Chapter One: Introduction

1-1Introduction:

The gall bladder is a globular or pear shaped organ with capacity of 50ml, it consist of three parts: Fundus, body and Neck. It lies in the gall bladder fossa in the visceral surface of the right liver lobe, adjacent to the quadrant lobe. It stores and concentrates the bile secreted by the liver. The gall bladder is an ideal organ for sonography, the ultra sound is more effective than oralcholecystorgrphy and the diagnostic accuracy is said to be height (96%).(JohnT.2007)

The ultrasongoraphy of gall bladder provided valuable information in the investigation of gall bladder stone in patient suspected of having gallstone particularly those patients with typical symptoms. (DonatoF et al. 2006)

Gall stone is the most frequent disease of gall bladder pathology. It is estimated that 10% of the adult population have gall bladder stone, and that of the population over 70 years of age will have gall bladder stone. (World j .2006).

Although the gall stones may form anywhere inthe biliary tract but the main site isthe gall bladder. Gall stone have 2 types, cholesterol and mixed stones (contain 77% cholesterol Mono hydrate + ad mixture of calcium salts, bile acids and bile pigments, etc.) and account for 80% other type is pigment stone (composed primarily of calcium bilirubinate, and < 10% (cholesterol) comprising the remaining 20%.(Gladden et al. 2009).

This occurs more often in Asian and is often associated with infection in the biliary tree, also seen in patients with chronic hemolysis or alcoholic liver disease.

Complication of gall stone may have serious clinical implications. Impaction of a calculus in the neck of g.b or in the cystic duct lead to Acute cholecystitis which

have many complications which include perforation, pericholecystic a bcess, and development of Empyma and bilio enteric fistula. There for, radiologic imaging makes a substantial contribution to the differential diagnosis. Ultrasongoraphysignificantly aids to the diagnosis of acute cholecystitis, although most ultra sonography sings are not typical but suggestive of acutecholecystiti. Ultrasound is the more sensitive and specific method in diagnosing the gall bladder stones. It is simple, quick, non invasive and cheep diagnostic tool. Unfortunately ultra sound is operator dependant so good choice of technical factors with high quality machine and long experience operator are essential factors for good performing exam result.(Gladden et al. 2009).

1.2 Objectives of the study:

1.2.1 General objectives: To characterized gall bladder stone using ultrasongoraphy.

1.2.2 Specific objectives:

To evaluate incidence of gall stone in over weight patients.

To evaluate incidence of gall stone in female compare to male.

To characterize ultrasound appearance of gall stone.

To evaluate the complications of gall stone.

Tostudy the relationship between incidence of gallstones and multiple pregnancy, dibatessmellitus, hypertension and other diseases .

1.3over view of study:

Chapter one Is an introduction theoretical frame work show the definition, objectives ,hypothesis, materials and method, population of study duration of study, instrumentation and data collection .

Chapter two the literature reviews.

Chapter three deal with materials and methods.

Chapter four results.

Chapter five Discussion, conclusion and recommendation.

Chapter Two

Literature Review and Previous studies

2.1 Definition:

Gall bladder is storage reservoir for bile. It allows the delivery of bile acids at a high concentration and in a controlled manner, via the cystic

Duct to the duodenum, for degradation of dietary.((Berkely. 1998)

2.2 Anatomy of gall bladder:

Understanding the anatomy of gall bladder and extra hepatic biliary system is essential to all sonologist and surgeons. Caring for patient with hepato- biliary disorder is very important – this concept is under scored by the recognition that these organ are in juxtaposition to a number of major vascular structures as well as other viscera of both, gastro inter and genitourinary tracts (Healey, et al 2000).

