بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

Sudan University of Science and Technology

College of Graduate Studies

ComparativeStudy Between Ultrasonographyand MagneticResonance Cholangiopancreatography inDiagnosing Obstructive Jaundice

دراسة مقارنة بين الموجات الصوتية و الرنين المغنطيسي في تشخيص اليرقان الانسدادي

A thesis Submitted for Partial Fulfillments for theRequirement of M.ScDegree in DiagnosticRadiological Technology

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الآية

بسم الله الرحمن الرحيم

قالتعالى: (يَا أَيُّهَا النَّاسُ قَدْ جَاءَتْكُمْ مَوْعِظَةٌ مِنْ رَبِّكُمْ وَشِفَاءٌ لِمَا فِي الصُّدُورِ وَهُدًى وَرَحْمَةٌ لِلْمُؤْمِنِينَ * قُلْ بِفَضْلِ اللَّهِ وَبِرَحْمَتِهِ فَبِذَلِكَ فَلْيَفْرَحُوا هُوَ خَيْرٌ مِمَّا يَجْمَعُونَ).

صدق الله العظيم

[سورة يونس الآية: 57-58]

Dedication

I dedicate thisthesisto thesoul of my **father,**

My beloved **mother,** my **wife**, my **brothers** and my **sister**.

Acknowledgment

All praise is due to Allah the Almighty, without whose support this task would have not been such a success.

Thanks are also due to supervisor**Professor:Caroline Edward Ayad** for her patience, support, precious guidance, throughout the process of this thesis.

I would also like to extend my thanks and appreciation to the teaching staff at SudanUniversity of Science and TechnologyCollege of Graduate studies for their support and encouragement.

Sincere thank are also extended to my dearest friends for their support throughout this thesis.

Abstract

This descriptive study was performed in Dar Alelj Specialized hospital, Aliaa Specialized hospitals and Turkish Medical Diagnostic Center hospital,inKhartoum-Sudan during the period from November 2017 _ February 2018.

The aims of this study were to compare the ultrasonography (U/S) and magnetic resonancecholango- pancreatography (MRCP) in determination the site and cause of biliary obstruction. Also to evaluate the advantages and disadvantages of each imaging methods.

The study was applied in 60 patients, (60%) females and (40%)males whowere examined by U/S and MRCP,using data collection sheet.

The data were collected, classified, analyzed by using(SPSS). The analysis of the results found that the female patients were dominant (60%) VS (40%) males, most of the patients were from western of Sudan (40%), most affected age was the age over 6th decade constantly (48.4%) , the married patients were(90%), most of the patients were housewife (41.6%) and the patients with history of Diabetes were (36.7%).

Abdominal ultrasound depicted the cause of obstruction in (43) patients out of 60 Patientincluded the three categories:common bile duct stone(35)Patients, pancreatic mass were (7), and strictures was (1)Patient.

MRCP visualized correctly and diagnosed the causes of obstruction jaundice in (57) patients out of 60 patientsincluded the three finding:CBD stone was founding (43) patients, pancreatic mass in (9)and stricturesin (5)patients.

The accuracy of MRCP in diagnosis obstruction jaundice was (100%) and ultrasound accuracy was (75.4%).

The study recommendsutilizing theU/S as a first stepto diagnose the obstruction jaundice followed byMRCP, for further assessment.

الخلاصة

هذه الدراسة وصفية, مستقبلية أجريت في مستشفيات ولاية الخرطوم , في مستشفيي علياء التشخيصي , دار العلاج و مستشفيي التركي التشخيصي ,في الفترة بين نوفمبر 2017 الي فبراير 2018.

الهدف من هذه الدراسة تقييم دقة و دراسة الموجات فوق الصوتية وجهاز الرنين المغناطيسي في تشخيص مكان ومسبباتانسداد الجهاز الصفراوي وتقييم محاسن ومساوئ الموجات فوق الصوتية وفحص الرنين المغناطيسي.

طبقت هذه الدراسة على عدد60 من المرضى اللذين لديهم تقرير فحص الموجات فوق الصوتية وفحص الرنين المغناطيسي.

تم جمع البيانات وتصنيفها وتحليلها بواسطة برنامج التحليل الإحصائي ووجدت الدراسة أن المرضى الإناث أكثر من الذكور بواقع (60%) و (40%) بالترتيب, غالبية المرضى من غرب السودان (40%) وأكثر الفئات العمرية إصابة أعلى من العقد السادس من العمر ويمثلون (48.4%) , أيضا أظهرت هذه الدراسة أن معظم المرضى متزوجين (٩٠%) ومعظم المرضى ربات المنزل (41.6%) ومرضى السكري (36.7%) .

شخصت اسباب انسداد القنوات الصفراوية بالموجات الصوتية لعدد 43 مريضا وقسمت اسباب الانسداد لثلاثة اماكن – الحصوات شخصت ف 35 من العدد الكلي 43 مريضا - الاورام شخصت في سبع مريضا – التضيقات شخصت في مريض واحد.

كما شخصت فحص الرنين المغناطيسي اسباب انسداد القنوات الصفراوية لعدد 58 مريضا وقسمت اسباب الانسداد لثلاثة اماكن - الحصوات شخصت في 43 مريضالاورام شخصت تسعه مريضا - التضيقاتفي 5 مريضا.

و)%(100اوضحت الدراسة انفحص الرنين المغناطيسي اكثر دقة في تشخيص اليرقان الانسدادي بكفاء .). (75%لكن الموجات الصوتية اقله دقة في التشخيص اليرقان الانسدادي

أوصت الدراسةباستخدام الموجات فوق الصوتية كنافذة لعمل فحص الرنين المغناطيسي لجهاز الصفراوي وهو الأكثر دقة في تشخيص اليرقان الإنسدادي, وكذلك أوصت الدراسة أن يكون هذا البحث قائدا لمزيد من البحوث المستقبلية في هذا المجال.

List of Abbreviations

CHD	Common hepatic duct.
CA	Carcinoma head pancreas.
CBD	Common bile duct.
CT	Computed tomography.
CCK	Cholecystokinin.
DJS	Dubin Johnson syndrome.
ERCP	Endoscopic retriogradecholangiopancreatography.
RC	Respiratory compensator.
RF	Radio frequency.
GIT	Gastrointestinal tract.
GB	Gall bladder.
MRA	Magnetic resonance angiography.
MRI	Magnetic resonance imaging.
MHZ	Megahertz.
MRCP	Magnetic resonance cholangiopacreatoraphy.
OCG	Oral cholecystography.
FFA	Fast Flip angle.
SPIR	Spectral presaturation inversion recovery.
T1	Spin-lattice relaxation time.
T2	Spin-spin relaxation time.
TGC	Time gain control.
T1W	Weighted image.
TR	Repetition time.
TSE	Turbo spin echo.
US	Ultrasound.
PTC	Percutaneous transhepatiocholangioraphy.

Table ofContents

1.1. Introduction:

Jaundice (icterus) is detectable clinically when the serum bilirubin is greater than 50μmol/L (3mg/dL). The usual division of jaundice into prehepatic, hepatocellular and obstructive (cholestatic) is an over simplification as in hepatocellular jaundice there is invariably cholestasis and the clinical problem is whether the cholestasis is intrahepatic or extra hepatic.

Obstructive jaundice is strictly defined as acondition occurring due to block in the pathway between the site of conjugation of bile in livercells and the entry of bile in the duodenum through the ampulla. The block may be intrahepatic or extrahepatic in the bile duct.

Jaundice will thereforecan be considered under the following headings: haemolyticjaundice increased bilirubin load for the liver cells, congenital hyperbilirubinaemias defects in conjugation, cholestatic jaundice, including hepatocellular (parenchymal) liver disease and large duct obstruction (Kumar and Clark. 1993).

Role of radiology in investigation of jaundice: The principal role of imaging in the jaundiced patient is the identification and detailed assessment of major bile duct obstruction. The clinical suspicion is based on a variable combination of dark urine, pale stools, pruritus, cholangitis and cholestatic liver function tests.Kumar and Clark1993).

Ultrasonography (U/S) is the preferred initial imaging investigation, but will usually be supplemented with a combination of computed tomography(CT), Magnetic resonance cholangio-pancreatography (MRCP), direct cholangiography andin some centers, endoscopic and/or intraoperative Ultrasound (Silverman, cohan 2007).

MRCP is the bestidentification when the patients require immediate intervention, and very safety to patients from unnecessary ERCP, The use of MRCP as second modality imaging tool complementary with ultrasound, and can be improve the diagnosis when suspected obstruction in biliary system(Silverman, cohan 2007).

MRCP often demonstrates dilatation of the extra hepatic tree as well as the intrahepatic duct (Silverman, Coha (2007).

1.2. Statement of theStudy Problem:

In spite of the various image modalities apply to evaluate obstructivejaundice, and the ultrasonography is the first common choice for the physician to evaluate such problem so that use compare between ultrasonography and MRCP to confirm the presence,site and causes of obstructive jaundice to increase diagnostic accuracy.

1.3. Objectives of the Study:

1.3.1. General Objective:

- To compare between ultrasonography, and magnetic resonance cholangio-pancreatography to diagnosis obstructive jaundice.

1.3.2. Specific Objectives:

- To identify the causes of obstructive jaundice.
- To determinethesite ofobstructive jaundice.
- To discuss the advantages and disadvantages of bothmodality.

1.4. The Rational and Importance of Study:

The aim of this prospective study is to compare the diagnostic reliability between U\S and MRCP in evaluation of patients with obstructive jaundice in clinical practice , and Facilitate the diagnostic tools between them to good diagnosis for causes of obstruction jaundice and show anatomical structures of biliary system very clear.

1.5. Hypothesis of the Study:

MRCP is more accurate than ultrasonography to detectionthe side and causes of obstructivejaundice.

1.6. Over view of the Study:

This study was consist of five chapters, chapter one is introduction including objectives and problem of the study. Chapter two is literature review and biliary system anatomy, physiology, pathology, Chapter three is material and Methods. Chapter four is result of the study. Chapter five isdiscussion, ConclusionRecommendation and references.

2.1. Anatomy

2.1.1. Liver Normal Structure:

The liver is a wedge-shaped organ weighing approximately 1.5 kg in the adult. It is situated in the right hypochondrial region of the abdominal cavity and is divisible into four lobes; the right is larger than the left; the smaller caudate lobe is situated posteriorly and the quadrate lobe is anterior (Dean Bchir, Dmrd: 1987).

The blood supply to the liverthe liver receives blood from two sources:

Arterial blood from the right and left hepatic arteries, which are branches of the coeliac axis.Venous blood from the hepatic portal vein, which drains much of the alimentary tract, from the stomach to the rectum, and the spleen(Dean Dmrd: 1987).

Blood leaves the liver through the hepatic veins, which drain into the inferior vena cava. The portal tracts each contain three tubular structures, which are branches of: the bile duct, the hepatic artery and the portal vein (Dean Bchir, Dmrd: 1987).

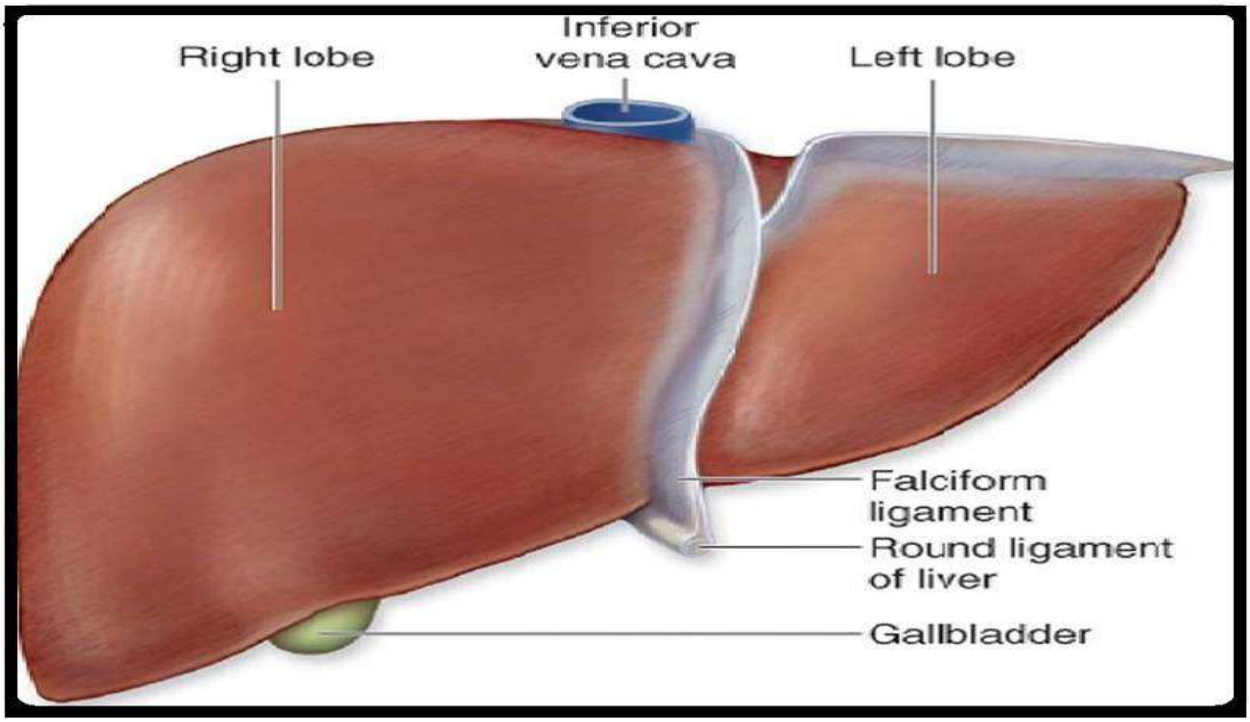

Fig (2.1) anterior view of the liver (DeanBchir, Dmrd: 1987).

