Sudan University of Science and Technology

College of Graduate Studies

A Study of Gall stones Causes in Omdoum Area using Ultrasonography

دراسة اسباب حصاوي المرارة في منطقة ام دوم باستخدام التصوير بالموجات فوق الصوتية

A Thesis Submitted for Partial Fulfillment for the Requirement of (M.Sc.) Degree in Medical Diagnostic Ultrasound

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الآية

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 the soul of my father and to my mother

To the soul of my brother and my sister

To my wife and my kids

Acknowledgement

My deepest appreciation and sincerest gratitude to my god for giving me a health to complete this thesis and still giving me more and more. To my colleagues

To the staff of M.Sc. degree of Ultrasound in Sudan university.

To all teachers, workers, tea makers, library staff, and anyone in this college for their cooperation and help.

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List of Abbreviations

AJOR……. American Journal of Roentgenology

AUS…….....Abdominal Ultra Sound.

CGS…….. .Cholesterol Gall Stone.

C.L.……... ...Cholelithiasis.

C.D.L.……...CholeDochoLithiasis.

C.B.D.……...Common Bile Duct.

CT…….....Coputed Tomography.

CP……... .....Contraceptive Pills.

ERCP……. Endoscopic Retrograde Cholangio Pancreatography

MGS…… .....Mixed Gall Stone.

MS…….....Multiple Stones.

MHz…….,,,,,Mega-Hertz.

(HOMA-IR)…… Homeostasis Model Assessment of insulin resistance

MS…….. ....Mixed Stones.

PGS……..... Pigment Gall Stone

PHC…….....Primary Health Center.

TAUS…….. ....Trans Abdominal Ultrasound.

SS ….....Single Stone.

GSD…….....Gall Stone Disease..

H……..... ....Height.

W…… ....Width.

US……....Ultrasound.

Abstract

This descriptive study was carried out in order to study the gall stones in Omdoum area. The study was conducted from July to November 2018. 64 patients were selected, their age ranged from 14 to 87 years; subjects with symptoms related to gall bladder pathologies were included. Trans-abdominal ultrasound scanning by 3.5 MHz probes was performed, and the maximum length, width, and anterior wall thickness and numbers of gall stones were obtained.

The results of the study revealed that the gall stones, increase in relation to increase in the patient's age and weight. Fat infiltration associated with obesity which predispose to cholesterol gall stones in some patients due to high level of cholesterol in their blood. Furthermore, the study found that the gall stones were affected by the parity, contraceptives pills users and family history. However there was no effect of diabetes on occurrence of gall stones. 19 cases showed single stone (29.7%) and 45 cases with multiple stones (70.3%). In addition the gallbladder wall thickness was significantly thicker in case of multiple stones.

Trans-abdominal ultrasound is a respectful approach, and should be used confidently in the diagnosis of gall stones and evaluation of the gall bladder pathologies among Sudanese.

المستخلص

أجريت هذه الدراسة الوصفية بغرض معرفة جصوات المرارة بمنطقة امدوم شرق النيل ولاية الخرطوم في الفترة من يوليو الي نوفمبر2018م. تم اخذ عدد 64 حاله عشوائية من عمر14 إلى 87 سنة بعد التأكد من معاناتهم من أعراض متعلقة بأمراض المرارة. تم فحصهم بالموجات فوق الصوتية علي الجزء الايمن العلوي للبطن باستخدام مسبار3.5 ميقا هيرتز, وبهذه الطريقة تم اكتشاف حصاوي المرارة وعددها وقياسات المرارة (الطول , العرض وسمك الجدار الامامي).

أظهرت الدراسة ان وجود حصوات المرارة في منطقة امدوم يزيد بزياده بعض العوامل المتعلقة بالشخص كالعمر والوزن و التاريخ المرضي للأسرة. ايضا اكتشفت الدراسة ان وجود الحصاوي المرارية تتعلق بدرجة خصوبة المراة واستخدام حبوب منع الحمل. وايضا السمنة وتشحم الكبد وارتفاع نسبة الكلوسترول في الدم وهى تتطابق مع مؤشرات الخطورة لحدوث حصوات المرارة ومع ذلك لم يكن هناك أي تأثيرلمرض السكري على ظهورحصاوي المرارة. أظهرت 19 حالة حصاوي أحادية (29.7٪) و45 حالة حصاوي متعددة (70.3٪). بالإضافة إلى أن سماكة جدارالمرارة كانت أكثرسمكًا في حالة الأحجارالمتعددة.

تعتبر الموجات فوق الصوتية وسيلة فعالة لذلك يجب ان تستخدم بثقة في تشخيص أمراض الحويصلة المرارية لدي السودانيين .

Chapter One

Introduction

Introduction

1.1 Introduction:

Gallstones are crystal-like deposits that form in the gallbladder. The stones may stay in the gallbladder and cause no symptoms, or they may irritate the gallbladder wall or block gallbladder ducts, resulting in infection, inflammation and upper abdominal pain. It is possible for the infection to spread to the liver or pancreas. Treatment can range from pain relief to surgery intervention.

Gallstones represent a significant burden for health care systems worldwide and are one of the most common disorders presenting to emergency room (Hung et al., 2011). It was once considered a disease of western world but due to changes in food pattern, now it is becoming an increasingly common cause of morbidity, leading to hospital admission in the developing world (Sachdeva et al., 2011). It is one of the most common disorders of gastrointestinal tract, affecting 10% people in western society (Gurusamy and Samraj, 2006). Its occurrence in Asian population ranges from approximately 3-15% and in Pakistan incidence is about 4% and 14.2% in males and females respectively (Channa et al., 2004).

Gallstones can occur anywhere within the biliary tree. They can occur due to the super saturation of bile, cholesterol precipitation, crystal formation, impaired gall-bladder function and impaired of entero-hepatic circulation of bile acids. There are various types of stones;mixed stones are cholesterol predominant, while black pigment stones consist of 7-10% calcium bilirubinate and brown pigment stones are formed as a result of infections which convert soluble bilirubin into insoluble state leading to formation of soft brown stones (Bortoff et al., 2000).

Ultrasonography is the procedure of choice in suspected gallstones or biliary diseases. It is the most sensitive, specific, non-invasive and inexpensive test for the detection of gallstones. Sensitivity is variable and dependent upon proficiency but in general it is highly specific and sensitive(>95% for stones <2 mm). A characteristic finding evaluated in ultrasound of gallbladder filled with stones is wall echo shadow sign. Due to high echogenicity of anterior wall of gallbladder, superficial stones are visible while deeper stones and posterior gallbladder wall are not visible (Bortoff et al., 2000). The goal of study was to evaluate the relationship of sonographic findings, hemolytic indices and liver function tests with gallstones.

1.2 Problem of the study:

There were a lot of gall bladder stones appears now aday in Omdoum area, so we need easily, cheap available accurate tools for study and characterization of it.

Gall stones puts the patients at risk of certain health problems during their life In addition there is more patients are expired during the last 10 years in Omdoum due to serious complications of gall stone and also there is a lack of knowledge about experimental information related to ultrasound findings regarding gall stone.

1.3 Objectives:

1.3.1 General objective:

The general objective of this study was **A Study of Gall stones Causes in Omdoum Area using Ultrasonography**

Specific Objectives:

- To add reference value for the sonographic findings in cholelithiasis.
- To identify the difference between indices in normal gall bladder and inflammed gall bladder and cholelithiasis
- To assess normal healthy gall bladder
- To explore the importance of ultrasound in cholelithiasis and reduction of complications.
- To create channels between the health services and community to decrease cholelithiasis regarding predisposing, precipitating and risk factors.
- To show the associated pathology related to gall stones.

1.4 Overview of the study:

This study was concerned with the presence of gall stones by using trans-abdominal ultrasound, accordingly it falls into five chapters: chapter one was an introduction which included: brief anatomy, the problem, the objectives of study and the overview. Chapter two included: detailed background about the anatomy, and sonogram of the gall bladder as well as the literature review. Chapter three deal with the materials and method used to conduct this study. Chapter four illustrated the results using figures and tables. And finally chapter five presented discussion, conclusion, and recommendations of the study followed by references and appendices.

Chapter Two

Theoretical Background and Literature review

Chapter Two

Theoretical Background and Literature review

2.1 Gall bladder anatomy:

2.1.1 Gall bladder development:

The gallbladder develops from an endodermal outpouching of the embryonic gut tube. Early in development; the human embryo has three germ layers and abuts an embryonic yolk sac. During the second week of embryogenesis, as the embryo grows, it begins to surround and envelop portions of this sac. The enveloped portions form the basis for the adult gastrointestinal tract. Sections of this foregut begin to differentiate into the organs of the gastrointestinal tract, such as the esophagus, stomach, and intestines(Aslam et al., 2013).

During the fourth week of embryological development, the stomach rotates. The stomach, originally lying in the midline of the embryo, rotates so that its body is on the left. This rotation also affects the part of the gastrointestinal tube immediately below the stomach, which will go on to become the duodenum. By the end of the fourth week, the developing duodenum begins to spout a small outpouching on its right side, the hepatic diverticulum, which will go on to become the biliary tree. Just below this is a second outpouching, known as the cystic diverticulum that will eventually develop into the gallbladder(Adkins et al., 2000).

2.1.2 Shape and location:

The gallbladder is a pear-shaped, hollow structure located under the liver and on the right side of the abdomen. The gallbladder is part of the biliary tract.

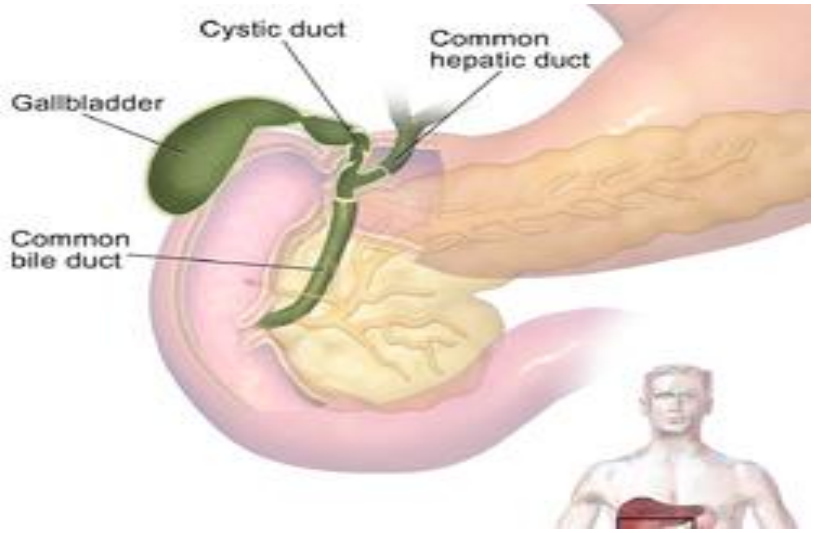

Figure 2-1 Anatomy of gall bladder

2.1.3 Structure of the gall bladder:

The gallbladder is a hollow organ that sits in a shallow depression below the right lobe of the liver that is grey-blue in life.In adults, the gallbladder measures approximately 7 to 10 centimeters (2.8 to 3.9 inches) in length and 4 centimeters (1.6 in) in diameter when fully distended.The gallbladder has a capacity of about 50 milliliters.The gallbladder is shaped like a pear, with its tip opening into the cystic duct.The gallbladder is divided into three sections: the fundus, body, and neck. The fundus is the rounded base, angled so that it faces the abdominal wall. The body lies in a depression in the surface of the lower liver. The neck tapers and is continuous with the cystic duct, part of the biliary tree.The gallbladder fossa, against which the fundus and body of the gallbladder lie, is found beneath the junction of hepatic segments IVB and V. The cystic duct unites with the common hepatic duct to become the common bile duct. At the junction of the neck of the gallbladder and the cystic duct, there is an out-pouching of the gallbladder

wall forming amucosal fold known as "Hartmann's pouch"(Jones and Bhimji, 2018).

2.1.4 Variation

The gallbladder varies in size, shape, and position between different people.rarely, two or even three gallbladders may coexist, either as separate bladders draining into the cystic duct, or sharing a common branch that drains into the cystic duct. Additionally, the gallbladder may fail to form at all. Gallbladders with two lobes separated by a septum may also exist. These abnormalities are not likely to affect function and are generally asymptomatic.The location of the gallbladder in relation to the liver may also vary, with documented variants including gallbladders found within, above, on the left side of, behind, and detached or suspended from the liver. Such variants are very rare(Higashiyama et al., 2018).