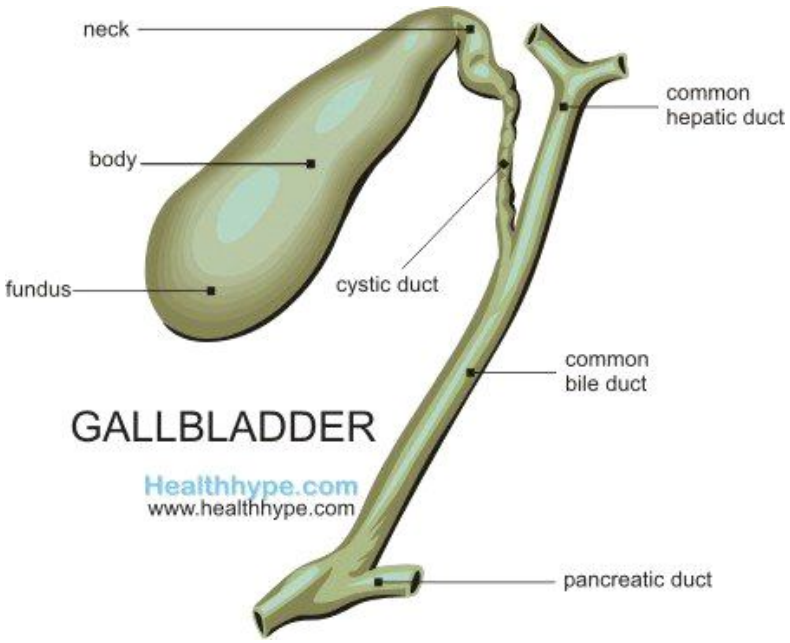

Figure:(2-1):Shows Anatomy of gall bladder(Berkely. 1998)

2.2.1 Development anatomy:

Knowledge of the developmental anatomy is essential because gall bladder and biliary anomalies are not uncommon and failure to recognize such congenital problem can result in significant peri operative morbidity (Hodge. Et al 2006).

When the embery0 is 3 mm in size the liver prim odium appears in the middle of the third week (approximately 25 days) as an outgrowth of end dermal epithelium at the distal end of the foregut. This out growth known as the hepatic diverticulim on liver bud, consist of the rapidly proliferating cells strand which penetrate the septum transversum, that is the mesodermal plate between the pericardial cavity and the stalk of the Yolk Sac. At this stage embryo Is 32 days old approximately and 5mm in size. While the hepatic cell strands continue to penetrate in the septum, the connection between the hepatic diverticulum and the foregut

[duodenum] narrows, thus forming the bile duct. As mall ventral out growth gives rise to the gall bladder and cystic duct. The embryo is now approximately 36 days old and of 9mm in size. Initially the gall bladder is a hollow organ, but as a result of proliferation of its epithelial lining it becomes temporarily solid. The definite lumen develops by recanalisaiton ofthe epithelium.(Hodge.et al 2002).

During further development, the epithelial liver cord intermingle with the vitelline and the umbilical veins forming the hepatic sinusoids. The liver cords differentiate into parenchyma and form the lining of the biliary ducts. As a result of its continuous rapid growth, the liver becomes too large for the confines of the septum transverum and begins gradually to protrude into the abdominal cavity. As the embryo growth older the mesoderm of the septum between the ventral abdominal wall and the liver become stretched and very thin, thus forming a membrane called the flaciform ligament. The umbilical vein originally found in the mesoderm of the septum now occupies apposition in the free, caudal margin of the flaciform ligament.(Healy et al. 2000)

Similarly, the mesoderm or the septum between the liver and the foregut [stomach and duodenum] become stretched and me membranous, there by forming the lesser momentum. [gastro hepatic and gasroduodenals ligament]. In the free margin of the lesser momentum are found d the bile duct, the portal vein and the hepatic Artery (Hunter . 1989s).

