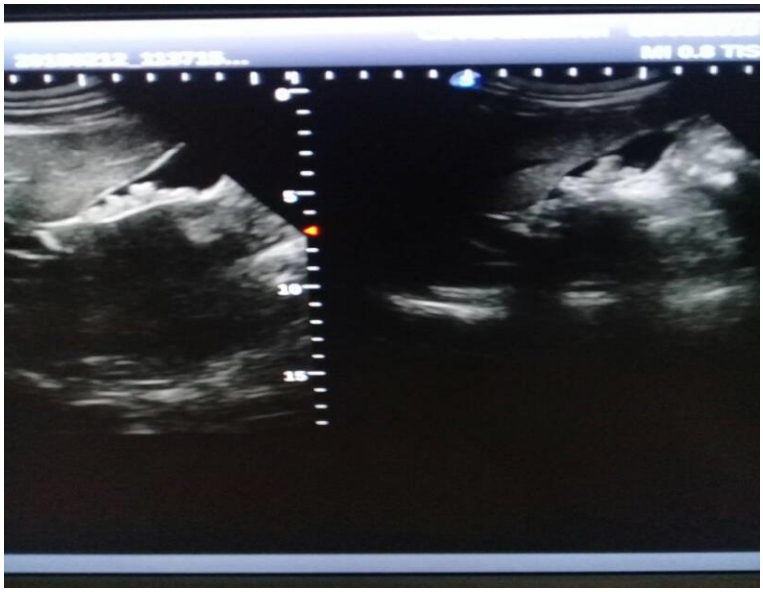
Data Collection Sheet

Gender	Age	Duration of pain		Treatment		Sonographic finding				
		Acute	Chronic	Yes	No	GB	Liver	Pancrea	Spleen	Ascites

Appendix 2

Ultrasound images from study sampling

Image(1) Female 47 years suffering from acute epigastric pain U\S shows multiple GB stones



Image(2) Female 40 years suffering from acute epigastric pain U\S shows Multiple GB stones

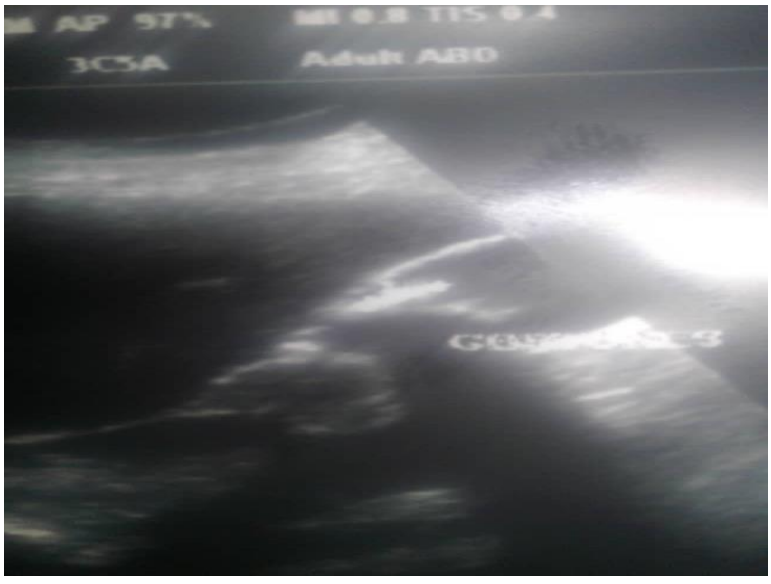
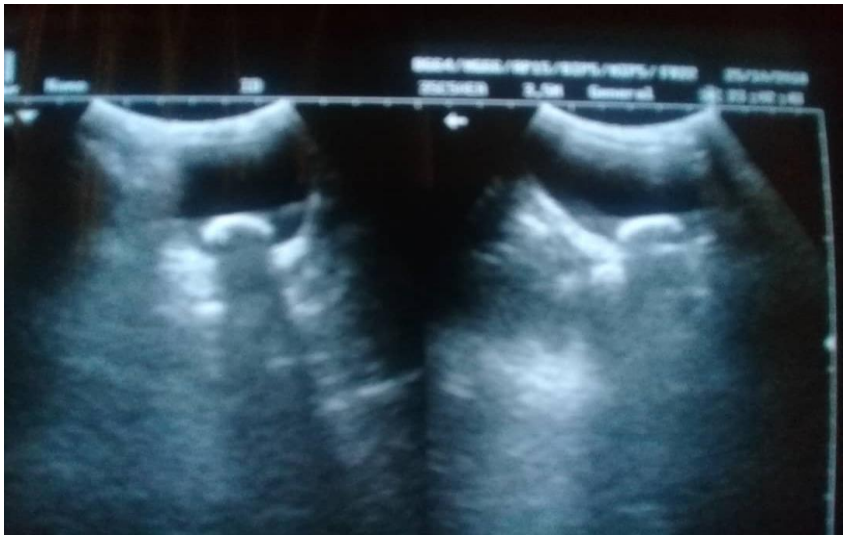