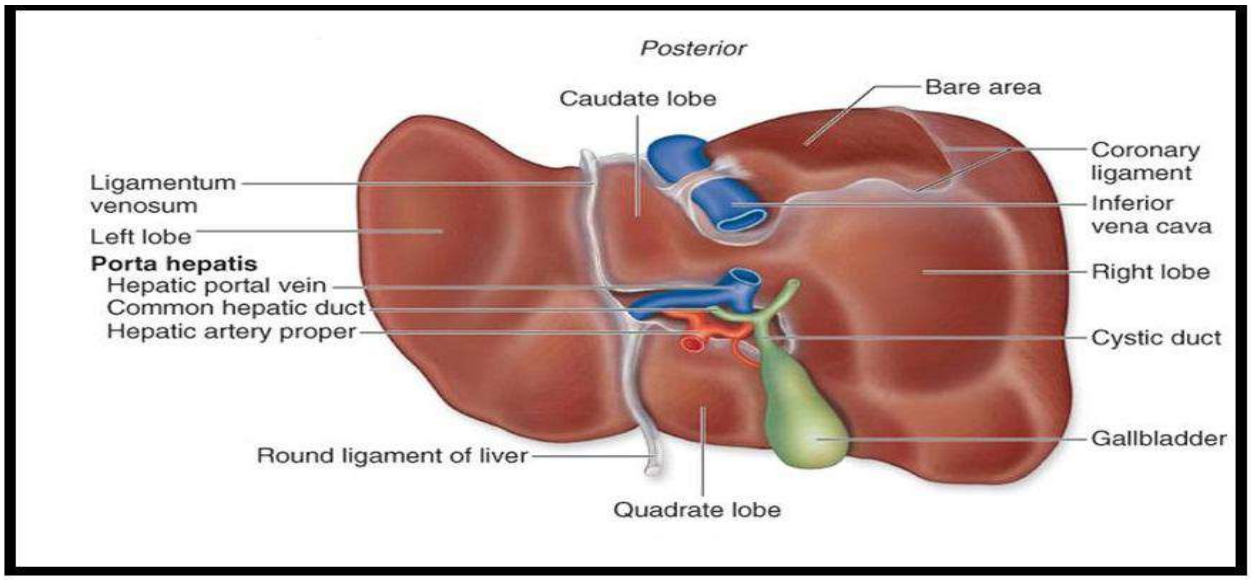

Fig (2.2): posterior view of the liver(Dean Bchir, Dmrd: 1987).

2.1.2. Anatomy of Biliary System:

The biliary system consists of the organs and ducts (bile ducts, gallbladder, and associated structures) that are involved in the production and transportation of bile. The bile is drained from the liver by two main ducts the right and left hepatic ducts .the right and left hepatic ducts leave the liver at the portahepatis And unite almost immediately to form the common Hepatic duct(underwood 2007).

Common hepatic duct Passes downwards for about 3cm and is then joined at an acute angle on its right side by the cystic duct which is the duct from the gall bladder. The cystic duct and the hepatic duct together form the common bile duct (underwood 2007).

The common bile ductwhich is about 7.5cm in length, passes downwards behind the first part of the duodenum and then enters a groove on the posterior surface of the pancreas. It then runs downwards in this groove, in front of the inferior vena cava, and finally unites with the pancreatic duct to enter the second part of the duodenum, on the surface of the duodenal papilla. The opening into the duodenum is surrounded by a sphincter muscle, the sphincter of odd(underwood2007).

The gall bladder is a pear-shaped sac which lies on the under surface of the liver, to which it is attached by connective tissue its about 10-12cm in length' connected to the liver and duodenum by the biliary system, the gall bladder is divided, for descriptive purposes, into a fundus a body and neck (underwood2007).

The fundus is the outer expanded end of the gall bladder. It projects below the inferior surface of the liver and lies in contact with anterior abdominal wall just below the right 9th costal cartilage at the level of the lateral border of the rectus abdominis muscle.

The body the body of gall bladder is directed upwards, backwards and to the left on the under surfaces of the liver. It continuous with the neck of the gall bladder close to the portahepatic(underwood 2007).

The neck the neck of gall bladder is narrow. It passes initially Upwards and forwards and then curves sharply downwards to become continuous with the cystic duct.

The cystic duct the cystic duct is about 3cm in length. It passes downwards and backwards from the neck of the gall bladder to join the right side of the hepatic duct. The mucous membrane lining the cystic duct is thrown in to a series of circular folds which are called the spiral valve (underwood 2007).

The structure of gall bladder The wall of the gall bladder is composed of three coats: An outer serous coat formed by the peritoneum: the peritoneal covering is absent On the upper surface of the body and the neck Of the gall bladder; Amiddle coat composed of a thin layer of fibrous tissue and smooth muscle fibers which run mainly in a longitudinal direction; An inner layer of mucous membrane possessing Honeycombed appearance, the mucous membrane is lined by columnar epithelium.

The blood supply to the gall bladder the gall bladder is supplied with arterial blood by the cystic artery which is a branch of the hepatic artery. The veins from the gall bladder drain in to Cystic vein which loin's portal vein(underwood 2007).

Lymph drainage the lymph drains in to the cystic lymph nodes situated near the neck of the gall bladder. From there the lymph vessels pass to the hepatic nodes along the course of the hepatic artery and then to the celiac nodes (Richard. 2003)

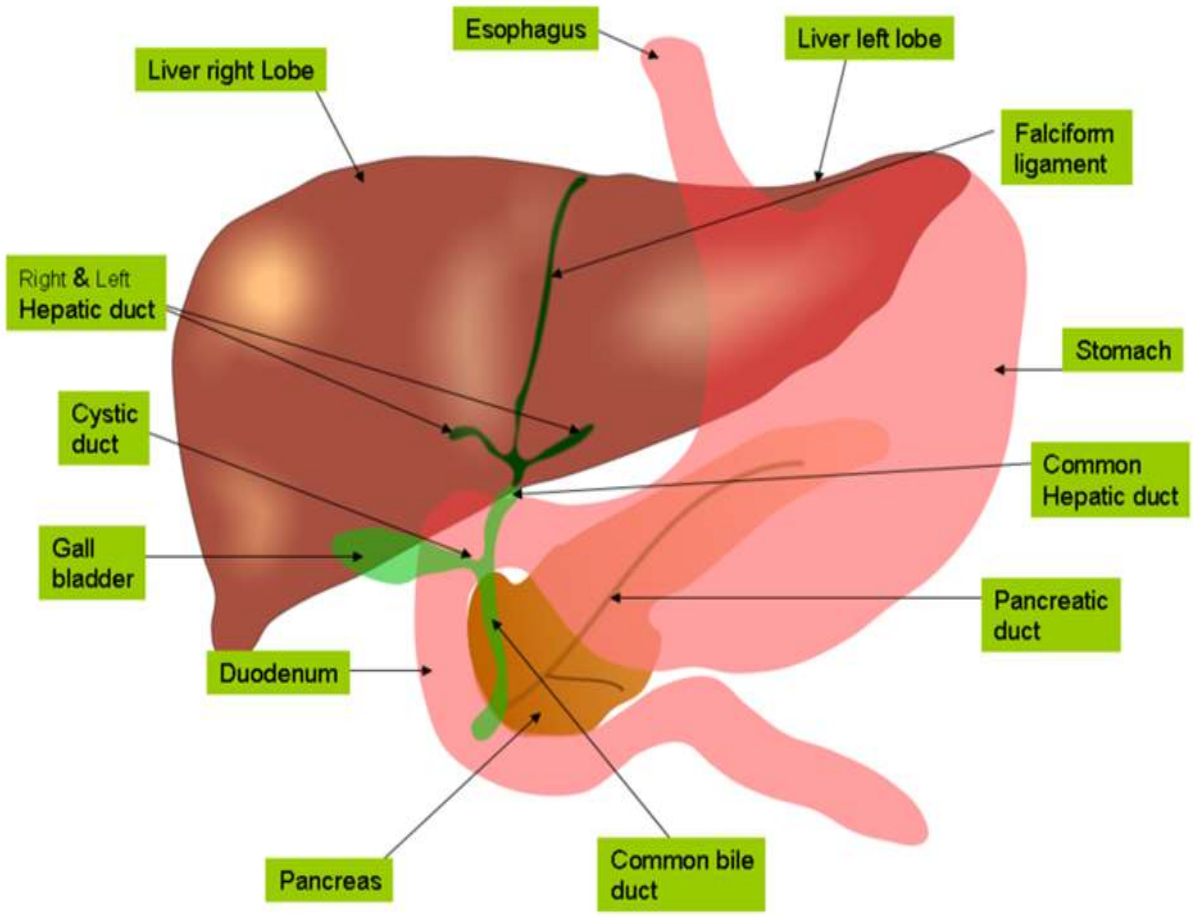

Figure (2.3): shows anatomy of the biliary system(www.internet.com.)

2.1.3. Normal Structure of Pancreas:

The pancreas is a retroperitoneal organ, the head and incarnate process lying within the duodenal loop, the body crossing the aorta and inferior vena cava, and the tail abutting onto the splenic hilum. The pancreas is a mixed exocrine and endocrine organ (Richard. 2003).

The pancreas is alayish-pink , about 15 cm in length ,which extends transversely across the posterior abdominal wall ,from the duodenum to the spleen .It is composed of a head, which lies within the curve of the duodenum ,a neck , a body , which passes across the abdomen ,behind the stomach, and a tail ,which is the narrowed extremity of the pancreas which lies in contact with spleen. The common bile duct passes behind the head of the pancreas, in a groove on its posterior surface .The inferior vena cava, the abdominal aorta, the superior mesenteric vessels, and the left kidney lie

behind the body of the pancreas. The splenic artery runs along the upper border of the pancreas and the splenic vein runs behind the upper border of the pancreas (Richard2003).

The blood supply of the pancreas the pancreas receives arterial blood from branches of the splenic, right gastric, and superior mesenteric arteries (Richard. 2003).

2.2. Physiology:

2.2.1. Physiology of the Biliary System:

Bile is secreted continuously by the hepatocytes, as bile is needed in the intestine only when food is ingested; it needs to be stored between meals. The gall bladder has a capacity of 30-50 ml. It stores and concentrates bile and regulates its Discharge in to the duodenum(sukar: 2000).

2.2.2. Bile

Yellowish to greenish fluid secreted continuously by hepatocytes into the biliary system (Tarig Hakim: 2008).

Characteristic of the bileColour: Golden yellow or greenish fluid; Taste:

Bitter taste; Osmolality: Isotonic; PH: slightly alkaline (Tarig Hakim: 2008).

Contents water and electrolytes (k +|Ca +|HCO3- |CI-|…); bile salts; bile pigments (bilirubin); cholesterol phospholipids; alkaline phosphate enzyme (arig hakim: 2008).

Function of bile:

Neutralization of acid chime by the high bicarbonate content in bile (alkaline pH). Note that bile, pancreatic secretion and duodenal secretion all act together to neutralize acid in the duodenum (Tarig Hakim: 2008).

Fat digestion and absorption by the bile salts; the bile salts result in; Emulsification (for far digestion) and Micelle formation (for fat absorption). Emulsification =Breakdown of large fat droplets into smaller ones. This facilitates digestion by increasing surface area of fat the actin of pancreatic lipase. Micelles =Cylindrical structures formed by bile's salts and phospholipids in bile .Bile salts are arranged in a way that their hydrophilic parts project to the outside and their hydrophobic parts project to the center inside. Large lipid molecules are enclosed in the center of these micelles. This makes lipids soluble in water and facilitates their transport to the intestinal wall for absorption (Tarig Hakim .2008).

Excretion Bile is an important excretory route for bile pigment (bilirubin), cholesterol, some drugs, some dyes and inorganic substances (Tarig Hakim: 2008).

Control of bile by two types of factors:

- Choleretica: Factors that increase secretion of bile from the liver and its flow within the bile ducts. They include: Bile salts, secretin, vagus, gastrin and glucagon. Note that bile salts recycle through the enterophepatic circulation. This recycling increases flow of bile &decreases synthesis of bile acids. Therefore it is the most important choleric factor. It is responsible for about 90% of bile flow.
- Cholagogues: Factors that contract the gall bladder &increase flow of bile into the duodenum. They include CCK and vagus. However, sodium sulphate and phosphate are also included.

2.2.3 Function of the gall Bladder (Cholecyst)

Storage of the bile between meals bile is stored in the gall bladder .The full capacity of the gall bladder is about 50ml.This is released into the duodenum up to10 times per day (i.e. Volume of bile released into the intestine =0.5L|day). Concentration of bile (the mucosa of the gall bladder absorbs water). Acidification of the bile (the mucosa also absorbs bicarbonate).

The gall bladder also controls release of bile through the cystic and common bile ducts into the duodenum (Tarig Hakim: 2008).

2.2.4 Function of the Pancreas:

The glands Scattered through the pancreas are the islets of Langerhans consisting of endocrine cells producing peptide hormones, the most important of which are insulin and glucagon; their secretion drains directly into the blood and ultimately into the liver through the hepatic portal vein (Tarig Hakim:2008).