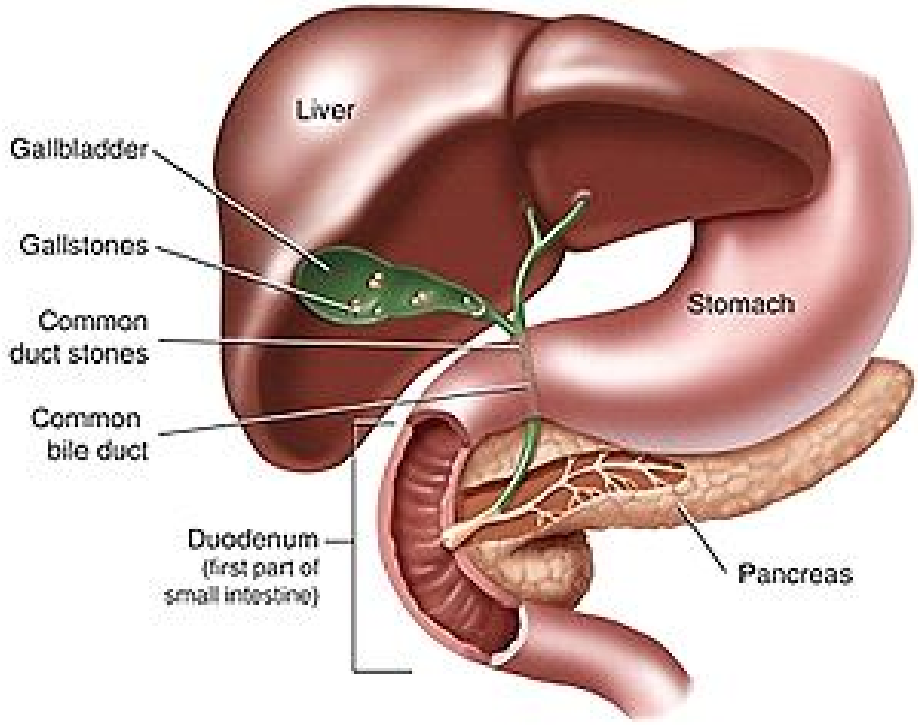

Figure:(2-2): Shows Development anatomy(Hunter . 1989)

2.2.2 Microscopic Anatomy:-

The bladder is a blind pear shaped diverticulim of the common hepatic duct, to which it is connected by cystic duct. Occasionally, embryonic bile duct, Lusaka's duct are seen in the connective tissues that open into the bile duct of the liver, these embryonic remnants never communicate with the lumen of this organ. The gall bladder is approximately 3 inches (8cm) in length and 1.5 inches (4cm) in diameter but is capable of considerable distention.(World J.2006)

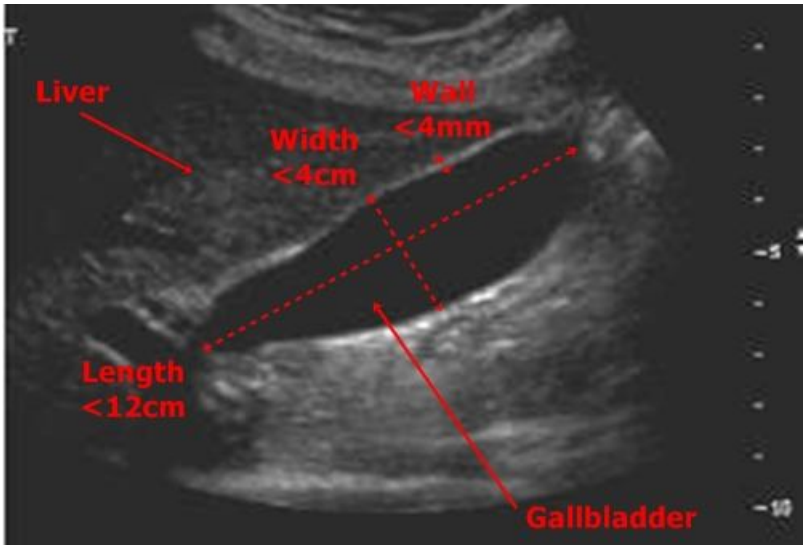

Figure :(2-3): Shows Gall bladder Dimention in ultra sound(https:\\med line plus.gov/gall stones html)

Its wall is composed of mucous membrane, muscular is and adventitia layer.