Image (3) Male 52 years suffering from chronic epigastric pain U\S shows single GB stone

Image (4) Female 35 years suffering from acut epigastric pain U\S shows multiple GB stons

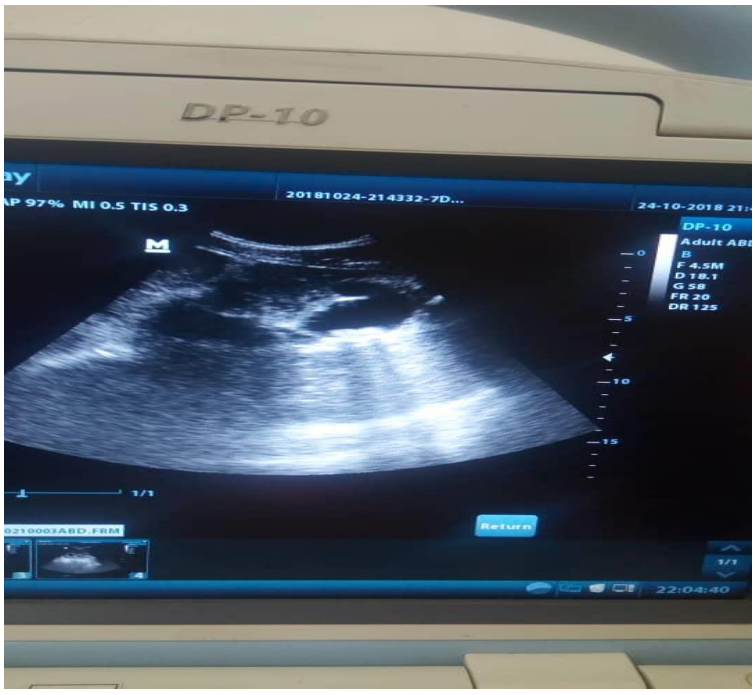
Image(5) Male 70 years suffering from chronic epigastric pain U\S shows single GB stone and fatty liver



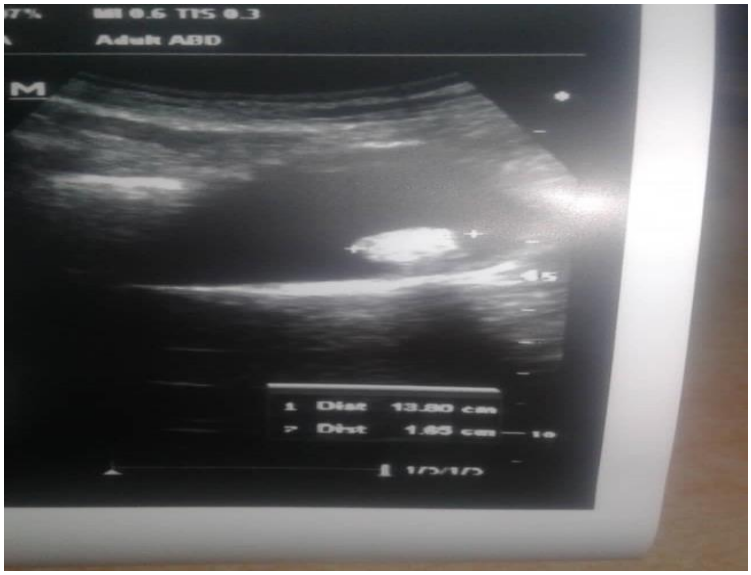
Image(6) Female 38 years suffering from chronic epigastric pain U\S shows single stone

Image(7) Female 50years suffering from chronic epigastric pain U\S shows GB with wall Echo shadowing(WES)sign

Image(8) Female 44 years suffering from chronic epigastric pain U\Sshows tow stones



Images(9) Male 57 years suffering from acute epigastric pain U\S shows tow stones



Image(10) Female 42 years suffering from chronic epigastric pain U\S shows single GB stone

Image(11) Female 50 years suffering from chronic epigastric pain U\S shows multiple stones

Image (12) Female 60 years suffering from chronic epigastric pain U\S shows fatty liver