The exocrine pancreas comprises the bulk of the organ and is composed of glands and ducts with a lobular arrangement, the latter fusing to form the pancreatic and accessory ducts which convey the exocrine secretions into the duodenum.

The exocrine glands contain numerous zymogen granules and produce trypsin, lipase, phospholipase, amylase and elastic; these enzymes require activation, normally in the duodenum. The pancreas also secretes a bicarbonate-rich alkaline medium. Some of the exocrine glands are perfused with blood that has already perfused islets in the viciznity (i.e. they have a portal blood supply); this almost certainly provides some physiological advantages, but it does mean that these glands are especially vulnerable to ischemia if the circulation is impaired (arig hakim Khartoum university: 2008).

2.3. Pathology

2.3.1. Liver disease:

Symptoms

Acute liver disease this may be asymptomatic and anicteric. Symptomatic disease, which is often viral, produces generalized symptoms of malaise, anorexia and fever. Jaundice may appear as the illness progresses (Kumar and Clark.UK: 1993).

Chronic liver disease Patients may be asymptomatic or complain of non-specific symptoms, particularly fatigue. Specific symptoms include: right hypochondrial pain due to liver distension; abdominal distension due to ascites; ankle swelling due to fluid retention; hematemesis and melaena from gastrointestinal hemorrhage; pruritus due to cholestasis. this is often early symptom of primary biliary cirrhosis; breast swelling (gynaecomastia), loss of libido and amenorrhea due to endocrine dysfunction; confusion and drowsiness due to neuropsychiatric complications (Porto systemic encephalopathy) (Kumar and Clark: 1993).

Signs of Liver Disease

Acute liver disease there may be few signs apart from jaundice and an enlarged liver. Jaundice is a yellow coloration of the skin and mucous membranes and is best seen in the conjunctivae and sclerae. In the cholestasis phase of the illness, pale stools and dark urine are present. Spider naive and liver palms usually indicate chronic disease but they can occur in severe acute disease (Kumar and Clark: 1993).

Chronic liver disease the physical signs are shown in. However, it is possible for the physical examination to be normal in patients with advanced chronic liver disease. The skin: The chest and upper body may show spider naive. These are telangiectasia's that consist of a central arteriole with radiating small vessels. They are found in the distribution of the superior vena cava (i.e. above the nipple line). They are also found in pregnancy. In hemochromatosis the skin may have a slate-grey appearance. The hands may show palmar erythema, which is a non-specific change indicative of a hyper dynamic circulation; it is also seen in pregnancy, thyrotoxicosis or rheumatoid arthritis. Clubbing occasionally occurs, and a Dupuytren's contracture is often seen in alcoholic cirrhosis. Xanthomas (cholesterol deposits) are seen in the palmar creases or above the eyes in primarybiliary cirrhosis. The abdomen: Initial hepatomegaly will be followed by a small liver in well-established cirrhosis. Splenomegaly is seen with portal hypertension. The endocrine system: Gynaecomastia (occasionally unilateral) and testicular atrophy may be found in males. The cause of gynaecomastia is complex, but it is probably related to altered estrogen metabolism or to treatment with spironolactone (Kumar and Clark: 1993).

2.3.1.1. Acute Hepatitis

Acute parenchymal liver damage can be caused by many agents; although some histological features are suggestive of the etiological factor, most of the changes are essentially similar whatever the cause. Hepatocytes show degenerative changes (swelling, cytoplasmic granularity, vacillation), undergo necrosis (becoming shrunken, eosinophilia Councilman Bodies) and are rapidly removed (Kumar and Clark: 1993).

Chronic viral hepatitis is the principal cause of chronic liver disease, cirrhosis and hepatocellular carcinoma in the world. Chronic inflammatory cell infiltrates comprising lymphocytes, plasma cells and sometimes lymphoid follicles are usually present in the portal tracts. The amount of inflammation varies from mild to severe (Kumar and Clark: 1993).

2.3.1.2. Chronic hepatitis

Chronic viral hepatitis is the principal cause of chronic liver disease, cirrhosis

And hepatocellular carcinoma in the world. Chronic inflammatory cell infiltrates comprising lymphocytes, plasma cells and sometimes lymphoid follicles are usually present in the portal tracts. The amount of inflammation varies from mild to severe.

2.3.1.3. Liver Cirrhosis

Cirrhosis results from the necrosis of liver cells followed by fibrosis and nodule formation. The liver architecture is diffusely abnormal and this interferes with liver blood flow and function. This derangement produces the clinical features of portal hypertension and impaired liver cell function (Kumar and Clark: 1993).

2.3.1.4. Alcoholic Liver Disease

Alcohol can produce a wide spectrum of liver disease from fatty change to hepatitis and cirrhosis. Fatty change: The metabolism of alcohol invariably produces fat in the liver, mainly in zone 3. This is minimal with small amounts of alcohol, but with larger amounts the cells become swollen with fat (steatosis) giving, eventually, a Swiss-cheese effect on haematoxylin and eosin stain. Steatosis can also be seen in obesity, diabetes, starvation and occasionally in chronic illness there is no liver cell damage. The fat disappears on stopping alcohol (Kumar and Clark: 1993).

2.3.1.5. Budd-Chiara Syndrome

In this condition there is obstruction to the venous outflow of the liver owing to occlusion of the hepatic vein. In one-third of patients the cause is unknown, but specific causes include hypercoagulability states, such as polycythemia Vera, taking the contraceptive pill, or leukemia.

Other causes include occlusion of the hepatic vein owing to posterior abdominal wall sarcomas, renal or adrenal tumors, hepatocellular carcinoma, hepatic infections (e.g. hydrated cyst), congenital venous webs, radiotherapy, or trauma to the liver (Kumar and Clark: 1993).

2.3.1.6. Veno-Occlusive Disease

This is due to injury of the hepatic veins and presents clinically like the Budd-Chiari syndrome (Kumar and Clark: 1993).

2.3.1.7. Fibro polycystic Diseases

These diseases are usually inherited and lead to the presence of cysts or fibrosis in the liver, kidney and occasionally the pancreas, and other organs (Kumar and Clark.: 1993).

2.3.1.8. Liver Abscess

These abscesses are uncommon, but may be single or multiple. The most commonis a portal pyaemia from intra-abdominal sepsis (e.g. appendicitis or perforations), but now in many cases the etiology is not known. In the elderly, biliary sepsis is a common cause. Other causes include trauma, bacteremia and direct extension from, for example, a pernephric abscess.

2.3.1.9. Liver Tumors:

The most common liver tumor is a secondary (metastatic) tumor, particularly from the gastrointestinal tract, breast or bronchus. Clinical features are variable but usually include hepatomegaly. Ultrasound is the primary investigation, with CT or MRI used when available; MRI is comparable to CT at detectingmetastases. Primary liver tumors may be benign or malignant, but the most common are malignant (Kumar and Clark: 1993).

2.3.2. Biliary system diseases:

Congenital abnormalities Malformationof the biliary **system** include: biliary Artesia, in which there is failure of the biliary tree to develop and normally anastomose with intrahepatic structures; choledochal cysts, sometimes associated with congenital hepatic fibrosis. Intrahepatic malformations of the biliary system are inaccessible to surgical correction and, if life-threatening, may be an indication for liver transplantation. In addition to these malformations, the liver is often affected by the production of abnormally viscous bile in patients with cystic fibrosis (mucoviscidosis)

Diseases of the gall bladder are extremely common and in almost every case it is associated with or due to the presence of gall stones (Eunderwood.2007).

Cholelithiasis (gallstones) Risk factors include female gender, obesity, diabetes mellitus; Gallstones consist of pure cholesterol, bile pigment or a mixture; Complications include cholecystitis, obstructive jaundice, and carcinoma of the gallbladder. Cholelithiasis is the name given to the common condition in which gallstones form within the biliary system. Risk factors for cholesterol-rich stones include female gender and obesity (hence 'far, fair, forty, fertile, female', an alliterative description of the typical patient) and diabetes mellitus. Stones are prone to occur if there is a relative excess of cholesterol in the bile. Gallstones are usually composed of a mixture of cholesterol and bile pigment, although almost pure cholesterol or pigment stones are occasionally found. Pure pigment gallstones occur notably in patients with hemolyticanemia where there is consequent excessive excretion of bilirubin.

Cholesterol stones may form if there is an imbalance between the ratio of cholesterol and bile salts; normally, the latter form micelles which have a hydrophilic exterior enclosing the hydrophobic cholesterol, Thus gallstones can result from: an excess of cholesterol; a deficit of bile salts. The pathological effects of gallstones include: inflammation of the gallbladder (cholecystitis); mucocele; predisposition to carcinoma of the gallbladder; obstruction of the biliary system resulting in biliary colic and jaundice; infection of static bile, causing cholangitis and liver abscesses; gallstone ileus due to intestinal obstruction by a gallstone which has entered the gut through a fistulous connection with the gallbladder; pancreatitis .

CholesterosisCholesterosis is the name given to the clinically unimportant occurrence of cholesterol-laden macrophages in the lamina propria of the gallbladder mucosa. This occurrence gives the mucosa a yellow-speckled appearance known as 'strawberry gallbladder.

CholecystitisCholecystitis is an inflammatory condition of the gallbladder. It is almost always associated with gallstones and occurs as an acute or chronic condition. It is a common cause of abdominal pain in the right hypochondrium (Underwood.2007).

Acute cholecystitis usually associated with gallstones; initially sterile, then infected; Complications include empyema and/or rupture. Acute cholecystitis is usually due to obstruction of the outflow from the gallbladder by a gallstone. The initial inflammatory reaction is due to the irritant effects of bile and is therefore usually sterile at this stage. However, stasis of bile predisposes to infection, which.

Then stimulates a more vigorous and often pyogenic acute inflammatory response. The gallbladder wall becomes edematous, due to increased vascular permeability, and infiltrated with acute

inflammatory cells. The lumen distends with pus, and stretching of the wall already weakened by inflammation leads to a risk of perforation and peritonitis. Alternatively a fistula may form with the second part of the duodenum and allow stones to be passed into the bowel lumen. Large stones may occasionally lodge at the ileocaecal valve and cause intestinal obstruction (gallstone ileus). An inflamed gallbladder grossly distended with pus is called an empyema.

Chronic cholecystitisinvariably associated with gallstones; Fibrosis and Aschoff-Rokitansky sinuses; chronic cholecystitis may develop insidiously or after repeated episodes of acute cholecystitis. The gallbladder wall is thickened by fibrosis and is relatively rigid. Thus obstructive jaundice due to gallstones is not usually associated with a palpable gallbladder because the stones will be associated with chronic cholecystitis and therefore a rigid gallbladder. Conversely, obstructive jaundice due to carcinoma of the head of the pancreas often results in a palpable distended gallbladder; this is the pathological basis of Courvoisier's law. The thick gallbladder wall has within it Aschoff-Rokitansky sinuses, mucosal herniation (diverticula) often containing inspissated bile or even small stones. The wall bears an infiltrate of chronic inflammatory cells and the blood vessels often show endarteritis obliterans. A stone is often found in Hartmann's pouch, a pathological dilatation in the neck of the gallbladder formed by increased intraluminal pressure or impaction of the stone.

A mucocele of the gallbladder is the result of sterile obstruction of the neck by a gallstone. The lack of inflammation permits the gallbladder to distendwith mucus without rupturing. The mucocele has a thin wall and demands careful handling during surgical removal to avoid the risk of spillage of mucus into the peritoneal cavity and thus the risk of pseudomyxomaperitonea, a rare complication in which the peritoneum becomes seeded with mucus-producing epithelial cells and the cavity fills with mucus.

Carcinoma of the gallbladder usually an adenocarcinoma; invariably associated with gallstones; Carcinoma of the gallbladder is almost always associated with the presence of gallstones; this relationship may be causal. The tumor is most often an adenocarcinoma, although squamous cell carcinoma is also seen. As the gallbladder is not a vital organ, the tumor is often advanced at the time of clinical presentation, and invasion of the liver and other adjacent structures defeats attempts at operative removal. It therefore has a poor prognosis (underwood.Elsevier; 2007).

Carcinoma of the bile duct Adenocarcinoma; Increased incidence in ulcerative colitis; Presents with jaundice; Carcinoma of the bile duct is most commonly an adenocarcinoma. There is an increased

incidence in patients with chronic ulcerative colitis. It tends to present at a relatively early stage with obstructive jaundice.

2.3.3. Biliary Obstruction:

Bile duct obstruction is a fairly common event and may be due to: Gallstones, carcinoma of the common bile duct, carcinoma of the head of the pancreas, inflammatory stricture of the common bile duct, accidental surgical ligation of thecommon bile duct. The patient becomes jaundiced, deeply so if the obstruction is not relieved, with a raised conjugated serum bilirubin, pale stools and dark urine. A raised serum alkaline phosphatase with only modest elevation of transaminases is usual. If the biliary obstruction persists, there is a risk that the static bile becomes infected, causing cholangitis and liver abscesses. Lack of bile in the small intestine interferes with the absorption of fat and fat-soluble substances (e.g. some vitamins).

2.3.4. Diseasesof Intrahepatic Bile Ducts:

A clinical picture similar to that of biliary obstruction can result from diseases of intrahepatic bile ducts such as: biliary Artesia, primary biliary cirrhosis, sclerosing cholangitis. These conditions can usually be distinguished by careful clinical assessment, liver biopsy and imaging techniques (underwood.Elsevier:2007).