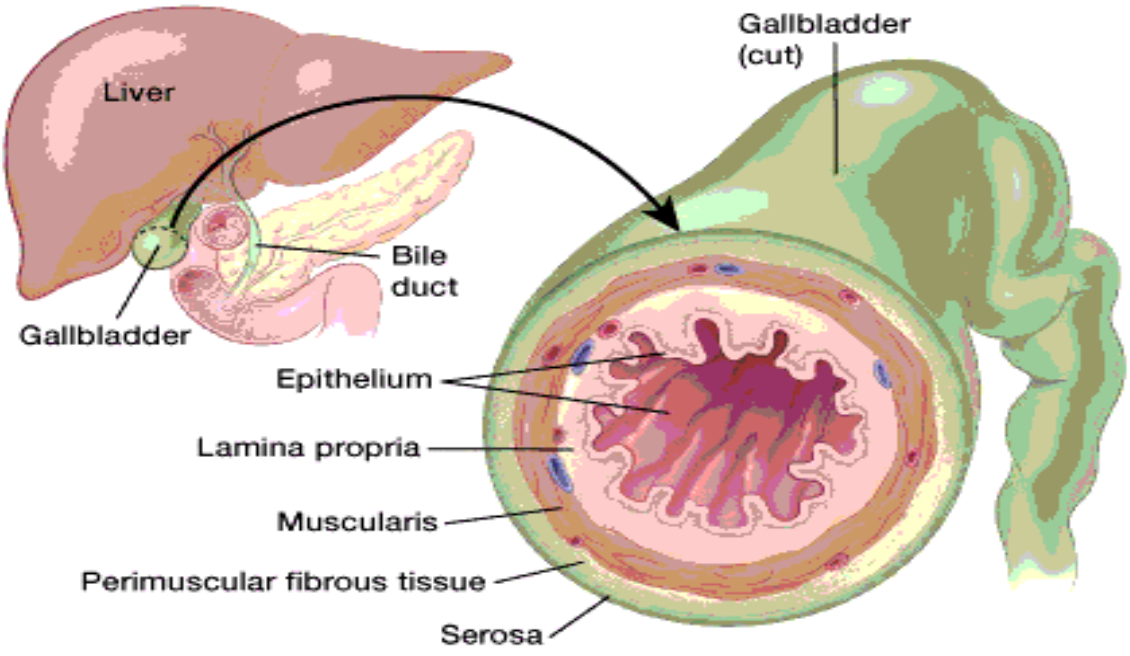

Figure :(2-4): Shows cross section of gall bladder (https:\\med line plus.gov/gall stones html)

The mucous membrane, when empty the mucosa is thrown into folds, or rugae, and thus irregular in section, often with the appearance of simple glands. All epithelial cells are similar, tall columnar cells, with basely located nuclei. Electron microscopy affine microscopic apical border cilia lining the apical membrane of ductular cells with lateral borders nearest the lumen exhibiting the zonulaocculudents, and basal borders showing flods.Afine basal lamina and lamina propria of delicate, reticular connective tissue support the cells with numerous small blood vessels provided by cystic artery and cystic veins, with some of the venous blood being returned the sinusoids of the liver. Occasional small lymph nodules are presented with a few mucous glands at the neck of the gall bladder. These glands occur more frequently in individuals with chronic inflammation of this organ along with abnormal folds of the epithelium.

RokitanskyAschoff sinuses. The later are not glands and may extend as far as the perimuscular connective tissue layer (Desanti et al 2000)

Muscular is, there is no sub mucosa in the gall bladder and external to mucosa is layer of smooth muscle, irregular in thickness and orientation of its competent bundles. In any section, smooth muscle will be cut in all possible planes, for the muscular is a mesh work of interlacing bundles of smooth muscle fibers between which are collagenous, reticular and some eleasticfibres (Desanti et al 2000).

Adventitia or serosa, the gall bladder lies on the inferior surface of the liver its outer coat of dense fibro connective tissue blends in some regions with that of Glasson's capsule. Elsewhere, the adventitia is covered by peritoneum. The neck of the gall bladder continues into cystic duct, and mucous membrane is thrown into as spiral fold with a comet containing smooth muscle. This is termed spiral valve of Heister. (Hodge.etal 2006s).