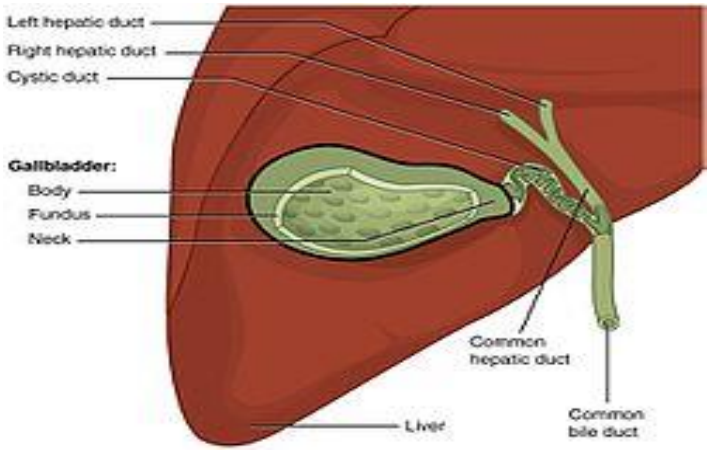

Figure 2.2 location of the gallbladder

2.1.5 Relations of the gall bladder:

The gall bladder is entirely surrounded by peritoneum and is in direct relation to the visceral surface of the liver. It lies in close proximity to the following structures. Anteriorly and superiorly inferior board of the liver and the anterior abdominal wall.Posteriorly transverse colon and proximal duodenum inferiorly biliary tree and the remaining parts of the duodenum(Jones and Bhimji, 2018).

2.1.6 Blood Supply:

The liver is unique among organs in that it receives blood via two distinct circulatory routes: systemic circulation and hepatic portal circulation. Each of these routes provides blood of differing compositions that allow the liver to perform its unique and vital digestive and metabolic functions. The celiac trunk branches from the abdominal aorta and splits into three major branches, one of which, the common hepatic artery, supplies blood to the liver and gallbladder along with the stomach, small intestine, and pancreas. The common hepatic artery further divides into three more branches, with the proper hepatic artery supplying blood to the liver, gallbladder, and part of the stomach. As the right hepatic artery approaches the gallbladder, it branches off to form the cystic artery, which supplies the gallbladder and cystic duct with oxygenated blood. These arteries further branch off into many smaller arteries and arterioles and, finally, capillaries to provide oxygen and nutrients to all of the tissues of the liver and gallbladder(Yi et al., 2007).

2.1.7 Venous drainage of the gall bladder:

When present the cystic vein drains the blood from the gall-bladder, and, accompanying the cystic duct, usually ends in the right branch of the portal vein. It is usually not present, and the blood drains via small veins in the gall-bladder bed directly to the parenchyma of the live(Yi et al., 2007).

2.1.8 Lymphatic drainage of the gall bladder:

Lymph from the gall bladder drains into the cystic lymph nodes situated at the bladder neck the cystic nodes then empty into the hepatic lymph nodes and ultimately the coeliac lymph nodes(Tebala et al., 2004).

2.1.9 Nerve supply:

The gall bladder and cystic duct receive innervation from the following three nerves. The right phrenic nerve conveys sensory information. The hepatic branch of the right vagus nerve provides parasympathetic innervation. The celiac plexus provides sympathetic innervation(Mann et al., 2009).

2.2 Physiology of the Gall bladder:

The main purpose of the gallbladder is to store bile, needed for the digestion of fats in food. Produced by the liver, bile flows through small vessels into the larger hepatic ducts and ultimately through the cystic duct (parts of the biliary tree) into the gallbladder, where it is stored. At any one time, 30 to 60 milliliters of bile is stored within the gallbladder. The bile emulsifies fats in partly digested food, thereby assisting their absorption. Bile consists primarily of water and bile salts, and also acts as a means of eliminating bilirubin, a product of hemoglobin . During gallbladder storage of bile, it is concentrated 3-10 fold by removal of some water and electrolytes(Jones and Bhimji, 2018).

2-3Pathology of gall bladder Gallstones :

The gallbladder is part of the digestive system. It is a pear-shaped, sac-like structure approximately 8 cm long and 2.5 cm wide located alongside the stomach and attached to the lower surface of the liver. The function of the gallbladder is to concentrate, store, and excrete bile. Bile has several components including cholesterol, bile salts, and bile pigments(eg: bilirubin). These chemicals can crystallize and form stones. The two main types of gallstones are: Cholesterol gallstones and Pigment gallstones(Lian et al., 2017).

Figure 2.3 numerous small gallstones made up largely of cholesterol

2-3-1 Cholesterol gallstones

The amount of cholesterol that can dissolve in bile depends on how much bile salt it contains. Too much cholesterol, or too little bile salt, tends to cause gallstones to form in the gallbladder. Approximately 80% of all gallstones are cholesterol stones(Lian et al., 2017).

2-3-2 Pigment gallstones

These are formed by calcium and bilirubin and account for approximately 20% of all gallstones. Pigment stones tend to form in patients with certain blood or liver disorders. The presence of gallstones in the gallbladder is known as cholelithiasis; gallstones in the bile duct are referred to as choledocholithiasis; infection and inflammation of the gallbladder is known as cholecystitis(Helmberger et al., 2001).

2-3-3 Causes of gall stones

The risk of developing gallstones tends to increase with age. Gender is also a factor, as women develop gallstones more commonly than men and at a younger age. And heredity appears to play a part in the development of gallstones as there is frequently a family history of the disease. Other factors that increase the risk of developing gallstones include; Being overweight – particularly when the extra weight is carried around the waist, Eating a high-fat, low-fiber diet, Having diabetes, Having high blood cholesterol levels, Heavy drinking and Smoking. As pregnancy and contraceptive pills can slow down gallbladder activity, women who have had multiple pregnancies or long-term contraceptive pill use are at higher risk of developing gallstones(Kharitonov et al., 2018).

2-3-4 Signs and symptoms of gall stones

Gallstones vary greatly in size. Some people may form one large stone, whereas others may have hundreds of tiny stones. Most commonly, gallstones are 5–10 mm in diameter. Most people with gallstones do not experience any symptoms. If symptoms are present, the most common early sign of gallstones is upper abdominal pain. This pain usually occurs in the

upper right side of the abdomen, is often severe, and may radiate to the chest, back, or the area between the shoulders. Other symptoms that may occur include , Indigestion_ ,Nausea or vomiting, Jaundice ,Light-coloured stools.

Symptoms can occur suddenly and may be referred to as biliary colic. This type of pain is commonly set off by eating fatty foods and often occurs in the middle of the night. The symptoms experienced may be so severe that people need to seek immediate medical attention. When infection of the gallbladder is present it is possible to also experience low-grade fever, sweats, and chills(Bale et al., 2018).

2-4 Investigation done For GB Stones

2-4-1 Laboratory Investigatios

2-4- 1-1 Liver Investigations

2-4-2 Radiological Investigations

2-4-2-1 Plain Xray

2-4-2-2 CT

2-4-2-3 MRI

2-4-5 Ultrasound physic

2-4-5-1 Ultra sound Technique

2-4-5-2 Normal Sonographic Appearance

2-4-6 Diagnosis of gall stones:

The most common test used to definitively diagnose gallstones is an abdominal ultrasound scan to create pictures of the gallbladder, which are then analyzed to look for signs of gallstones. If it is suspected that gallstones are blocking the ducts, then a test called endoscopic retrograde cholangiopancreatography (ERCP) may be performed(Borel et al., 2018).

2-4-7 - Gall bladder sonogram:

Now a day's gall bladder Sonography is a frequently used imaging modality to detect its abnormalities, pathologies. From this point of view here is some information about the normal appearance, different sonographic techniques, in addition to gall bladder biopsy(Zironi et al., 2007).

2-5-1Normal appearance: In relation to the normal sonographic appearance Biliary system diseases are a common pathology in medical practice. A frequent situation in everyday practice is a patient with pain in the right upper quadrant, in which the suspicion of biliary disease is the first diagnosis to confirm or exclude. Ultrasound is a reliable method for the evaluation of the biliary system and is the first method of choice when a biliary disease is suspected. Ideally a correct examination of the gallbladder and the biliary tree is performed on fasting patients. The gallbladder is evaluated by means of right subcostal oblique sections while for the hilum evaluation sections perpendicular on the ribs is used. The structures are assessed regarding their size, wall thickness and content(Zago et al., 2016).

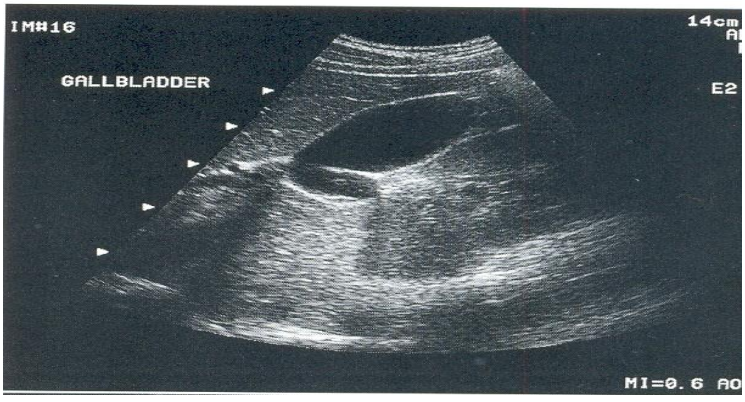

Figure 2-4sonographic appearance of the gallbladder

2-5-2 Gall stones appearance:

Ultrasound is considered the gold standard for detecting gallstones, grey scale ultrasound revealed highly reflective echogenic focus within

gallbladder lumen, normally with prominent posterior acoustic shadowing regardless of pathological type (acoustic shadowing is independent of the composition and calcium content), gravity-dependent movement is often seen with a change of patient position (the rolling stone sign)(Shen et al., 2015).

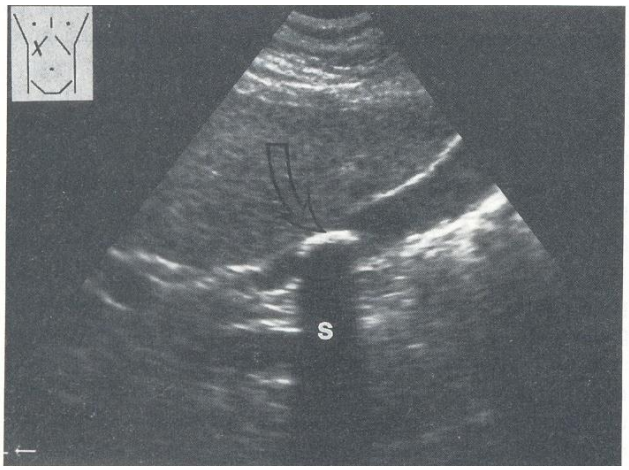

Figure 2.5 sonographic appearance of gallstone

2-6 Previous studies:

Astudy was carried out by (Attalla et al., 2013) to determine the Outcome of cholelithiasis in Sudanese children with Sickle Cell Anaemia (SCA) after 13 years follow-up**,** the study aim to determine the prevalence and outcome of children with SCA complicated with gallstones treated at the sickle cell clinic at the children emergency hospital Khartoum state.

261 patients age 4 months to 16 years were studied. Abdominal US examination was carried out. The 30 patients in whom gall stones were detected followed prospectively from June 1996 to September 2009 when a second AUS examination was obtained. Gall stones occurred in 30 patients. The overall prevalence of cholelithiasis was 11.5% and it increased with age. The youngest patient with cholelithiasis was 2 1/2 years old.

All the patients were asymptomatic at the time of diagnosis.

The sample included 165 (63%) males and 96(37%) An initial abdominal ultrasound reported that gall stones occurred in 30 patients (18 boys, 12girls). The findings were multiple gall stones with thick bladder wall. The overall frequency of cholelithiasis was 11.5%. The frequency of gallstones increased with age.

There was no significant sex difference in patients with gall stones Hematological data showed no significant difference between patients with and without gall stones. The prevalence of cholelithiasis in Sudanese children and adolescents with SCA was significant.

The large majority patients remained asymptomatic over a long period(Attalla et al., 2013).

Another study conducted by (Idris et al., 2013) to identify the Prevalence of Different Types of Gallstone in Relation to Age in Sudan**.** The objective was to evaluate the relationship between age as a risk factor and gallstones in local population.

A cross-sectional study was conducted in Khartoum teaching hospital during the period from January 2010 to December 2011 included all cholecystectomized patient.

The stones were divided into 3 groups depending upon their colours: pale yellow and whitish stones as cholesterol calculi, black and blackish brown as pigment calculi and brownish yellow or greenish with laminated features as mixed calculi.

The collected data was handled statistically using SPSS .

The study included 94 patients (6 (6.4%) males and 88 (93.6%) females The majority of patients were from the age group 31-50 years (64 patients

The pigment calculi were the commonest as found in 48 (51.07%) patients. The highest incidence of gallstones was found in age group 41-50 and 31-40 years in 43.6% and 24.5% respectively.