2.3.5. Pancreas Diseases:

Congenital abnormalitiescongenital abnormalities of the pancreas include: annular pancreas encircling, and sometimes obstructing the duodenum; pancreas divisum due to failure of fusion of the two embryological anlagen; ectopic pancreatic tissue (in the stomach or in aMackles' diverticulum) cysts (underwood.Elsevier:; 2007).

PancreatitisPancreatitis (inflammation of the pancreas) can be classified into acute and chronic forms. There is, however, overlap in that patients with chronic pancreatitis may have acute exacerbations.

Carcinoma of the pancreas usually adenocarcinoma, May present with obstructive jaundice; Very poor prognosis (underwood.Elsevier:; 2007).

2.3.6. Jaundice:

Jaundice (or icterus) is the name given to yellowing discoloration of the skin and mucosalSurfaces due to the presence of bilirubin. Usually jaundice is observable when the serum bilirubin concentration exceeds 40μmol/l. It is important to emphasis that: Many patients with significant liver disease, often severe, are not jaundiced; Liver disease is not only cause of jaundice; The

accumulation of bilirubin in the skin may cause some embarra\ssment to the patient and, often if due to biliary obstruction, discomfort due to pruritus attributed to bile salt accumulation (underwood.Elsevier:2007).

2.3.6.1. Classification of Jaundice:

Jaundice may be classified into pre-hepatic, intra-hepatic or post-hepatic causes, depending on the site of the lesion, or into conjugated and unconjugated forms, based on chemical analysis of the bilirubin in the blood or by deduction from the colour of the patient's urine. Only conjugated bilirubin is sufficiently water-soluble to be excreted in the urine (underwood.Elsevier: 2007).

Pre-hepatic causes the main cause of 'pre-hepatic jaundice' is hemolysis, due for example to hereditary spherocytosis or autoimmune red cell destruction. In these conditions there is excessive production of bilirubin from the hemoglobin released from lysed red cells. Because the excess bilirubin is unconjugated, it is not extractable in the urine; the urine colour is normal (hence the synonym 'acholuricjaundice'). The bile, however, may contain so much bilirubin that there is a risk of pigment gallstone formation.

Intra-hepatic causes Hepatic disorders in which jaundice may be a feature include: acute viral hepatitis, drug-induced liver injury, alcoholic hepatitis, decompensated cirrhosis, intra-hepatic bile duct loss (e.g. primary biliary cirrhosis, sclerosing cholangitis, biliary hypoplasia), in pregnancy, intra-hepatic cholestasis and acute fatty liver. In these conditions there is accumulation of bilirubin within the liver (intra-hepatic cholestasis), often histologically evident in biopsies as plugs of bile pigment distending canaliculi or bile ducts. The excess bilirubin is predominantly conjugated, is therefore water-soluble and is excreted in the urine, causing darkening; this is a simple but diagnostically useful observation.

Congenital hyperbilirubinaemiacongenital metabolic defects in the intra-hepatic conjugation, transport or excretion of bilirubin are relatively rare causes of jaundice. These include: Gilbert's syndrome (predominantly unconjugated); Crigler-Najjarsyndrome (predominantly unconjugated); Dubin-Johnson syndrome (predominantly conjugated); Rotor syndrome (predominantly conjugated) (underwood.Elsevier: 2007).

Post-hepatic causes Obstruction of the extra-hepatic bile ducts is important cause of jaundice necessitating urgent investigation and alleviation in order to prevent serious damage to the liver. Important causes are: congenital biliary atresia-often accompanied by a reduction in the number of intra-hepatic ducts; gallstones-usually associated with biliary colic and a nondistend able

chronicallyinflamed gallbladder; strictures-often following previous biliary surgery tumors-notably carcinoma head of the pancreas compressing the common bile duct. As with intra-hepatic causes, some of which also directly interfere with biliarydrainage.

2.4. Radiographic procedure:

2.4.1 Plain Abdomen x-ray Radiograph:

Plain radiograph of the biliary system may be taken to demonstrate opacities, including calcifications in the region of gall bladder and biliary tree.

The gall bladder and biliary ducts blend in with other abdominal soft tissue and in most cases cannot be visualized without the additional of contrast media examination. (Bontrager et al: 2006).

2.4.2 Oral Cholecystography (OCG):

It is a radiographic contract media examination in which the contrast ingested orally to study the anatomy and function of biliary system. The patient fast at least 8hr before the exam and the evening meal before the exam should be light and should not contain fats.

Patient ingests four to six tablets or capsules during the evening before exam.Scout radiograph (first radiograph) is taken with the patient prone .it checked to determine the presence or absence of opacified gall bladder. Right posterior oblique projection taken to demonstrate the biliary duct system drainage into duodenum and right lateral decubitus position demonstrate the opacified gall bladder is project away from the vertebral column.

Many projection may be taken after administer fatty meal which stimulate the duodenum mucosa to produce CCK which is will turn the gall bladder to contract to assessment the contracting ability of the gall bladder.The number of OCG is being ordered has decreased generally because of increase used of nosography(Bontrager et al: 2006).

2.4.3 Diagnostic Ultrasound (sonographer):

Ultrasound is first imaging investigation of choice for the jaundiced patient it is able to detect small calculi in the gall bladder and biliary ducts that generally are not visualized during OCG also ultrasound excellent in distinguish between the dilated and non-dilated ducts , common bile duct measurements are graded as follows : normal <6 .equivocal 6-8 mm dilated>8 .the site and cause of obstruction are defined only 25 percent of causes as overlying duodenal gas often obscure the lower end of common bile duct depending on the finding us and may be followed more definitive imaging of the biliary system(Bontrager et al :2006).

2.4.4. Operative Cholangiography:

Operative cholangiogram involves the injection of radiopaque dye into the ducts of the biliary tract during gall bladder surgery. X-ray then reveal clear images of biliary tract.This is test is used occasionally when other less invasive test do not provide enough information.The primary purpose of operative cholangiography is:to reveal any cholelithiasis (stones) not previously detected, determine the function of hepatopancreatic ampulla, and demonstrate small lesions, strictures or dilatation in biliary ducts.

2.4.5.Postoperative (T tube or delayed) Cholangiography:

Delayed cholangiogram usually performed in radiology department following cholecystectomy .the surgeon may be concerned about the residual stones in the biliary ducts that went detected during the surgery.

The surgeon will place a special tube catheter into the common bile duct .the catheter extend to the outside of the body and is clamped off, because the T-tube catheter has been clamped off drainage of excess bile is performed at the beginning of the procedure,after duct drainage and under fluoroscopic control the iodinated contrast media is injected fractionally and fluoroscopic spot films are taken.

2.4.6. PTC (Percutaneous TranshepatioCholangioraphy):

It is another type of cholangiography that demonstrates the biliary duct; it is more invasive than other form of cholangiography. PTC involve direct puncture of biliary duct with a needle passing through the liver once within duct , iodinated contrast media is injected under fluoroscopic control .fluoroscopic spot films and conventional radiographs are taken during the procedure. PTC is indicated for assessment of high biliary obstruction at the level of portal and where biliary obstruction is unable to outline by ERCP due to previous biliary diversion surgery.

2.4.7. ERCP (Endoscopic Retrograde Cholangiopancreatography):

ERCP is used to assess biliary obstruction diagnosed on ultrasound or computed tomography .ERCP is the investigation of choice for suspected distal biliary obstruction that may require investigation such as sphincterotomy , basket retrieval of stones , biliary biopsy or biliary stent placement..(Bontrager et al: 2006).

2.4.8.Nuclear medicine:

A hepato-biliary or HIDA scan is a scan of the gall bladder and biliary system. Patients with a history of the abdominal pain, nausea, and vomiting, or chest pain resulting from gall bladder or biliary diseases are candidates for this procedure.

Patients are injected with radio-active isotope and images are taken approximately 1 to 2 hours after injection.

After the completion of the examination, another procedure may be performed to indicate the response of the gall bladder to hormonal stimulation. It requires a second injection.

Liver and spleen nuclear medicine scans evaluate functional liver disorders that include cirrhosis, hepatitis, and metabolic disorders.

2.4.9. Computer Tomography (CT):

CT Cholangiography is a reasonable reliable method of imaging the biliary system Involve a slow intravenous contrast infusion of iodine containing cholangiography agent (biliscopin) to opacity the bile duct(Bontrager et al :2006).

2.4.10.MRCP:

Magnetic resonancecholeangiopencreatography is uses heavily T2 weighted image that show stationary fluids such as high signal with moving fluids and solids as low signal,The bile ducts and gallbladder are there for seen as bright structures on a dark background.MRCP has largely replaced by diagnostic ERCP, as the investigation of choice for imaging of the biliary system including assessment of jaundice patients with dilated bile duct on Ultrasound. MRCP is commonly used prior to laparosopiccholecystoctomy to diagnose bile duct calculi and bile duct varianls and to avoid of intraoperative exploration of common bile duct (Bontrager et al :2006).

2.5 Previous Studies:

Study 1: Ultrasonography, CTand MRCP in the Diagnosis of Choledochal Stones: study by: Dr.P. Pasanen, Department of Surgery, Kuopio University Hospital, in (1992, Vol. 33, No. 1), Pages 53-56. A prospective study of jaundiced (n = 187) and nonjaundiced (n = 33) cholestatic patients was carried out to evaluate the sensitivity of ultrasonography (US), CT, and MRCP in the detection of choledochal stone disease. Altogether 83 patients had the final diagnosis of choledocholithiasis. In thejaundiced patients, the sensitivity of US, CT, and MRCP was 22.5%, 23.2%, and 80.6%, respectively. In cases of cholestasis without jaundice, the values were 20%, 37.5%, and 66.7%. In patients in whom all 3 imaging studies were done (n = 64), the differences between US and MRCP and between CT and MRCP were statistically significant ($p < 0.0001$). In most false-negative MRCP studies (10/15), the clinical course of the disease strongly suggested a passed choledochal stone. On the basis of this study, we recommend prompt MRCP to be performed if choledochal stone disease is suspected on clinical grounds.

Evaluation of jaundice patients should include proper history and examination, laboratory investigation and imaging investigations (noninvasive like Ultrasound (U\S), CT and MRI or invasive like ERCP and PTC).

Study 2:MR Cholangiography was introduced by Waller et al in 1991. Authors used the rapid sequence gradient echo acquisition with three- dimensional post processing technique to evaluate the biliary system in five healthy volunteers and 13 patients of obstructive jaundice. The results were compared with other imaging modalities (US, CT scan and conventional radiographs obtained during PTC or ERCP) and concluded that MR cholangiopancreatography has the capability for noninvasive imaging of the biliary tree in patients with obstructive jaundice but improvement in technique is needed to overcome limited spatial resolution and low signal to noise ratio.

In addition to CT and M.R.I. the imaging techniques use for the evaluation of patients with suspected biliary tract diseased include routine and endoscopic radionuclidescintigraphycholangiopancreatography (ERCP) and percutaneous transhehepatic cholangiography (P.T.C) Each of these techniques has a role in evaluation of the biliary tracts however ; there are multiple factors that must be considered in selected appropriate imaging examination.

Study 3: American Journal of Gastroenterology (2005) The study about Detection of Bile Duct Stones in Suspected Biliary Pancreatitis: Comparison of MRCP, ERCP, and Intraductal US reported on the aim to evaluate of the ability of MRCP to detect choledocholithiasis in patients with acute biliary pancreatitis. The study done on Thirty-two patients with suspected biliary pancreatitis were studied prospectively. MRCP was performed immediately before ERCP by separate blinded examiners within 24 h of admission. Wire-guided IDUS was performed during ERCP within 72 h of admission, regardlessof the results of MRCP. The sensitivity of US, CT, MRCP, ERCP, and IDUS for identifying choledocholithiasis was 20.0%, 40.0%, 80.0%, 90.0%, and 95.0%, respectively. The sensitivity of MRCP for detecting choledocholithiasis decreased with dilated bile ducts (bile duct diameter > 10 mm, 72.7% vs. 88.9%).in conclusion MRCP can be used to select patients with biliary pancreatitis who require ERCP. IDUS may be applied in the management of biliary pancreatitis if ERCP is performed.

Study design:

This is a descriptive study deal with the Comparative study between ultrasound and magnetic retrograde cholangopancreatography, in diagnose obstructive jaundice. As well as to find the best modalities to demonstrate the anatomical structures among Sudanese population.

3.1 Material

3.1.1 Patients:

The study population consisted of 60 patients male(23) and female (36), their age between 30-80 yrs. they were clinically has obstructive jaundice or impacted ducted undergoing the ultrasound and MRCP investigations.

3.1.2. Area of the Study:

The study was carried out in Khartoum state hospitals, Dar- Alelaj Specialized Hospital, AliaaSpecialist Hospital and Turkish Medical Diagnostic Center, in the period between November2017 _ February 2018.

3.1.3. Study Variables:

Concerned with abdominal ultrasound and MRCP finding in obstructive jaundice patients, and these include:

a. Gall bladder abnormality.

b. Common bile ductabnormality.

c. Cause and site of obstructive jaundice.