From the study it can be concluded that age appears to have an effect on the incidence of gallstone disease.

The incidence is four times higher in women than in men.

Gallstone disease before 20 years of age is a rare occurrence.

The increased incidence of gallstones with age is seen across all ethnic. Gallstones (GS) are seen in all age groups but the incidence increases with every decade of life and they were found to be most prevalent in 4th and 5th decade of life.

Pigment and cholesterol stones were predominantly found in the age group 41-50 years.

Whereas, mixed stones were mainly found in 31-40 and 41-50 age groups. Cholesterol stones were not found in young aged (<30 years) and elder (>70 years) patients.

Incidence of gallstones was found many folds higher in females as compared to males and this increase was more in middle age groups.

Reason for this increment is well understood now and it is due to elevated estrogen levels, which increase cholesterol excretion in bile by causing its super saturation with cholesterol(Idris et al., 2013).

In industrialized western countries gallstones are of three varieties; most commonly they are composed of cholesterol followed by pigment and mixed stones. The pigment calculi were the commonest gallstones, and it occurs mainly in the age group of 41-50 years, followed by MS then CS, these findings were in accordance with study in Libya.

The differences observed between nations may be attributed to different dietary conditions and habitats and different socio-economic status of the people.

Although the dominancy of pigment stones in the study may be explained by the high incidence of tropical diseases especially malaria as it is one of the major factors causing pigment stones that precipitate increased production of bilirubin. Another factor that augments increased production of bilirubin is stasis of bile flow that predisposes to infection, and subsequently to pigment stone formation(Reshetnyak, 2012).

Another study concern with Extensive Quantitative Analysis of Gallstones. The aim was to determine the composition of gallstones in a Sudanese population. It describes an extensive quantitative analysis of gallstones from patients presented with symptomatic gall stone disease and treated by cholecystectomy after the acceptance of the pre-given informed consent in

Khartoum teaching hospital in the period between Jan 2010 and Dec 2010. Data are analyzed from 94 patients (six males and 88 females). Cholesterol stones showed significantly higher cholesterol content than pigment stones though not significantly higher than mixed stones.

Their phospholipids content and inorganic phosphates were higher than in the other types of stones and oxalate content was significantly elevated in comparison with mixed stones. In mixed stones, the cholesterol, bile acids, and bilirubin were intermediate between cholesterol and pigment stones, whereas triglycerides were significantly more than pigment stones. Bilirubin and bile acids were significantly higher than cholesterol stones. However, they contained the lowest amounts of sodium, potassium, magnesium, and oxalate. In pigment stones, bilirubin was significantly higher than both groups. (Idris et al., 2014).

Another study concentrate on the role of Oral contraceptives and the risk of gallbladder disease: a comparative safety study. Recent concerns have been raised about the risk of gallbladder disease associated with the use of drospirenone, a fourth-generation progestin used in oral contraceptives. Study conducted to determine the magnitude of this risk compared with other formulations of oral contraceptives. Study included women who were using an oral contraceptive containing ethinyl estradiol combined with a progestin during 1997–2009.

Both estrogen and progesterone have been shown to play an important role in the formation of gallstones. So women using oral contraceptives have been found to be at increased risk of gallbladder disease compared with women not using oral contraceptives

. Estrogen has been shown to increase cholesterol production in the liver, with excess amounts precipitating in bile and leading to the formation of gallstones. Progesterone has been shown to decrease gall-bladder motility, which impedes bile flow and leads to gallstone formation(Etminan et al., 2011).

Chapter Three

Materials and Method

Chapter Three

Materials and Method

3.1 Materials:

3.1.1 Subjects:

This is a descriptive prospective study, carried out in order to study the gall stones in Omdoum Area. This study was conducted in Omdoum area from July – to November 2018. 64 patients whom came for abdominal Ultrasound scans, they were suffering from symptoms related to gall bladder diseases. Patients who were not resident in Omdoum, visitors and patients refused to be a candidate of study were excluded.

3.1.2 Machines used:

Ultrasound machines: Mindray DP10 made in china, with two probes, with full US department facilities. Moreover measurement equipment for the patient's weight was used.

3.2 Method:

3.2.1 Technique used:

Patients were evaluated in the supine position but can be positioned in the upright, standing, or left lateral decubitus positions for improved visualization. Male patients should have their entire right hemithorax exposed for the examination. Take care with female patients to drape appropriately and to minimize exposure of sensitive areas. Pain management should not be delayed and patients may experience some discomfort due to probe pressure.

Patients were scanned following overnight fast using ultrasound scanner with 3.5 MHz curvilinear probe. Subjects fasted overnight to reduce gastric and intestinal bowel gas and also for adequate distension of the GB. With the patient in supine position coupling gel was applied to the abdomen (right upper quadrant). The stomach and duodenum were checked for presence of food particles and fluid so as to ensure patient complied with the directive of fasting overnight.

3.2.4 Measurements:

GB measurements (cm) were taken with the probe placed in the right hypochondrium, in midclavicular line and angled cephalad in both longitudinal and transverse planes. Maximal longitudinal and transverse measurements were taken. The length (L) and gallbladder wall thickness (GBWT) were taken in the longitudinal plane on arrested respiration, while the width (W) and height (H) were taken in the transverse plane after the probe was rotated through 90° from the longitudinal view to obtain maximal transverse view. Gallbladder volume (GBV) (cm^3) was then calculated using the prolate ellipsoid formula ($L \times H \times W \times 0.523$)

3.2.5 Data collection method:

The data of this thesis is collected by using special data collection sheet, designed for collecting data from selected individuals whom they are fulfill certain criteria which contains twenty eight variables, divided into four parts personal data, local findings, and sonographic findings and laboratory findings. These data were collected in the following ways

The personal data consists of nine variables: patient's index, sex, age, weight, occupation. Family history, birth control, diabetes, hematological disease was picked up from the patient by direct questions (after taking permission). After completing the scan local findings were registered mass,

pain, tenderness and murphy sign. Also the sonographic findings data includes gall bladder wall thickness, gall bladder long axis and short axis stone, debris echoes, pericholecystic fluid collection, sonolucent layer, fatty liver, hepatomegaly and splenomegaly.

The patients then send to the laboratory to do investigation which includes hemoglobin, total white count, creatinine level and blood urea and a nurse complete the other variable which is the weight by using equipment that measures the weight automatically when the patient stands on it.

3.2.6 Data analysis:

The data was analyzed using Statistical Packaged for Social Studies (SPSS) version 20. Mean and standard deviation were used for continuous data and percentage and frequency were calculated for categorical data. All the percentages and frequencies were calculated by considering (n = 64).

3.2.7 Ethical Issues:

Verbal permissions were taken from the patients before doing scans, and they were informed about the study, and accept it. Also the patients get sure that their details will not be exposed. Before that verbal permissions were also taken from the head mangers of the hospital, and health center where the study is conducted.

Chapter Four

Results

Chapter Four

Results

Table 4.1 Gender distribution

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	5	7.8	7.8	7.8
	Female	59	92.2	92.2	100.0
	Total	64	100.0	100.0	

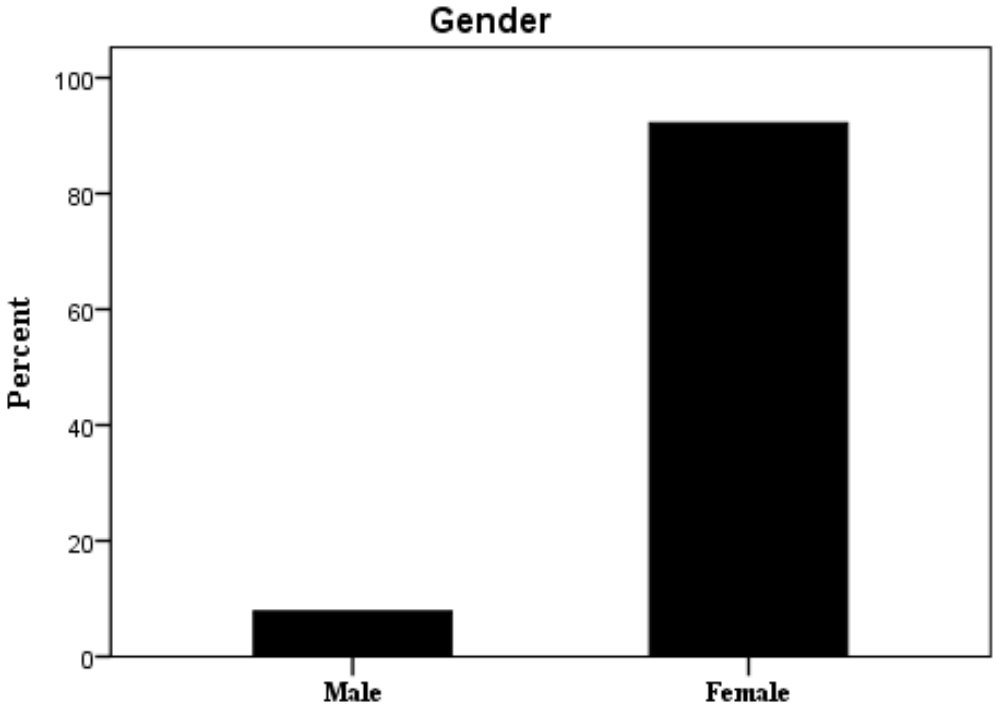

Figure (4-1): shows bar graph displaying frequency distribution of gender.

Table 4.2 OCCUPATIONS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Housewife	57	89.1	89.1	89.1
	Student	2	3.1	3.1	92.2
	Farmer	1	1.6	1.6	93.8
	Teacher	3	4.7	4.7	98.4
	Driver	1	1.6	1.6	100.0
	Total	64	100.0	100.0	

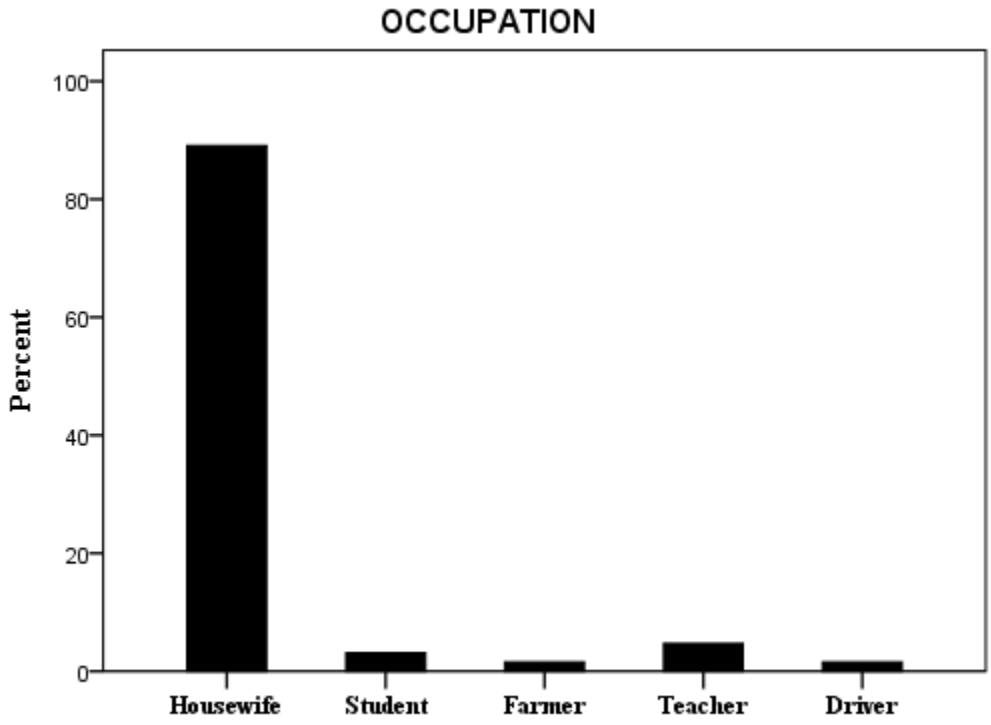

Figure (4-2): shows bar graph displaying frequency distribution of occupation.

Table 4.3 Family History

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	28	43.8	43.8	43.8
	No	36	56.3	56.3	100.0
	Total	64	100.0	100.0	

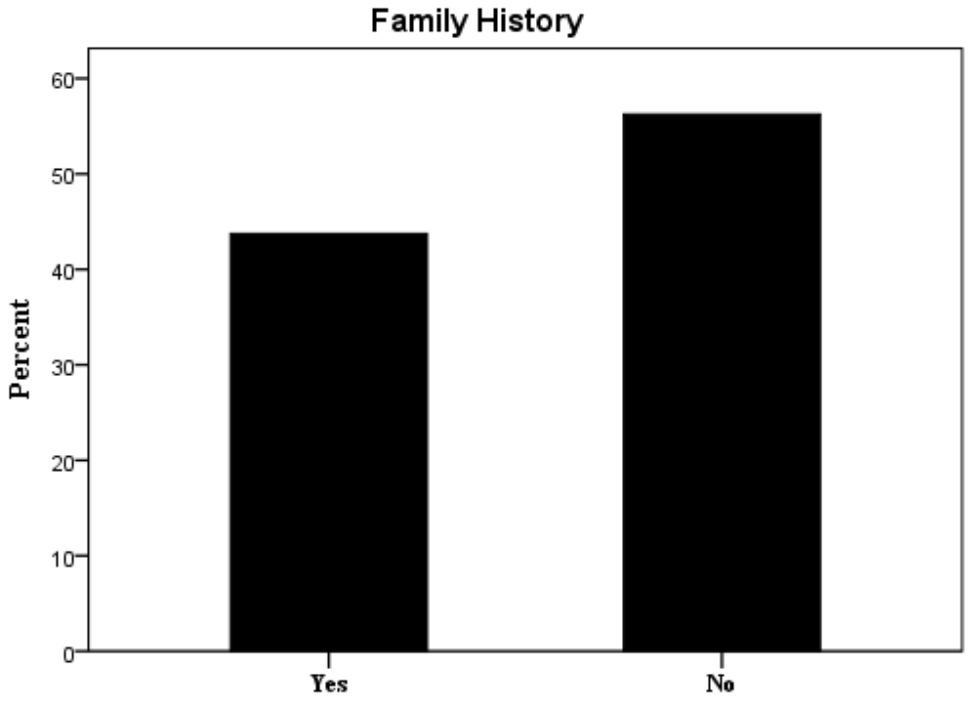

Figure (4-3): shows bar graph displaying frequency distribution related to family history.

Table 4.4 Usage of Contraceptive

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	41	64.1	64.1	64.1
	No	23	35.9	35.9	100.0
	Total	64	100.0	100.0	

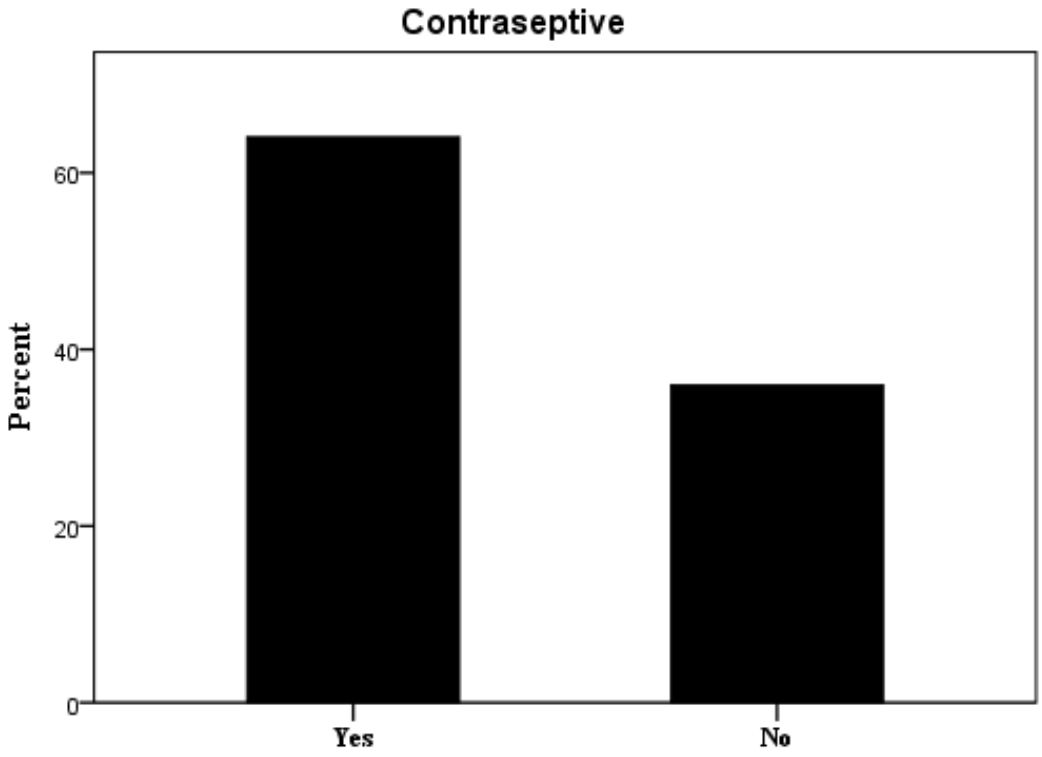

Figure (4-4): shows bar graph displaying frequency distribution of contraception.

Table 4.5 distribution of Diabetes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	15	23.4	23.4	23.4
	No	49	76.6	76.6	100.0
	Total	64	100.0	100.0	

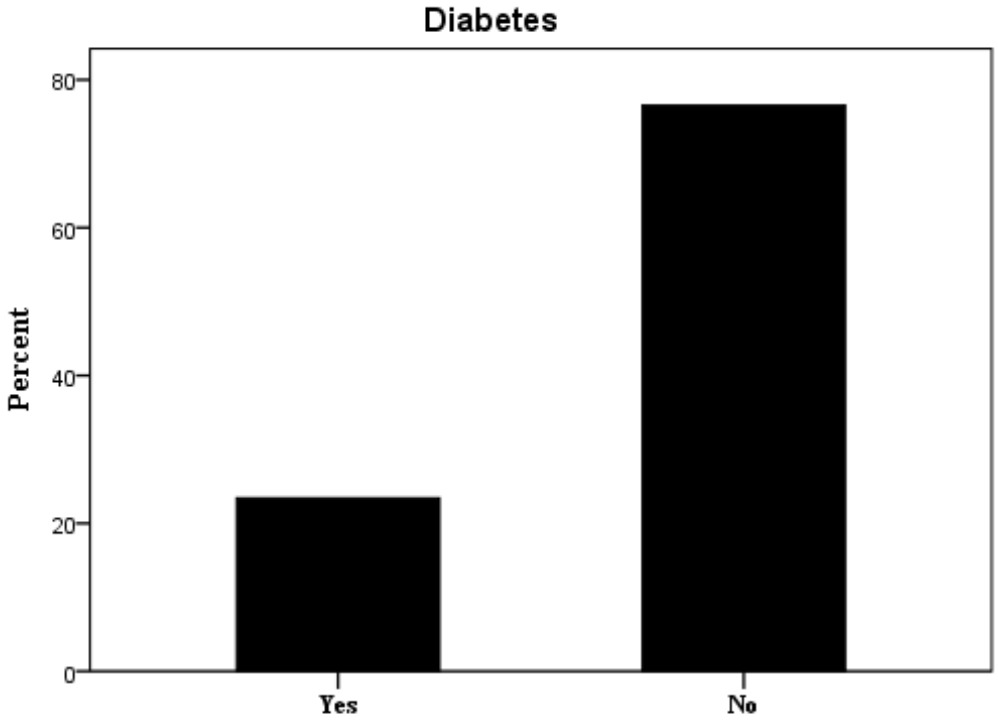

Figure (4-5): shows bar graph displaying frequency distribution of diabetes.

Table 4.6 Hematological Disorders

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	4	6.3	6.3	6.3
	No	60	93.8	93.8	100.0
	Total	64	100.0	100.0	

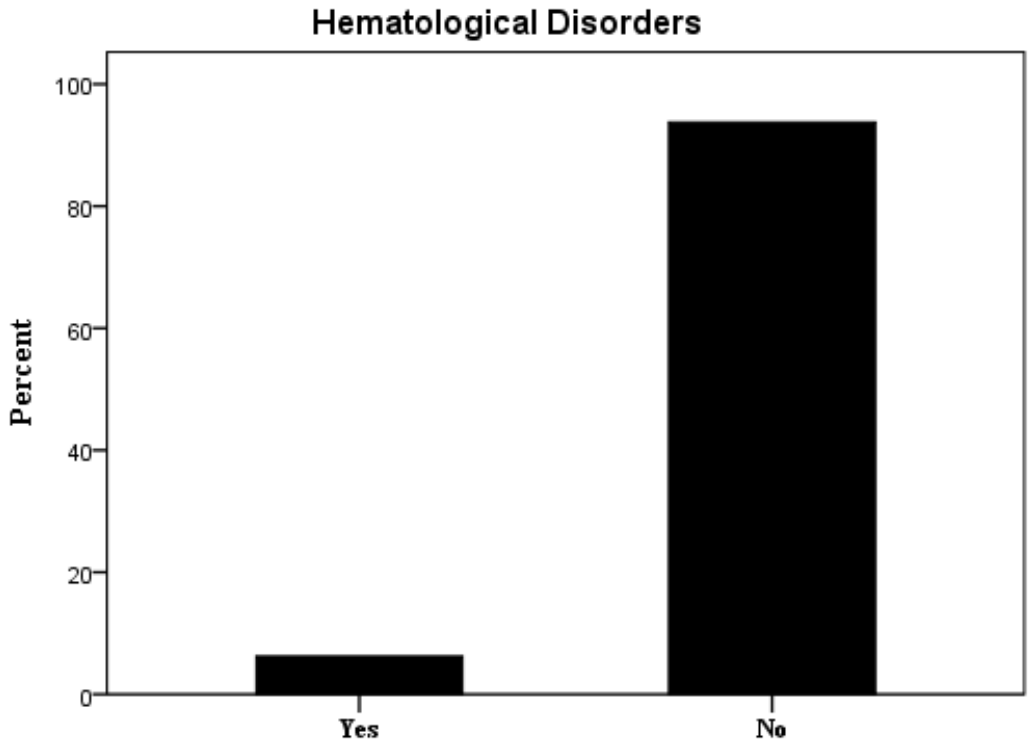

Figure (4-6): shows bar graph displaying frequency distribution of hematological disorders.

Table 4.7 presence of MASS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	1	1.6	1.6	1.6
	No	63	98.4	98.4	100.0
	Total	64	100.0	100.0	

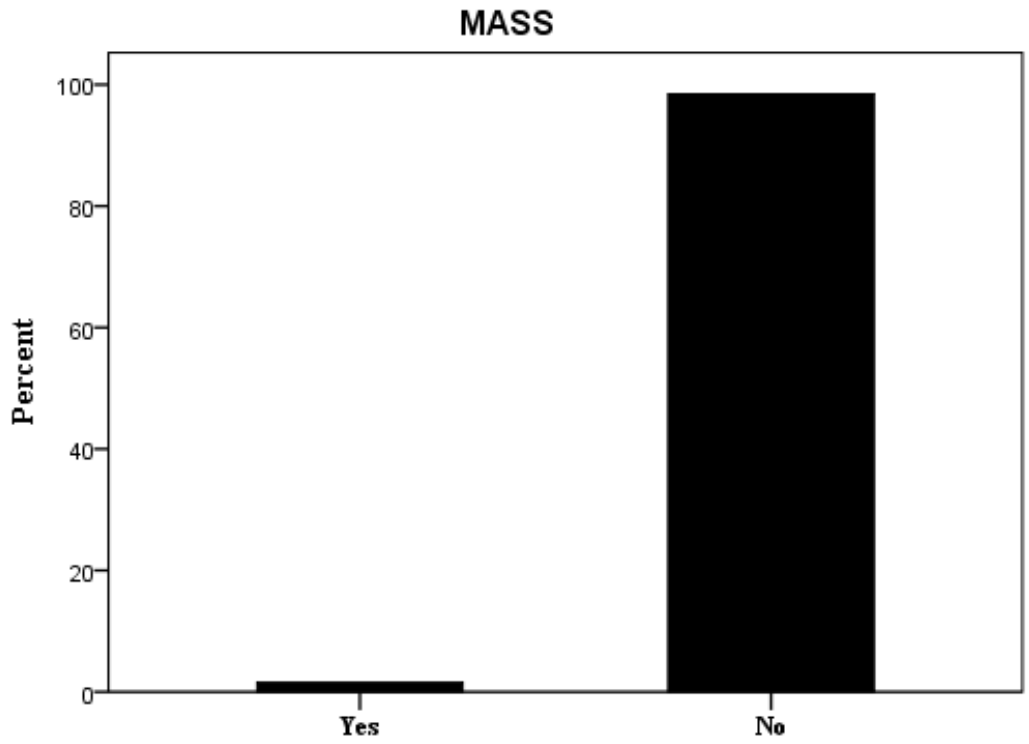

Figure (4-6): shows bar graph displaying frequency distribution of mass.