3.2. Methods:

3.2.1 Methods of Data Collection:

All MRCP were performed by a TOSHIBA (1.5 tesla) with 120 mt/m maximum gradient capability and phase array body coil, and PHILIPS(1.5 T) super conductive magnet. Body coil, peripheral pulse unit (P.P.U), and respiratory compensator. After localizing images, the coronal and axial abdominal images were obtained using T-weighted pulse sequences. And the axial images of the biliary and pancreatic duct were obtained by using T2-weighted fat suppressed pulse sequence. Both groups MRCP included breath-hold thick slab single-shot turbo spin echo(SSTSE BH) sequence images.

The parameters of the SSTSE BH sequence were as follows: TR, 3137ms:effective TE, 512MS: turbo factor, 128: flip angle 90 degree: slice thickness 30 to 40 mm: field of view 250mm: matrix 256*205: acquisition time 8 seconds .the entire pancreatic biliary tree was included in all images.

The same pulse sequence was repeated to acquire 4 to 6 projection of the pancreatic biliary system from different angles.

For abdominal ultrasound, the patient was prepared to insure the any abnormality in gallbladder or biliary ducts.

The abdominal ultrasound performed by putting the patient in supine position with a real time sector and curvilinear scanners.

A transverse scans were performed the identify the gallbladder, biliary system, liver, Right kidney and head of pancreas, Also decubitus and upright position to separate small stones from the gallbladder wall or cystic duct.

3.2.2. Data Collection and Analysis:

The data were collected from the patients sent to the U/S and MRCP department for abdominal u/s and MRCP, and the data were collected from the patients images and classified in data collection sheet according to Age, gender, residence, marital status, occupational, patient history, and cause of obstruct

RESULT:

This study includes 60 jaundiced patients with biliary system disorders were investigated by ultrasonography (u/s) and MRCP, the results in the following tables.

Table (4.1): Shows distribution of patients under study according to the gender.

Gender	Male	Female
Frequency	24	36
Percentage	40%	60%

Graph (4.1): Distribution of patient's according to gender.

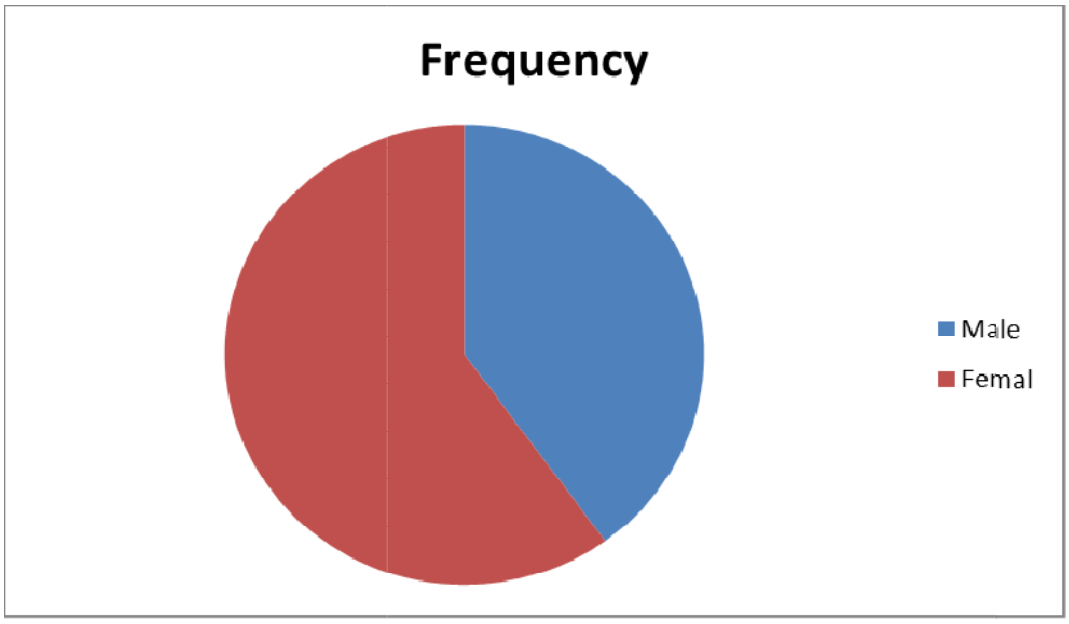

Table (4-2) Shows Distribution of the patient under study according to the age groups.

Age	**Frequency**	**Percent%**
30-40	**3**	**5**
41-50	**9**	**15**
51-60	**19**	**31.6**
61-70	**29**	**48.4**
Total	**60**	**100%**

Figure (4-2) Shows Distribution of the patient under study according to the age groups.

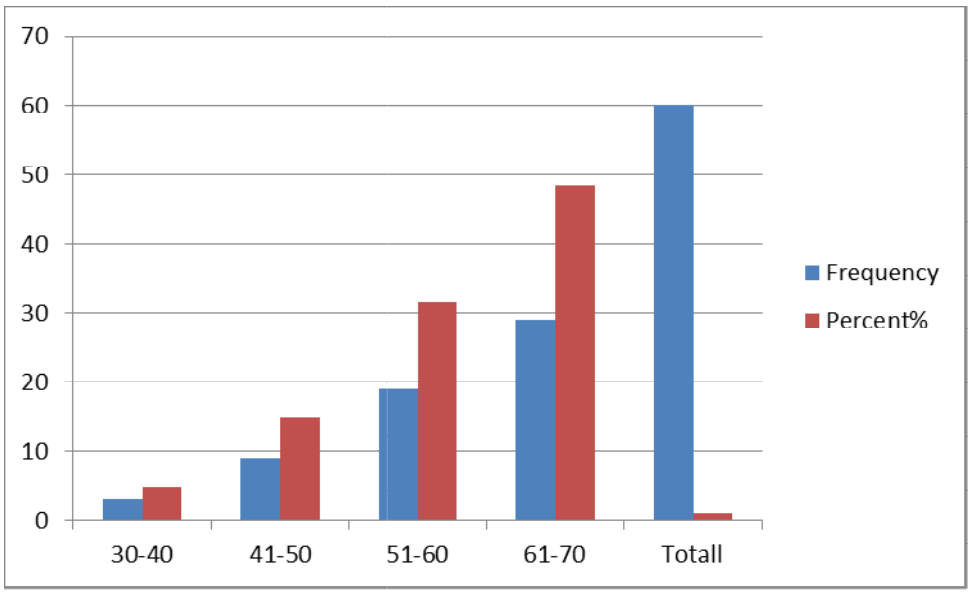

Table (4-3):shows the frequency distribution of patient accordion tomarital status.

marital status	frequency	Percent to%
married	54	90%
single	6	10%
total	60	100%

Graph (4-3): Frequency distribution of patients according to marital status.

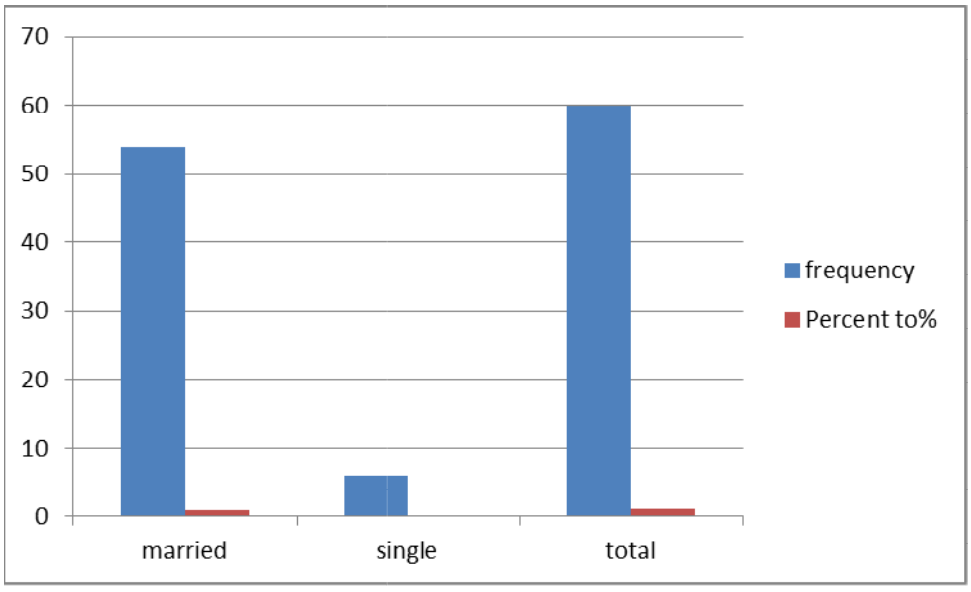

Table (4.4): Shows Frequency distribution of patients according to residence.

Residence	frequency	Percent%
Western of Sudan	24	40%
Khartoum	21	35%
North of Sudan	9	15%
Mid Sudan	6	10%
total	60	100%

Figure (4.4): Shows Frequency distribution of patients according to residence**.**

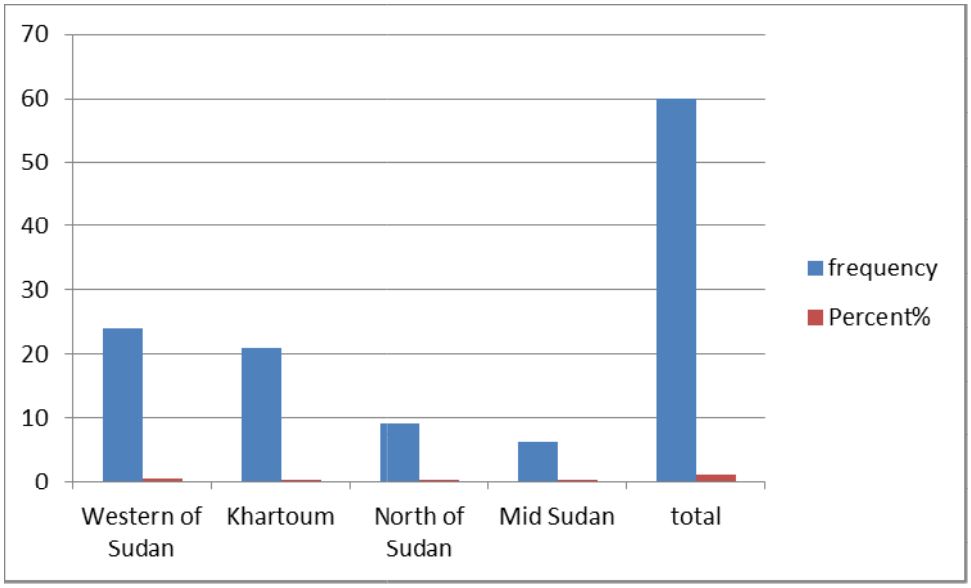

Table (4.5): Shows the frequency distribution of patient's occupation.

occupation	frequency	Percent%
Employer	11	18.4%
Housewife	25	41.6%
Student	9	15%
Worker	15	25%
Total	60	100%

Figure (4.5): Shows the frequency distribution of patient's occupation.

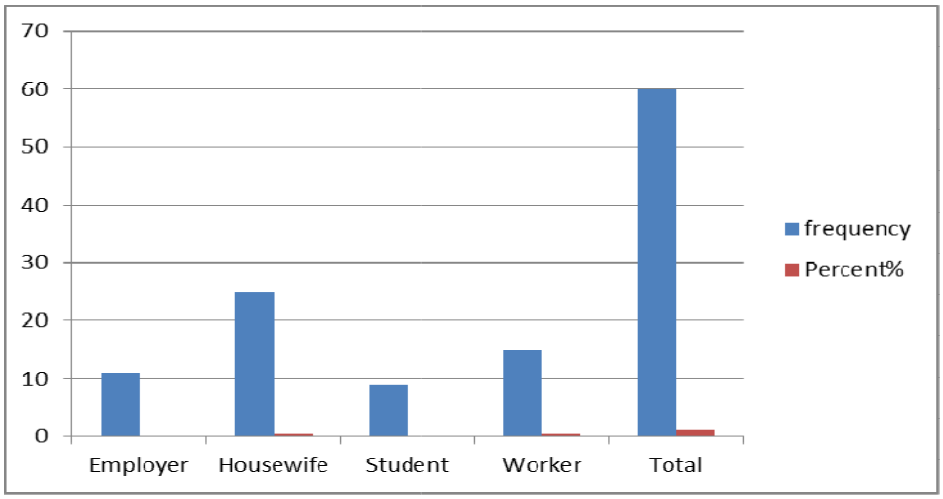

Table (4.6): Shows frequency distribution according to the patient's history.

Patient history	frequency	Percent%
Diabetic	22	36.7%
obesity	7	11.7%
Alcohol consumption	0	0
cholecystectomy	2	3.3%
Diabetic with Obesity	3	5%
On history of illness	26	43.3%
Total	60	100%

Figure (4.6): Shows frequency distribution according to the patient's history.