Table 4.8 presence of PAIN

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	59	92.2	92.2	92.2
	No	5	7.8	7.8	100.0
	Total	64	100.0	100.0	

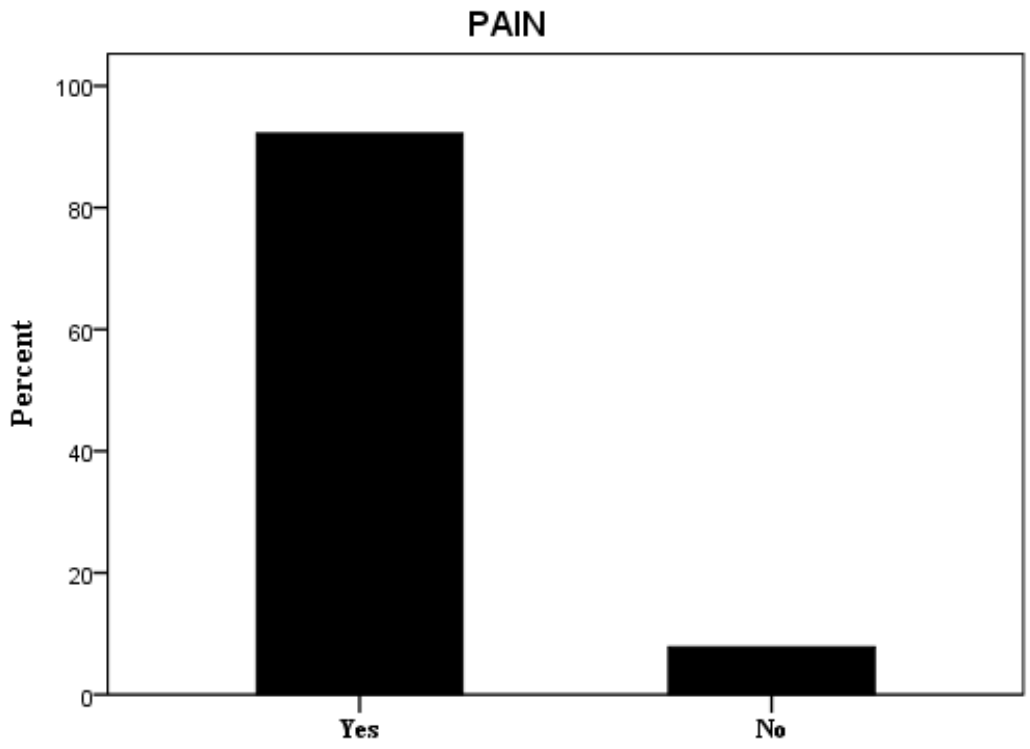

Figure (4-7): shows bar graph displaying frequency distribution of pain.

Table 4.9 Tenderness					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	58	90.6	90.6	90.6
	No	6	9.4	9.4	100.0
	Total	64	100.0	100.0	

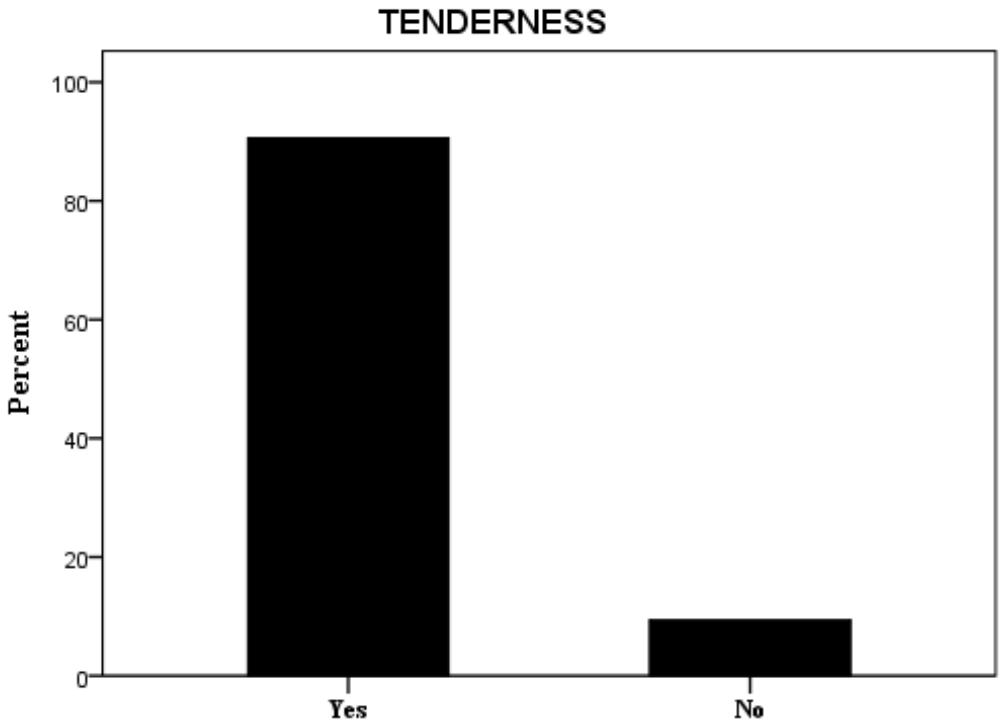

Figure (4-8): shows bar graph displaying frequency distribution of tenderness.

Table 4.10 distribution Murphy Sign

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	36	56.3	56.3	56.3
	No	28	43.8	43.8	100.0
	Total	64	100.0	100.0	

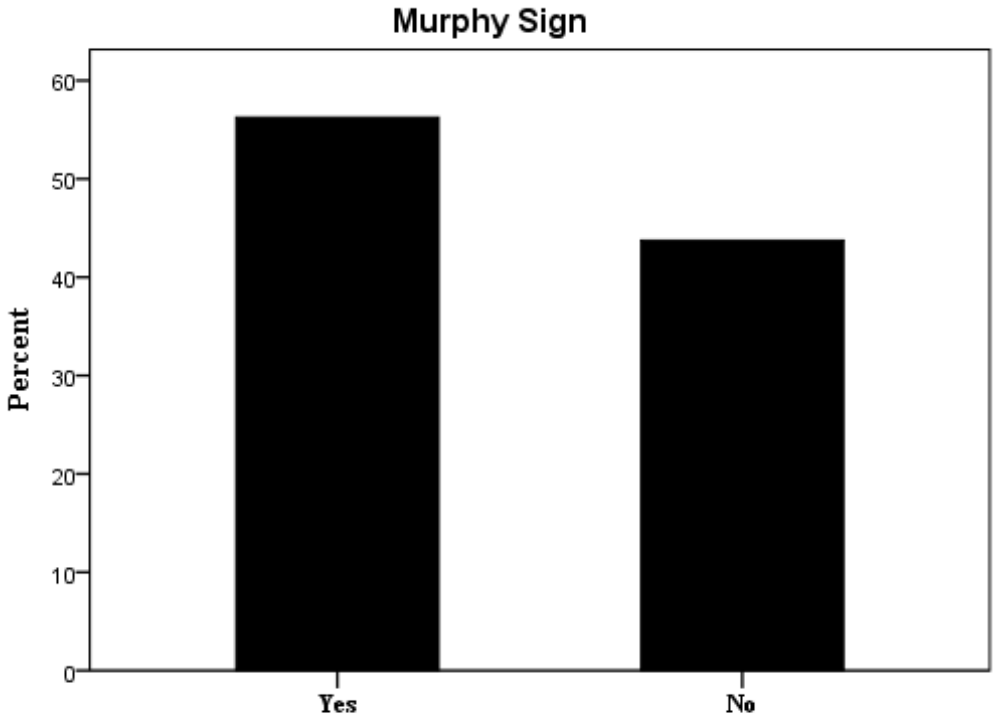

Figure (4-9): shows bar graph displaying frequency distribution of murphy sign.

Table 4.11DEBRIS ECHO

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	42	65.6	65.6	65.6
	No	22	34.4	34.4	100.0
	Total	64	100.0	100.0	

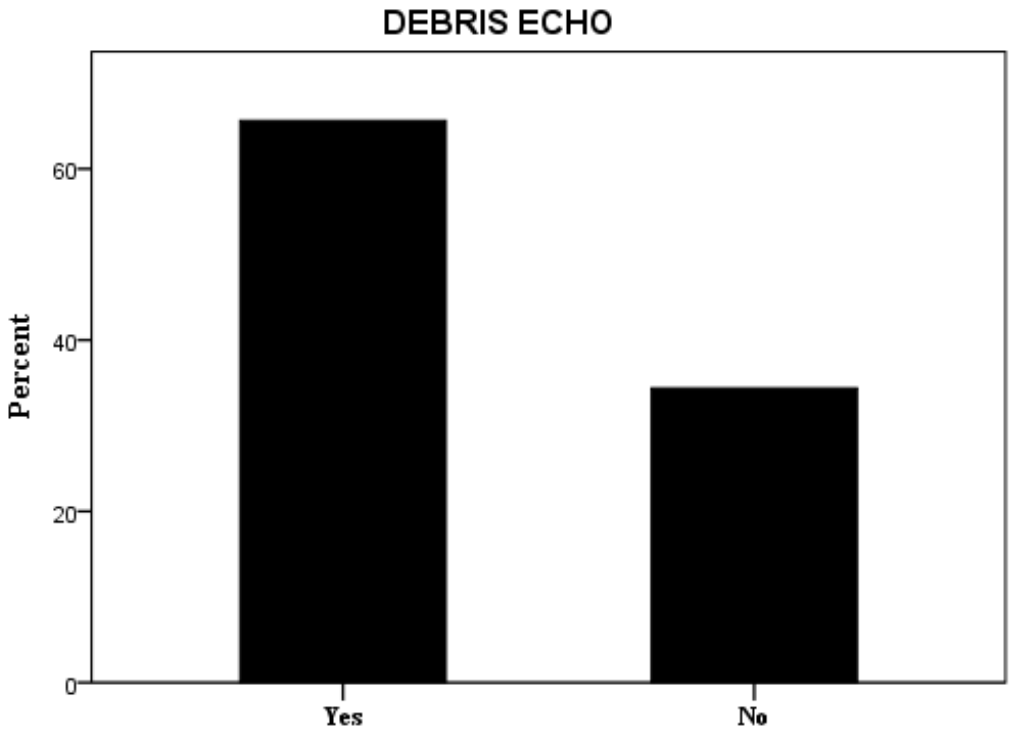

Figure (4-10): shows bar graph displaying frequency distribution of debris echo.

Table 4.12Fluid Collection					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	32	50.0	50.0	50.0
	No	32	50.0	50.0	100.0
	Total	64	100.0	100.0	

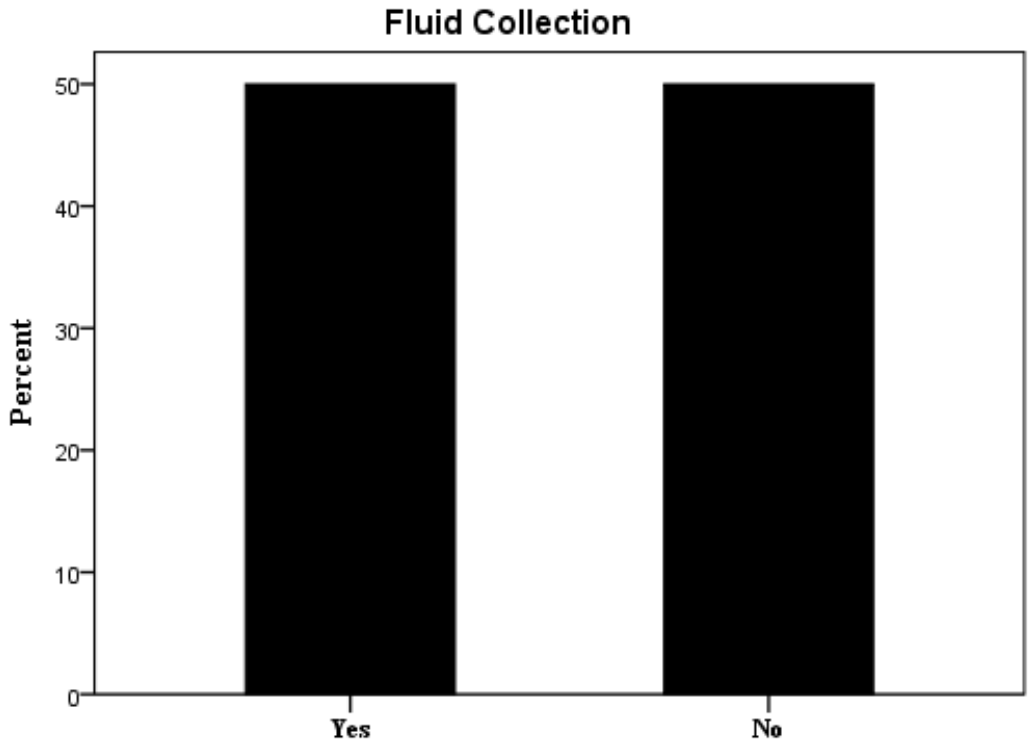

Figure (4-11): shows bar graph displaying frequency distribution of fluid collection.

Table 4.13Sonolucent Layer					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	32	50.0	50.0	50.0
	No	32	50.0	50.0	100.0
	Total	64	100.0	100.0	

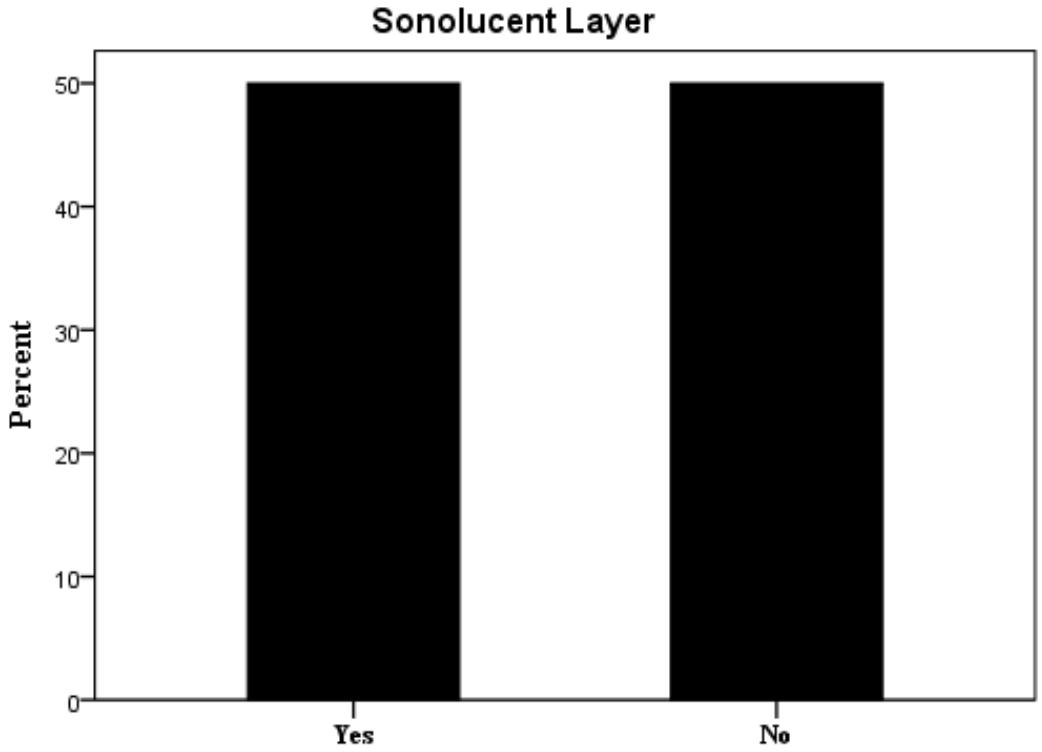

Figure (4-12): shows bar graph displaying frequency distribution of sonolucent layer.

Table 4.14 FATTY LIVER					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	30	46.9	46.9	46.9
	No	34	53.1	53.1	100.0
	Total	64	100.0	100.0	

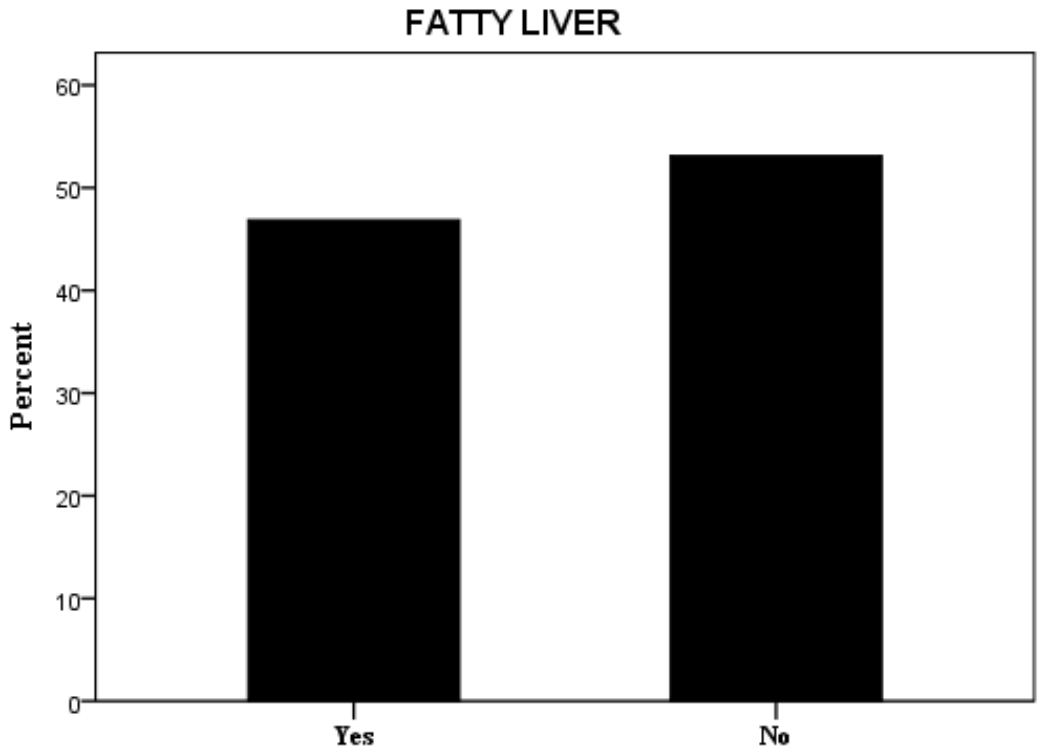

Figure (4-13): shows bar graph displaying frequency distribution of fatty liver.

Table 4.15 Frequency of Hepatomegaly					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	4	6.3	6.3	6.3
	No	60	93.8	93.8	100.0
	Total	64	100.0	100.0	

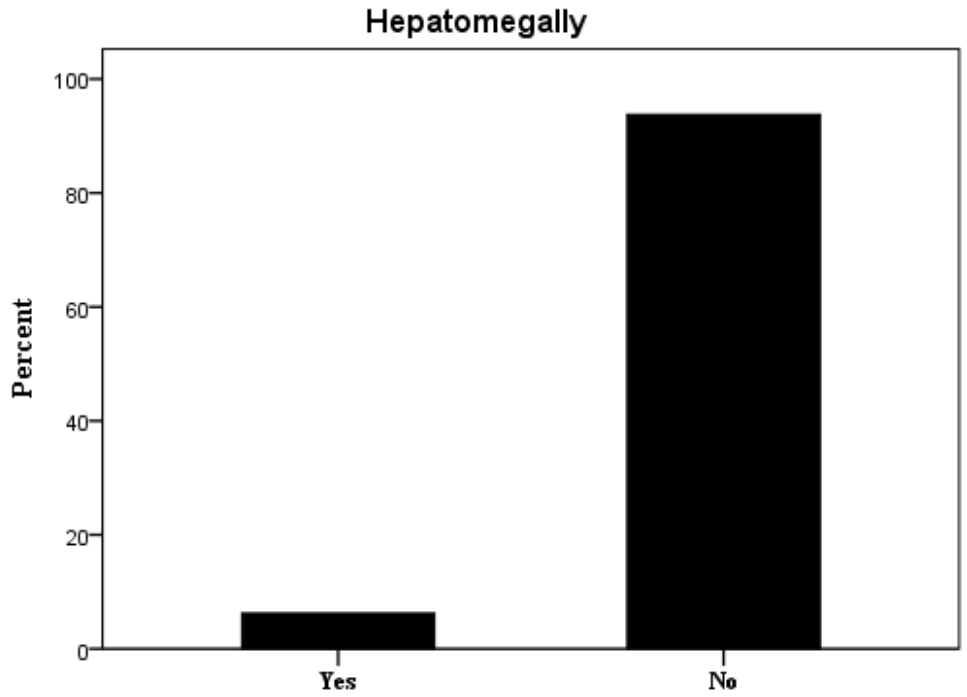

Figure (4-14): shows bar graph displaying frequency distribution of hepatomegaly

Table 4.16Splenomegaly					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	3	4.7	4.7	4.7
	No	61	95.3	95.3	100.0
	Total	64	100.0	100.0	

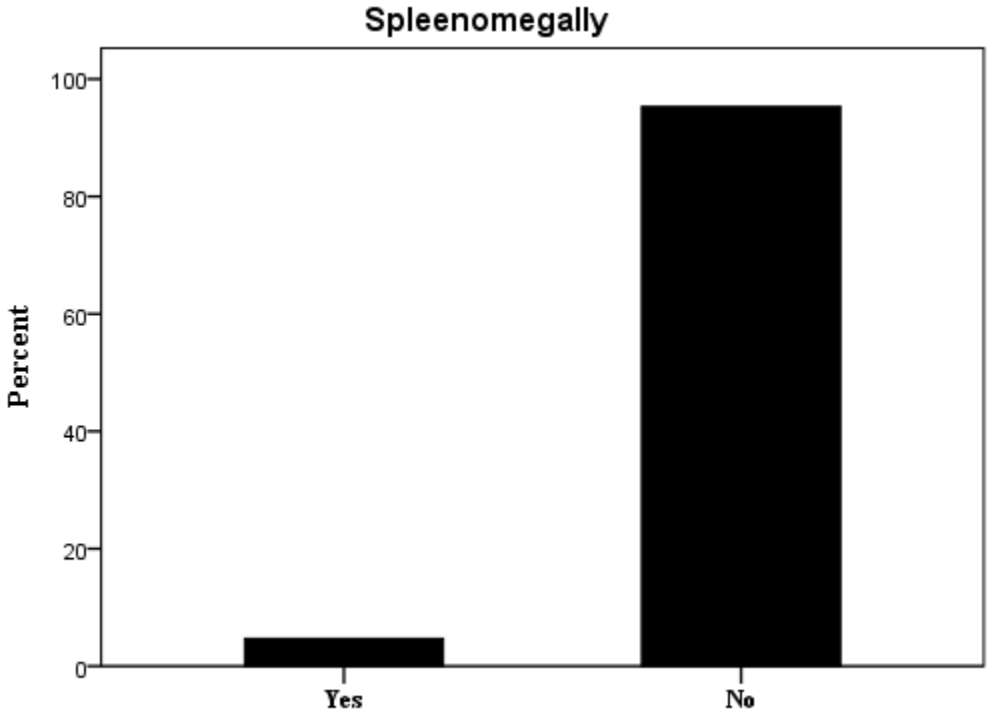

Figure (4-15): shows bar graph displaying frequency distribution of splenomegaly.

Table 4.17Gall stone number					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Single	19	29.7	29.7	29.7
	Multiple	45	70.3	70.3	100.0
	Total	64	100.0	100.0	

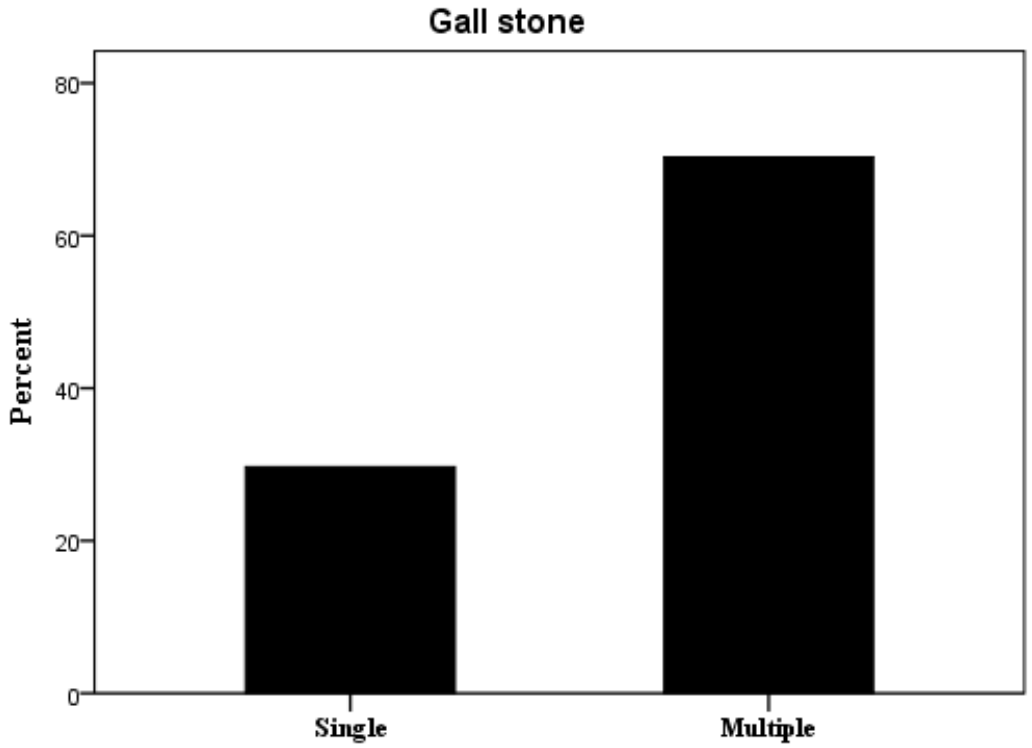

Figure (4-16): shows bar graph displaying frequency distribution of gall stones.