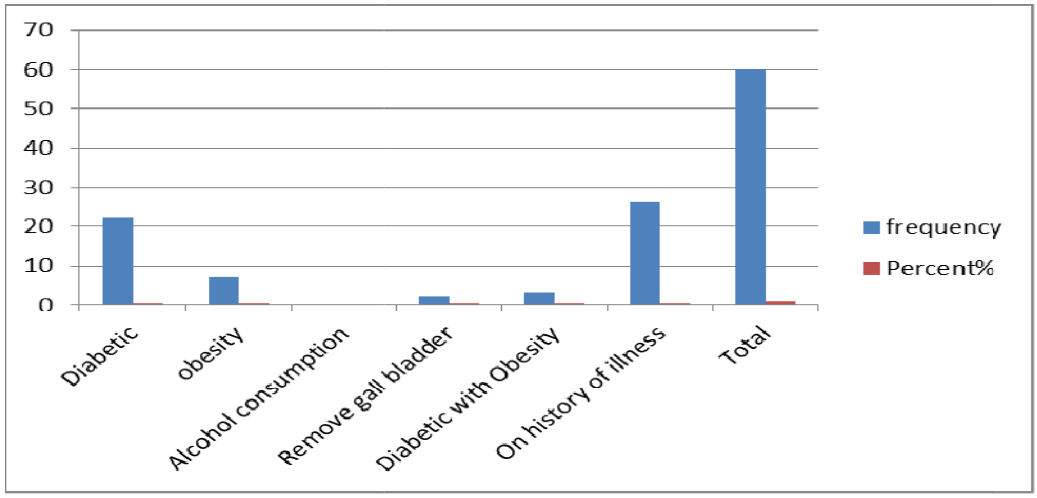

Table (4-7): Shows the frequency distribution of ultrasonography finding concerning causes of obstructive jaundice.

Causes of obstructive observed	Frequency	Percent%
Common bile duct stone	35	58.3%
Ca head of pancreas	7	11.7%
Stricture	1	0.16%
Normal	17	28.3%
Total	60	100%

Figure (4-7): Shows the frequency distribution of ultrasonography finding concerning causes of obstructive jaundice.

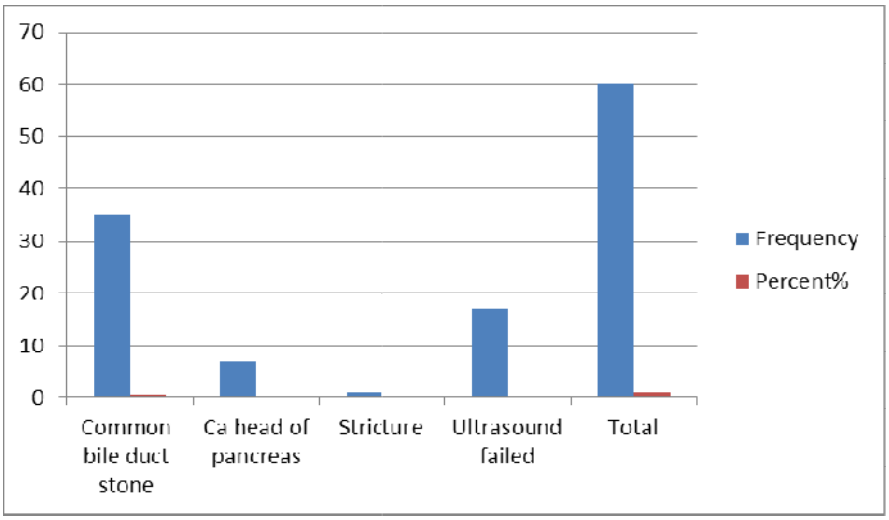

Table (4-8): Shows the frequency distribution of MRCP finding concerning causes of obstructive jaundice.

Causes of obstructive observed	Frequency	Percent%
Common bile duct stone	43	71.7%
Ca head of pancreas	9	15%
Stricture	5	8.3%
Normal	3	5%
Total	60	100%

Figure (4-8): Shows the frequency distribution of MRCP finding concerning causes of obstructive jaundice.

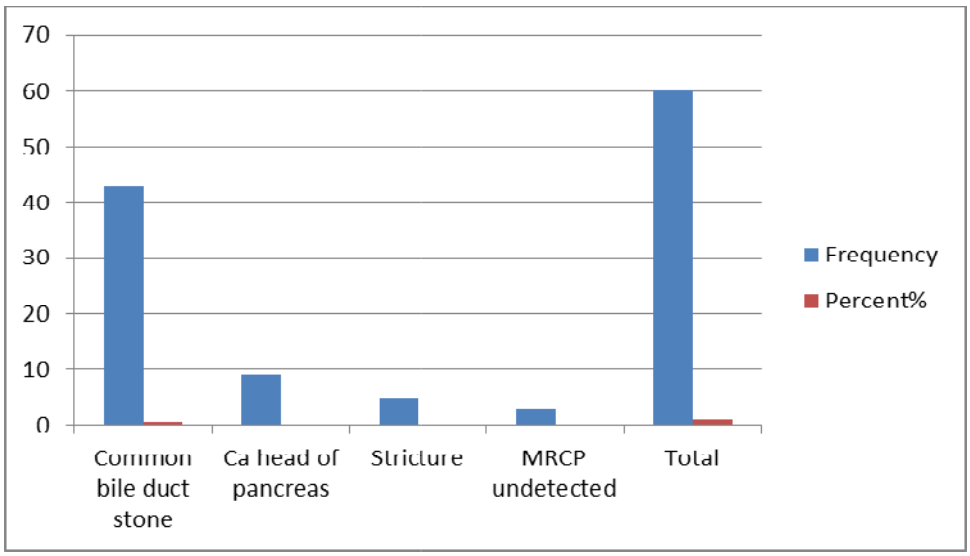

Table (4-9): Shows the efficiency of ultrasonography compared with MRCP to detect causes of obstructive jaundice out of 60 patients.

Modailty	No. pt	Stones	Masses	Stricture	False- pe
U/S	60	35	7	1	17
MRCP	60	43	9	5	3

Figure (4-9): Shows the efficiency of ultrasonography compared with MRCP to detect causes of obstructive jaundice out of 60 patients.

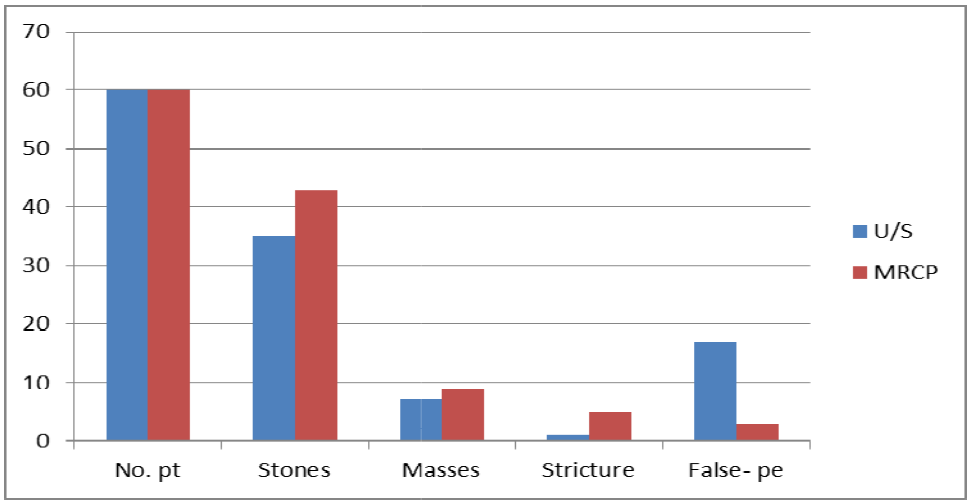

Table (4-10): Shows Crosstabulation test to detect sensitivity of MRCP compared with Ultrasonography out of 60 patients.

MRCP * US Crosstabulation					
			US		
			Positive	Negative	**Total**
MRCP	Positive	Count	43	14	**57**
		% within MRCP	75.4%	24.6%	**100.0%**
		% within US	100.0%	82.4%	**95.0%**
	Negative	Count	0	3	**3**
		% within MRCP	0.0%	100.0%	**100.0%**
		% within US	0.0%	17.6%	**5.0%**
Total		**Count**	**43**	**17**	**60**

5.1. DISCUSSION

In this study the classification of sample to genderwas shown in the table (4.1) 36 were females forming an incidence (60%) and 24 were males (40%) from 30 years to 80 years. This table showed Increasedthe incidence of female patients in this study due to excess of cholesterol in the body, multiple pregnancies, obesity and rapid weight loss and this showed similar results were found by Sandra L.hauen,Ansert.

Table and figure (4.3) found the obstructive jaundice in married patients were 54 out of 60 cases (90%) more than single patients 6 out of 60cases (10%) because in Sudan most of the people married too late, and there is relationship between obstruction jaundice and advanced age .

Table and figure (4.4) Shows the Geographical distribution points to where the patients lived within the past 10 years permanently so that, The majority of the patients were from western of Sudan there are 24 patients from 60 patients (40%), because their environment and nutrition habits.

Table and figure (4.5): Shows the majority of patients were housewives 25 (41.6%) because they are not doing any exercises, advanced their ages and increase number of gravid.

Table and figure (4.6) Shows the majority of patients were diabetic 22 out of 60 patients (36.7%) and this record because of advanced patient age.

Table and figure (4.7) (4.8) shows the distribution of ultrasonography and MRCP finding concerning causes of obstructive jaundice that found 35 (58.3) and 43 (71.7) respectively CBD stone, due to accumulation of bile in common bile duct.This study agrees withP. Pasanen(1992).

Table and figure (4.9) Shows the abdominal ultrasound depicted the cause of obstruction in (43) patients out of 60 Patient included the three categories: common bile duct stone (35) Patients, pancreatic mass were (7), and strictures was (1) Patient.

MRCP visualized correctly and diagnosed the causes of obstruction jaundice in (57) patients out of 60 patients included the three finding: CBD stone was founding (43) patients, pancreatic mass in (9) and strictures in (5) patients this study correlate with most of the studies done to determine the sensitivity of MRCP in detecting the cause of obstruction in jaundiced patients (Guibaud L, bret PM, Reinhold C et al: (1995). Buchert M, B et al: (1995).

Table (4.10) Shows Cross tabulation tests thatMRCP andU/S is constant in positive test (43) patients but that never in (14)patient negative test that noted. MRCP ismost sensitive compared with Ultrasonography that record (100%) and (75.4%) respectively,and this showed similar results were found byAmerican Journal (2005).

5.2. Conclusion

MRCP is superior than U/S in evaluation of the obstructive jaundice, and better than U/S in covering the diagnosis all biliary system disorders, and adding to advantage of each. (With the 100% accuracy).

Although, ultrasonography provides good information about the presence and site of biliary obstruction, it does not suggest the possible cause in cases, so ultrasonographg as screening modalityit's useful to confirm biliary dilatation and to choose patient for either more advanced imaging like MRCP or ERCP examination.

U/S and MRCP are complementary techniques in the evaluation of obstruction jaundice,so the use of MRCP as a second-line imaging tool, complementing with ultrasound can improve the management who have suspected biliary obstruction.

MRCP is important noninvasive imaging investigation and not operator dependent in the preoperative evaluation of patient with obstructive jaundice, but the U/S is operator dependent.

However,Limitations of ultrasonography is low sensitivity its association with patient'sconditions. The causes of obstruction may not be visualized in ultrasonographybecause of obesity, gasses.

Also U/S scanning is individual dependence, therefore it require experience and new advanced machines.But the MRCP is breath-depending procedure that will be impossible with those cannot control their breathing.

MRCP is contraindicated with patients who have claustrophobia.

MRCP is contraindicated with patients those implanted medical devices sensitive to MRI (ferromagnetic substances).

MRCP machines are less available than other modalities (high cost machine price).

5.3. Recommendation

- This thesis extended to include various methods to study the present sites and causes of obstructive jaundice, can be use methods like MRCP, EU/S and ERCP.
- To have an accurate diagnosis and avoiding expose patient to unneeded investigation,good preparation of the patient is first step for U/S and MRCP examination.
- Some cases missed diagnosed by ultrasonography, so MRCP should be done to ensure the final diagnosis.
- Clinical history should be provided in the request form so as to choose the suitable technique and method of examination.

- Further studies could be made to show other causes of jaundice especially non obstructive by U/S and MRCP.

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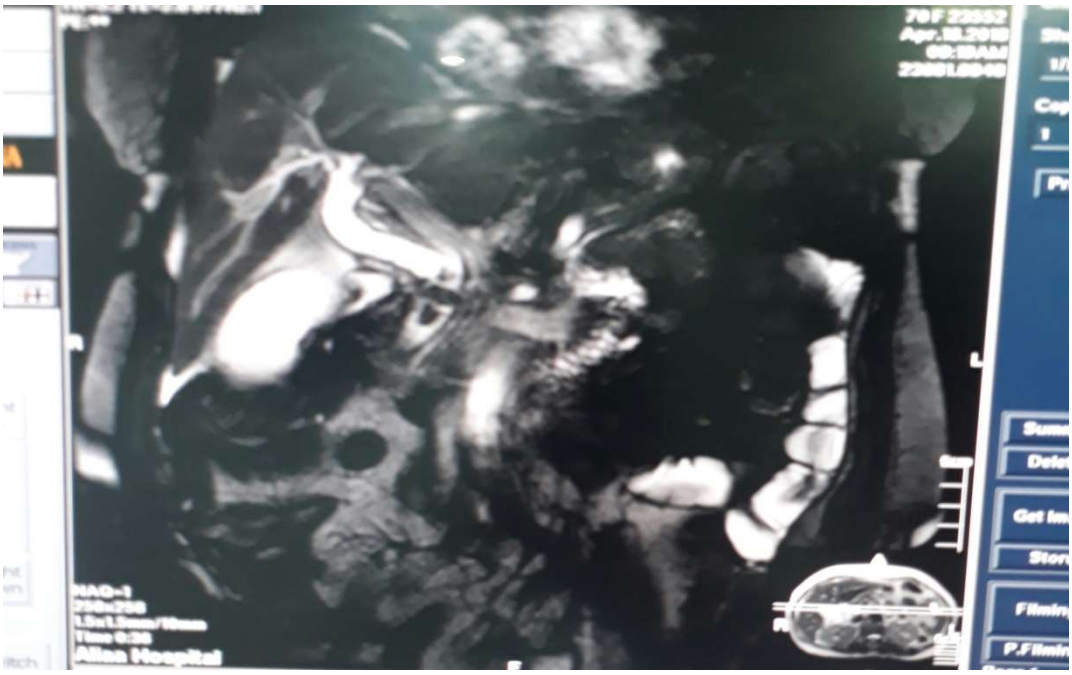

Image 1.1: 66years old female patient, coronal single shot T2 MRCP image shows dilated CBD with CBD stone.