Table 4.18Descriptive Statistics of study variables					
	N	*Minimum*	*Maximum*	*Mean*	*Std. Deviation*
AGE	64	10	84	47.38	16.232
Weight	64	32	120	78.33	14.095
G.B Wall Thickness	64	1.4	3.8	2.923	0.6697
G.B Long Axis	64	6.2	8.8	7.461	0.5681
G.B Short Axis	64	3.2	5.1	3.872	0.4589
T.W.C.	64	880	14600	9154.38	2947.825
CREATININE	64	.7	1.9	.977	.2061
UREA	64	24	105	38.73	10.900

Table (4-19): shows mean of Patient weight in different Gallstones

	Gall stone	N	Mean	Std. Deviation	Std. Error Mean
Weight	Single	19	73.00	15.210	3.489
	Multiple	45	80.58	13.130	1.957

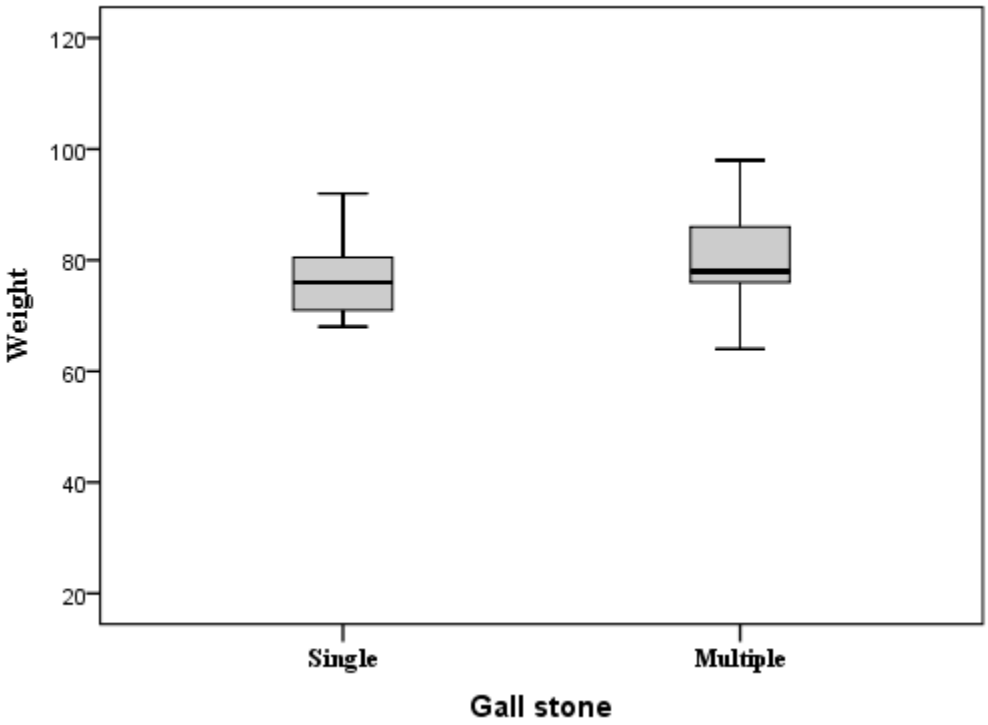

Figure 4.17 shows mean of Patient weight in different Gallstones

Table (4-20): mean G.B. wall thickness in different Gall stones

Group Statistics					
G.B Wall Thickness	Gall stone	N	Mean	Std. Deviation	Std. Error Mean
	Single	19	2.637	.6882	.1579
	Multiple	45	3.044	.6309	.0940

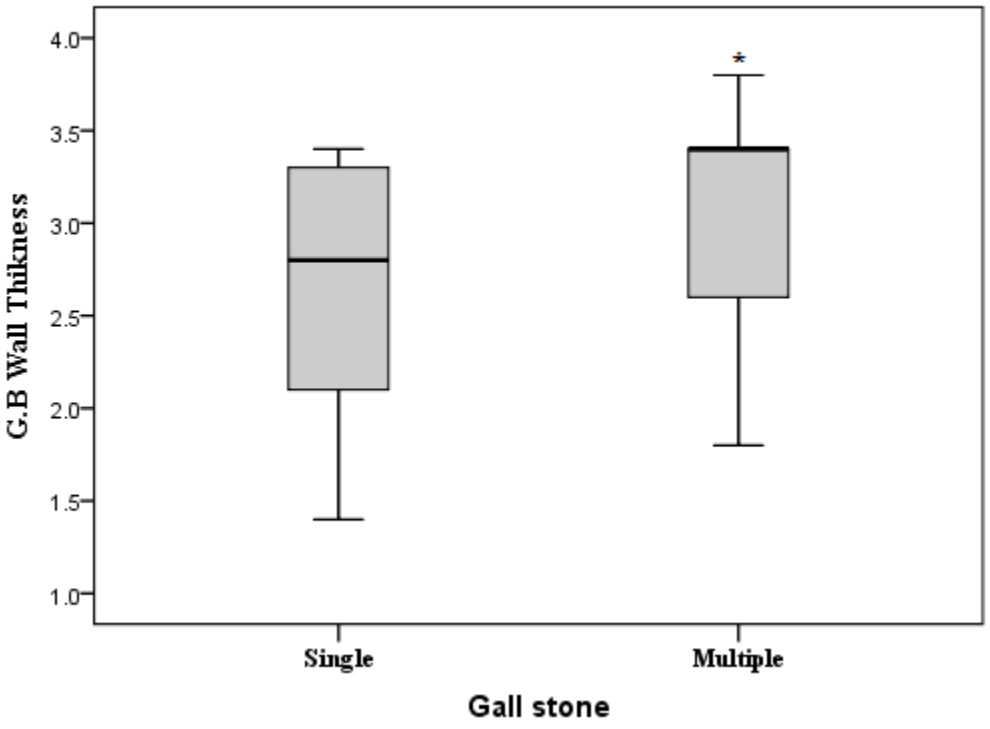

Figure 4.18 mean G.B. wall thickness in different Gall stones (strike represent significant difference ($p < 0.05$))

Table (4-21): mean G.B. wall thickness and Murphy sign)

Group Statistics					
	Murphy Sign	N	Mean	Std. Deviation	Std. Error Mean
G.B Wall Thickness	Yes	36	3.436	.1930	.0322
	No	28	2.264	.4441	.0839

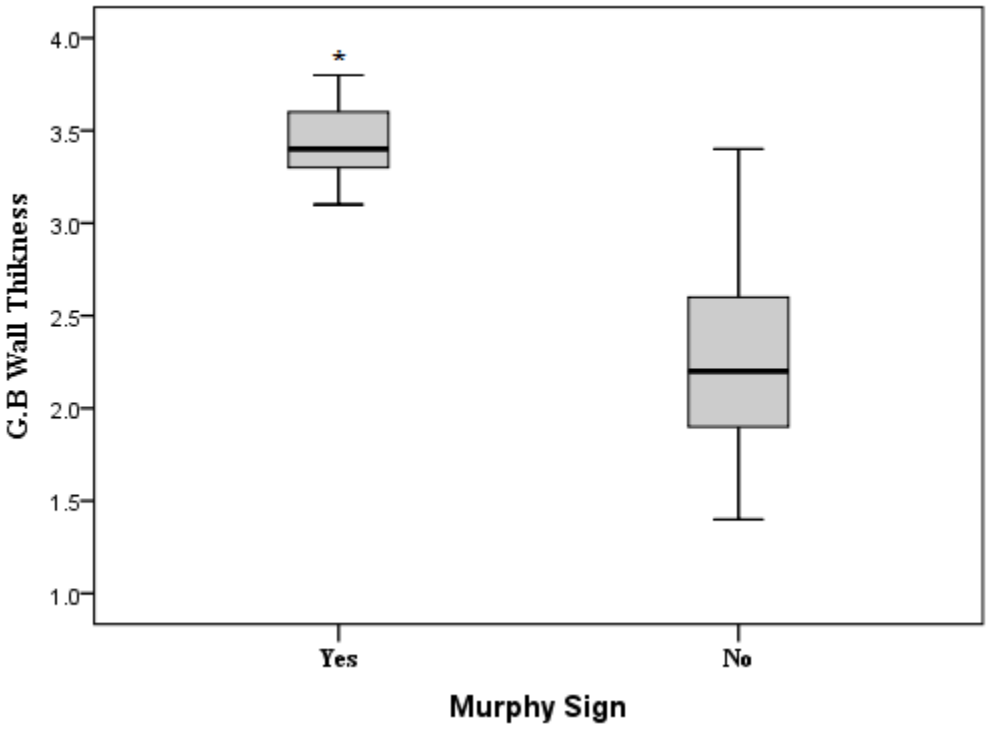

Figure 4.19 mean G.B. wall thickness and Murphy sign (strike represent significant difference ($p < 0.05$))

Table (4.22) correlation between the patient's gall bladder thickness and total white blood count.

Correlations			
		G.B Wall Thickness	T.W.C.
G.B Wall Thickness	Pearson Correlation	1	.696**
	Sig. (2-tailed)		.000
	N	64	64
T.W.C.	Pearson Correlation	.696**	1
	Sig. (2-tailed)	.000	
	N	64	64
**. Correlation is significant at the 0.01 level (2-tailed).			

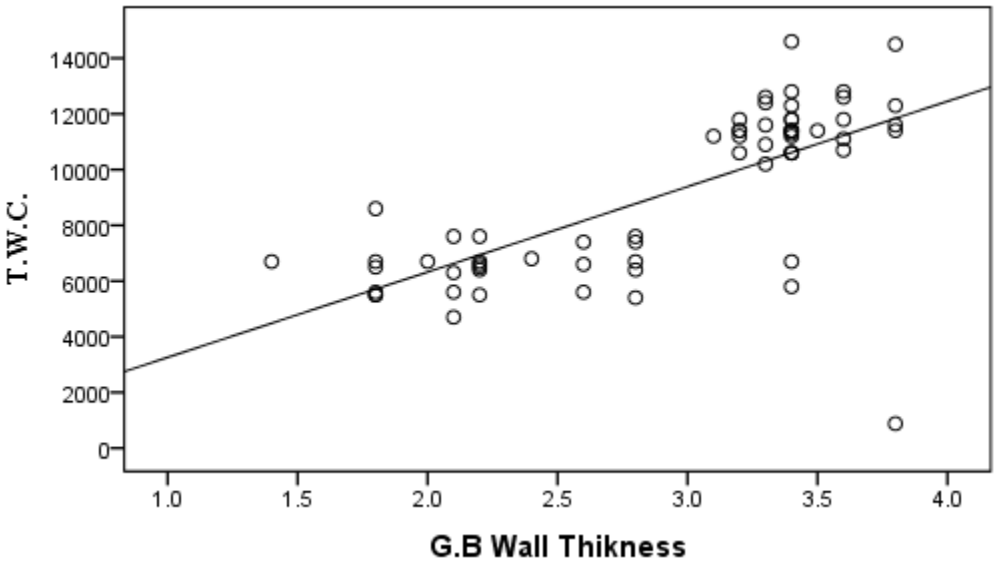

Figure (4-20): scatter plot shows the linear relationship between patient's gall bladder wall thickness and total white blood count.

Chapter Five

Discussion, conclusion, and recommendations

Chapter Five

Discussion, conclusion, and recommendations

5.1 Discussion:

The aim of this study was to identify the gall stones in Omdoum area using trans-abdominal ultrasound, and to state these in relation to their individual characteristics. 64 patients were selected who fulfill certain criteria related to gall bladder pathologies.

The results of this showed that 5 of them were male (7.8%) and 59 were female (92.2%)as displayed in Figure (4-1). In Figure (4-2) occupation of the patient affect extremely occurrence of the gall stones denoted by the sound percentile where house wife 57 (89.1%), Student 2(suffering from haematological disorder SCA) (3.1%) Farmer 1 (1.6%) Teatcher 3 (4.7%) Driver 1(1.6%). In Fig (4-3) Family history shows that there is strong relation between occurance of gall stones and family history 28 cases with possitive family history (43.8%) while negative family history are 36 cases (56.3%) denoting genetic relationship.

Regarding contraceptive usage women using birth control hormones are more prone to gall stones (41 out of total use birth control hormones (64.1%) while 23 not using (35.9%) this goes with study carried by (Etminan et al., 2011). as showned in Figure (4-4),

Furthermore there was no effect of diabetes on occurrence of gall stones.

Hematological disorder can lead to occurrence of gall stones particularly in children as in case of Sickle Cell anemia. and in spherocytosis due to hemolysis of R.B.Cs. (4 cases are reported (6.3 %) this goes with study carried out by (Attalla et al., 2013). As showed In Figure (4-6) it showed

Figure (4-7) showed association of gall stones with abdominal mass this reveal that there is no strong relation only present if there is associated pathology Present of mass 1case (1.6%) no mass 63 cases (98.4%)

Figure (4-8) showed association of pain with gall stones which is very frequent 59 cases suffering of pain (92.2%) and only 5 cases not suffering (7.8%) in this situations the gall stone referred as silent stone.

Figure (4-9) shows association of tenderness with gall stones which is very frequent 58 cases shows tenderness on abdominal palpation particularly on the right hypochondrium (90.6%) and only 6 cases not showed tenderness (9.4%). This result was in line with most of previous studies but sometimes in case of silent stones tenderness is not found(Almadi et al., 2012).

Figure (4-10) showed association of positive murphy sign with cholecystitis and gall stones which is very pronounce 36 cases showed positive murphy sign (56.3%) and only 28 cases not shows positive murphy sign (43.8%). Murphy sign is crucial sign of calculous or acalculous cholecystitis and this goes with most of previous studies but sometimes in case of silent stones murphy sign is not found (Almadi et al., 2012).

Fig (4-11) showed association of debris echoes with gall stones 42 cases shows debris echoes (65.6%) and 22 cases not shows debris echoes (34.4%).

Figure (4-12) showed association of pericholecystic fluid collection with acute cholecystitis denoting calculous cholecystitis in this study 32 cases shows pericholecystic fluid collection (50%) and 32 cases not shows pericholecystic fluid collection (50%) as pericholecystic fluid collection indicative of acute inflammation of the gall bladder and this goes with most of previous studies(Puri and Vilmann, 2006).

Figure (4-13) showed association of sonolucent layers with acute cholecystitis denoting calculous cholecystitis in this study 32 cases shows sonolucent layers (50%) and 32 cases not shows pericholecystic fluid collection(50%) as pericholecystic fluid collection indicative of acute inflammation of the gall bladder.

Figure (4-14) showed some cases of fatty liver related to obese and overweight cases which predispose to cholesterol gall stones in some patients due to high level of cholesterol in their blood 30 cases showed sonographic findings of fatty liver (46.9%) and 34 cases not showed appearance of sonographic findings of fatty liver (53.1%)

Figure (4-15) showed some cases of enlarged liver (hepatomegaly) due to fat infiltration associated with obesity which predispose to cholesterol gall stones in some patients due to high level of cholesterol in their blood 4 cases shows sonographic findings of enlarged liver (3.6%) and 60 cases not showed appearance of sonographic findings of enlarged liver (93.8%). This finding was similar in case of splenomegaly as showed in figure (4.16) due to hemolytic process associated with hematological diseases particularly S.C.A. which predispose to pigment gall stones in some patients3cases showed sonographic findings of enlarge spleen (4.7%) and 61 cases not showed appearance of sonographic findings of enlarge spleen(95.3%)

Fig (4-17) shows frequency distribution of gall stones as single or multiple stones; 19 cases shows single stone (29.7%) and 45 cases with multiple stones (70.3%). Moreover there is also another positive linear relationship between the occurrence of gall stones and patient's weight that's to say an increase in body weight there should be an increase in occurance of gall stones. In addition the gallbladder wall thickness was significantly thicker in case of multiple stones. Also the results confirmed that there is positive

linear relationship between the age of patients and the occurrence of gall bladder stones, that's to say .This positive relationship is expected because aging is main risk factors for gall stones occurrence as mentioned. And this result agrees with all previous studies(Idris et al., 2013).

5.2 Conclusion:

The results of this study stated that the gall stones and gall bladder diseases considered a serious and fatal if not handle carefully, cholelithiasis has increasingly become a major cause of abdominal morbidity, leading to hospital admission. Its occurrence has been found to be at least 7.4% in the adult population. There had also been a remarkable shift in the trend of gall-stone disease from middle aged, fertile, fat females to young asthenic females in their twenties. This is particularly because a majority of risk factors associated with gallstone disease are potentially modifiable.The study also concludes that, there was linear increase in the cholelithiasis in relation to increase in the patient's age and weight.

5.3 Recommendations:

- Trans-abdominal ultrasound is a respectful approach, and should be used confidently in the measurements and evaluation of the gall bladder among Sudanese.
- In order to improve the image quality, the patients should be well prepared, and the ultrasound machines should be well adjusted to have better resolution.
- There was another factors that might affect the gall bladder stones formation were not included here such as the ethnic group, hormones

levels, personal habits e.g., alcohol, and coffee intake. There for other researches were recommended to cover these factors.

- Further study of gall stones and gall bladder diseases in the other different states in our country should be conducted.
- Bad preparation of the patients which leads to wrong diagnosis. Therefore it's better to follow standard protocols to improve our techniques.
- If there is any indication of gall bladder disorder appears in U/S scanning, the patient must be scanned used spiral CT for further assessment to find other hidden pathology.
- According to the high cost of scientific research which the researcher was faced, the government should appeal universities in Sudan and companies to support the researchers in order to improve plans of treating and management of such diseases.
- Health education may play fundamental roles in decreasing the morbidity and mortality rate in such societies.
- Mal-used of birth control hormones without doctor advice may lead to catastrophic results.

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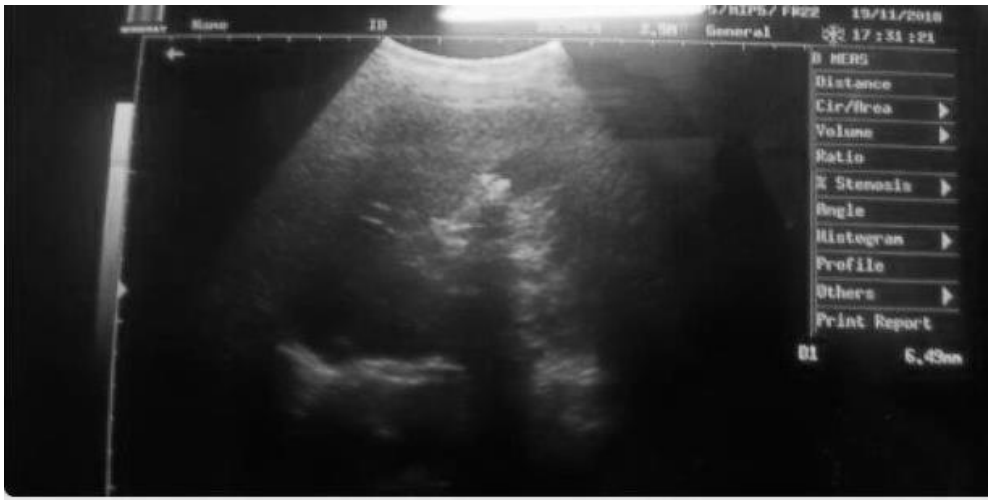
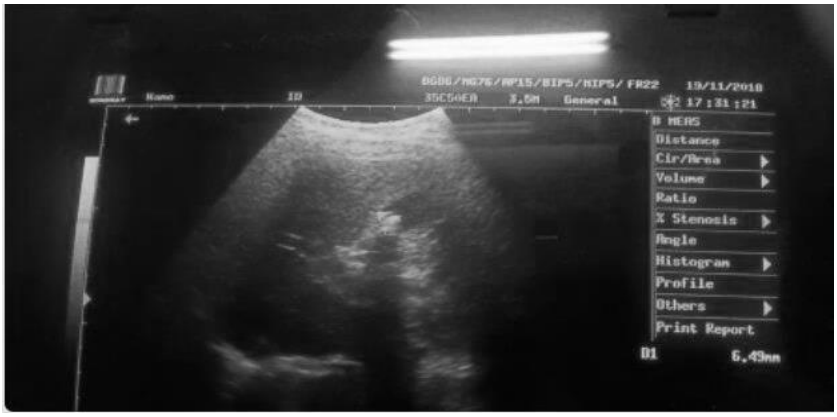
Appendix

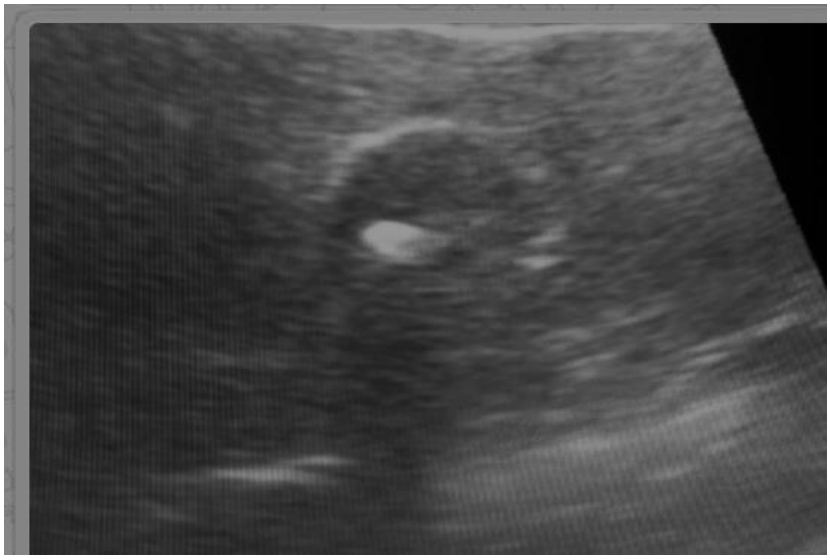
Appendix 1 A Female of 48 year with multiple gallstones



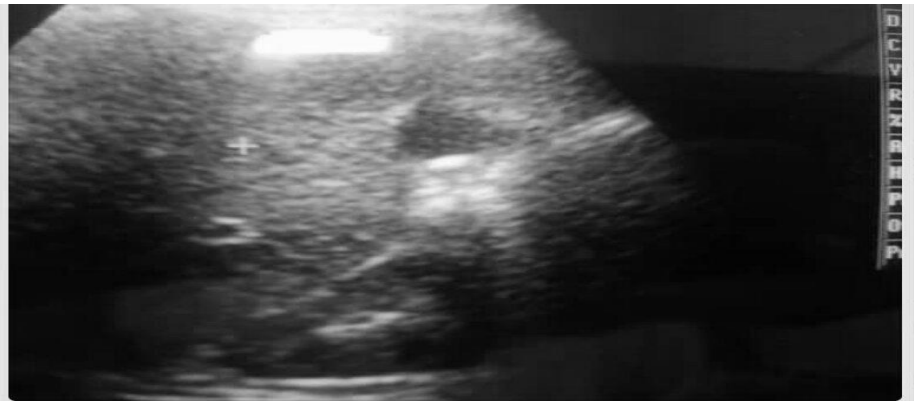
Appendix 1 A Female of 48 year with single gallstones



Appendix 3: Female of55 year with multiple gallstones



Appendix 4: Male of 38 year with single gallstone



Appendix 5: Female of 44 year with single gallstone

Appendix 6: Male of 55 year with single gallstone

Rsearch Format

ID	SEX	AGE	WHT	OCCUPATIO	F.H	B.C.P	D.M	H.D	LOCAL SIGNS			
									MASS	PAIN	TENDENESS	M.SIGN

SONOGRAPHIC FINDINGS											LABORATORY FINDINGS		
G.B.W.	G.B.A.		G.B.S		P.C.C.F.C	S.L.L	F.L	H.M.	S.M.	T.W.C	HB%	CREATININE	BLOOD UREA
	L	S	S	M									

ID	SEX	AGE	WHT	OCCUPATIO	F.H	B.C.P	D.M	H.D	LOCAL SIGNS			
									MASS	PAIN	TENDENESS	M.SIGN

SONOGRAPHIC FINDINGS											LABORATORY FINDINGS		
G.B.W.	G.B.A.		G.B.S		P.C.C.F.C	S.L.L	F.L	H.M.	S.M.	T.W.C	HB%	CREATININE	BLOOD UREA
	L	S	S	M									

ID	SEX	AGE	WHT	OCCUPATIO	F.H	B.C.P	D.M	H.D	LOCAL SIGNS			
									MASS	PAIN	TENDENESS	M.SIGN

SONOGRAPHIC FINDINGS											LABORATORY FINDINGS		
G.B.W.	G.B.A.		G.B.S		P.C.C.F.C	S.L.L	F.L	H.M.	S.M.	T.W.C	HB%	CREATININE	BLOOD UREA
	L	S	S	M									