Image 1.2: U/S image for the same patient shows dilated CBD (13mm) with CBD stone.

Image 2.1: 70 years old female patient, singleshot T2MRCP image shows dilated CBD with CBD stone.

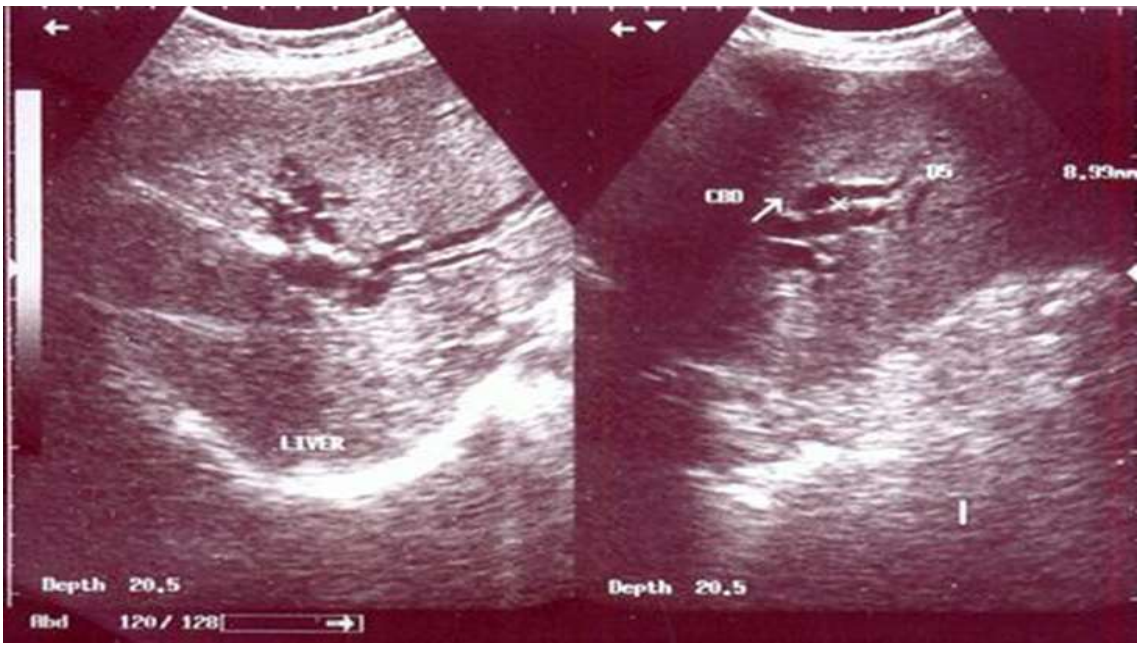

Image 2.2: U/S image for the same patient shows dilated CBD (9mm).

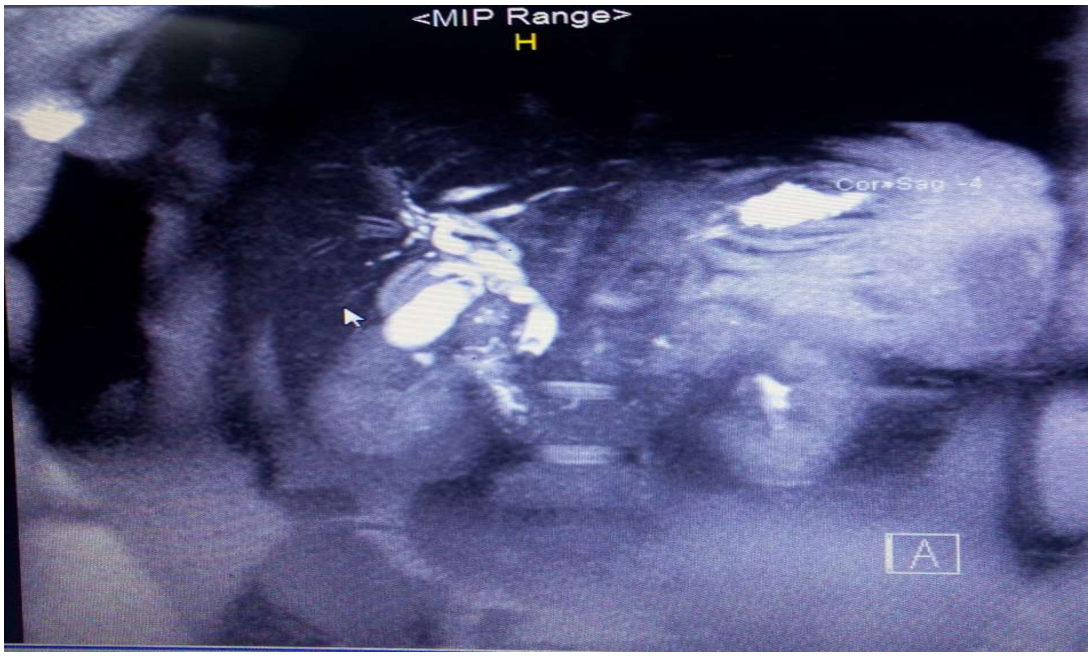

Image 3.1: 50 years old female patient, T2 MRCP image shows dilated CBD with CBD stone.

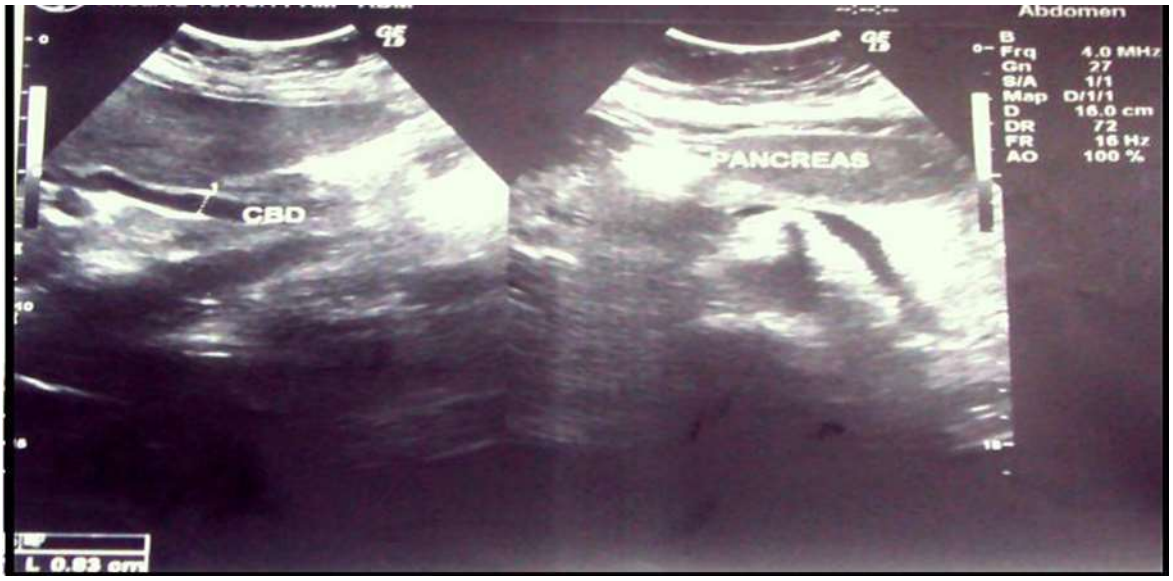

Image 3.2: U/S image for the same patient shows dilated CBD (9mm) with the CBD stone.

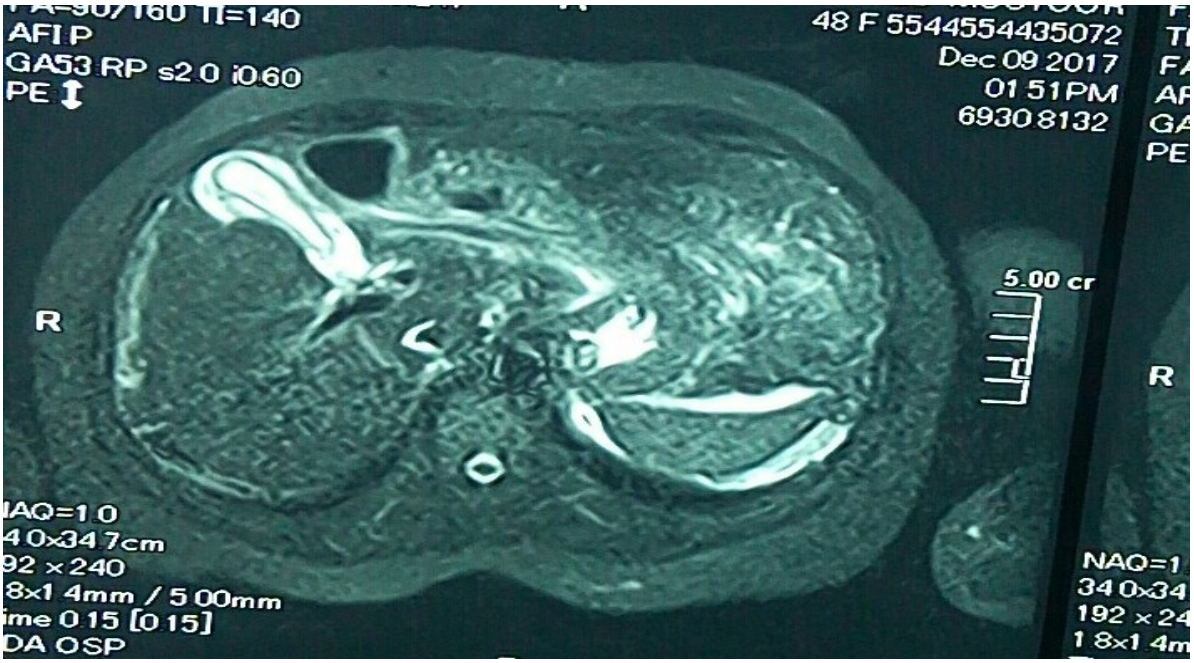

Image 4.1 : 66 years old female patient ,SSFSE T2 MRCP image shows dilated CBD .

Image 4.2: U/S for the same patient shows gall bladder stone with dilated CBD.

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Image 5.1: 53 years old male patient,Single Shot T2 MRCP image shows dilated CBD with CBD stone.

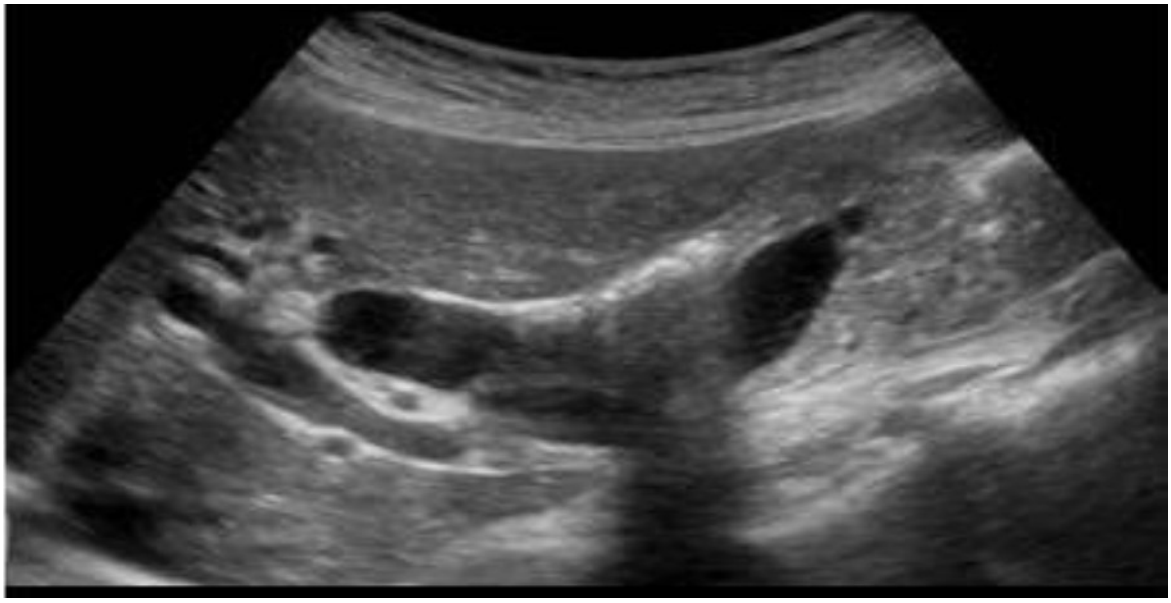

Image 5.2:U/S image for the same patient shows dilated CBD with Ca head of pancreas.

Image 6.1: 78years old male patient,SSFSE T2 MRCP image shows dilated CBD with CBD stone.

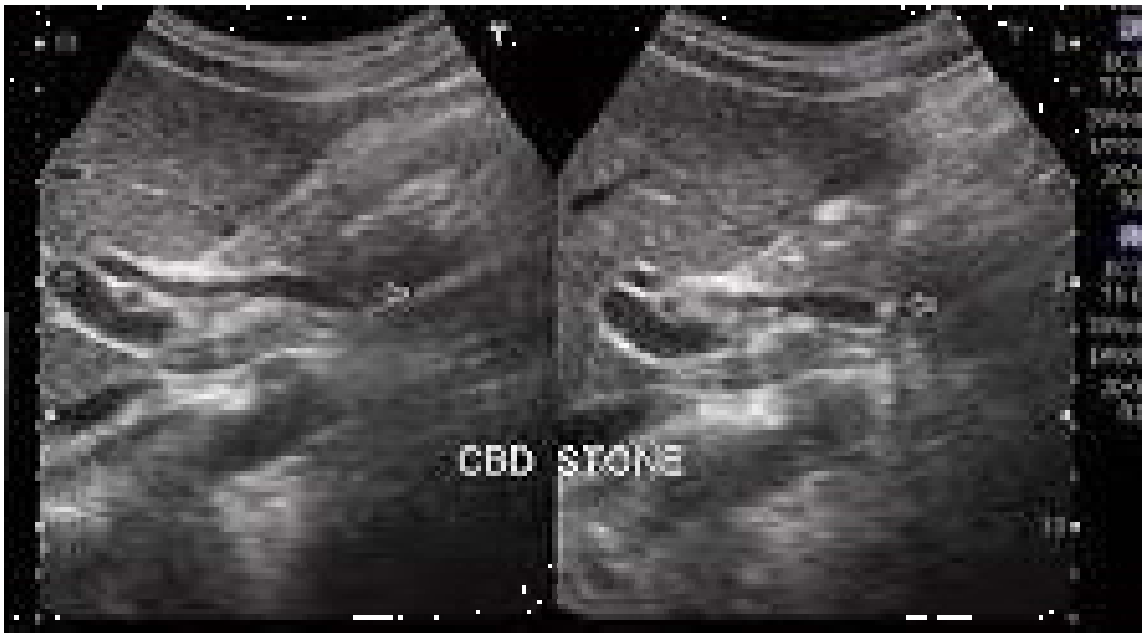

Image 6.2: U/S image for the same patient shows dilated CBD (10mm) with CBD stone.

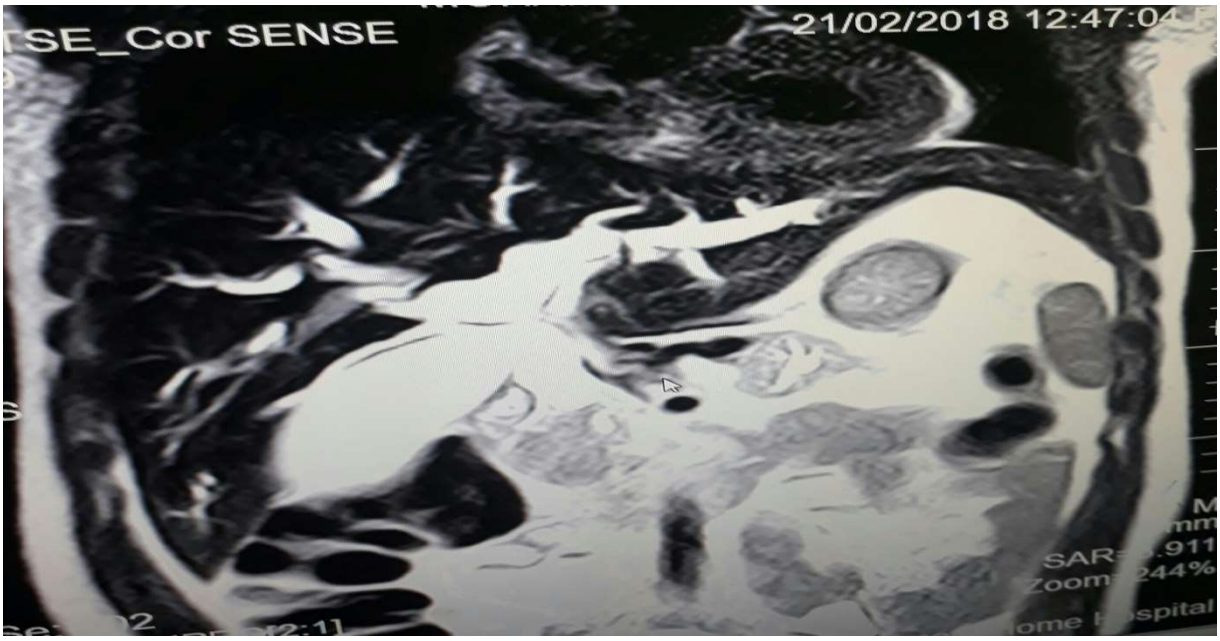

Image 7.1 : 71 years old female patient , SSFSE T2 MRCP image shows dilated CBD with CBD stone .

Image 7.2 : U/S image for the same patient shows dilated CBD (13mm) with CBD stone .

Image 8.1: 42 years old female patient, SSFSE T2MRCP Axial image shows dilated CBD

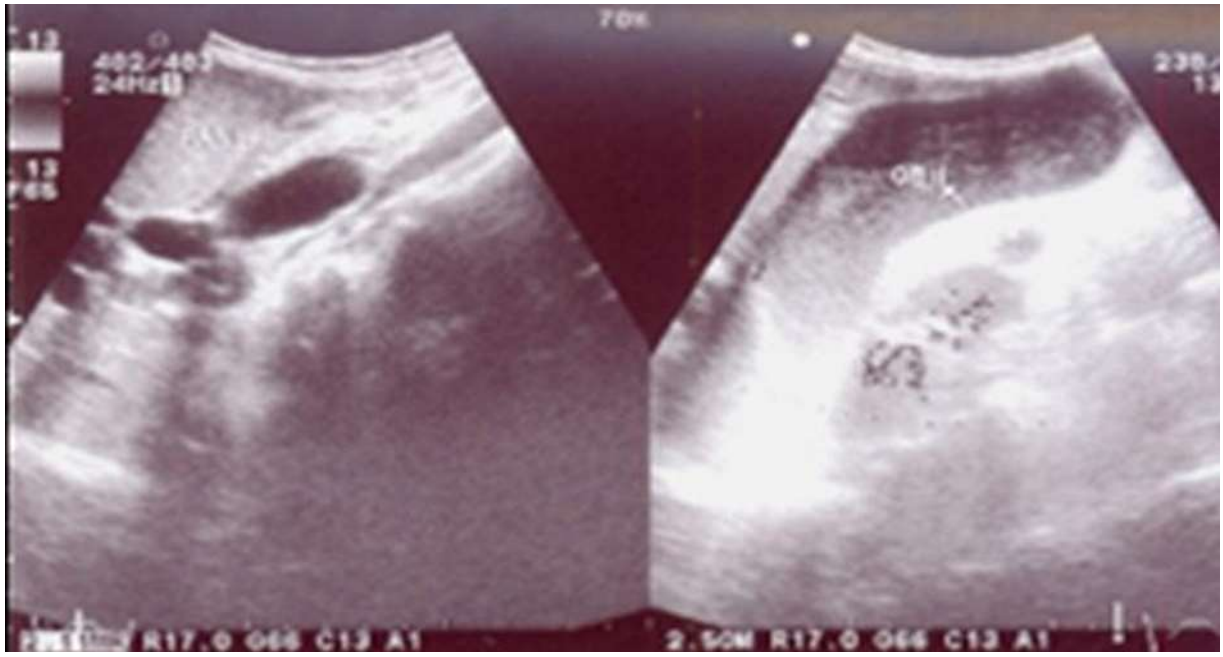

Image 8.2: U/S image for the same patient shows dilated CBD with CBD stone.

Image 9.1: 60 years old female patient, SSFSE T2MRCP image shows dilated CBD, withCBD stone.

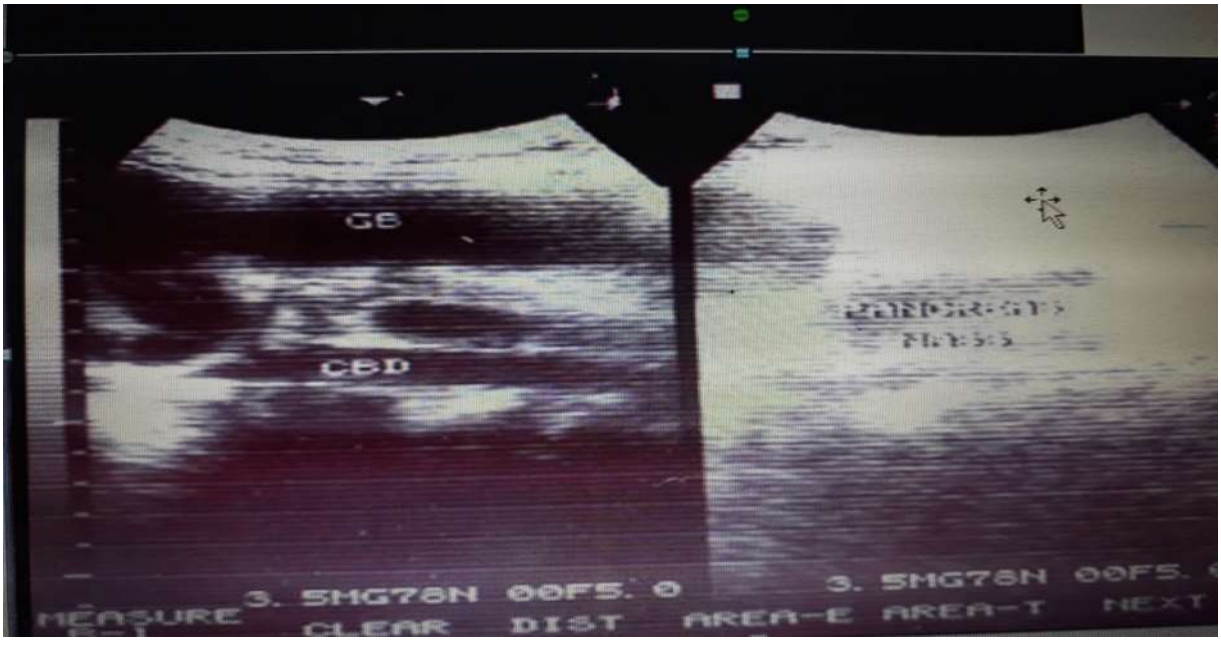

Image 9.2: U/S image for the same patient shows dilated CBD (11mm) with CBD stone.

Image 10.1: 55 years old female patient, SSFSE T2MRCP image shows dilated CBD, with CBD stone.

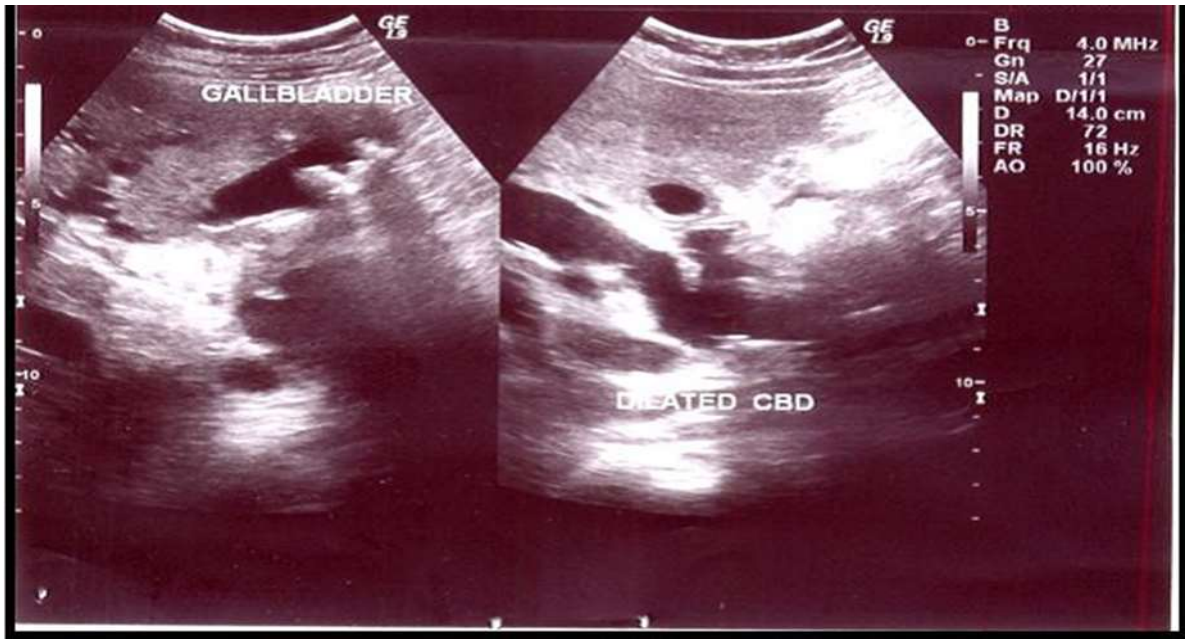

Image 10.2: U/S image of the same patient shows dilated CBD (12 mm) with CBD stone (2.5mm).

Image 11.1: 53 years old female patient, SSFSE T2MRCP image shows dilated CBD, withCBD stone.

Image 11.2: U/S image of the same patient shows dilated CBD (10mm) with CBD stone.