Although the mobile abdominal viscera are in constant in position the surface marking of the Fundus of the gall bladder is clinical value.

2.2.3 Surface marking of the gall bladder Fundus:

This projects below the inferior border of the liver [it extend along aline which passes the right tenth costal cartilage to left fifth rib at the mid clavicular line] at the point where the lineasemilunaris crosses the tip of the ninth costal cartilage in the transpyloricplane (Grays etals. 2000)

Figure :(2-5) Shows gall bladder relation(https:\\med line plus.gov/gall stones html)

2.2.4 Macroscopic anatomy:

The biliary apparatus collects bile from the liver, stone it in the gall bladder, and transmits to duodenum. The apparatus consist of The right and left hepatic ducts, the common hepatic duct, the gall bladder, the cystic duct, and the bile duct.(Bisset. 2001)

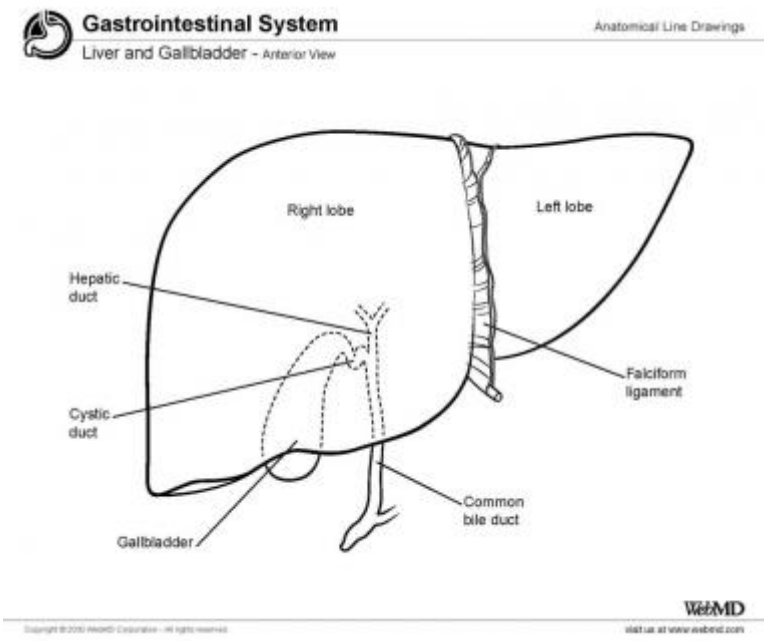

Figure :(2-6) Shows Biliarytrees(**www.ZapMeta.ws/sgall** bladder treatment)

The Diameter of right hepatic duct is 3mm ,left is 5mm. The right and left hepatic ducts emerge at the porta hepatic from right and left lobes of the liver in the shape of (v). Left hepatic duct has a greater propensity for dilatation as a consequence of distal obstruction. The right hepatic duct has a very short extra hepatic course and it is aboutIcm long. The arrangement of structures at the portahepatis, from behind forwards, is the branches of the portal vein, hepatic artery and hepatic ducts.

The common hepatic duct size is about 4cm long. The main right and left hepatic ducts unite near the right end of the port hepatic as the common hepatic duct which descends about 3cm before being joined on its at an acute angle by the cystic duct to form the common bile duct. It makes up the left border of the

triangle of calot. The common hepatic duct lies to the right of the hepatic artery and an to the portal vein (Ellis et al .2005).

The gall bladder is a conical or pear- shaped musculomembranes sac, lodged in fosse on the under surface of the right lobe of the liver, and extending from near the right extremity of the porta to the anterior border of organ. It is from 7-10m In length, 25cm in breadth at its widest part and hold from 30 to 35 c.c. it is divided into Fundus, body and neck. It is normally present in the right hypochondrium. It extends forwards from a point near the right end of the porta hepatic to the inferior hepatic border. It is upper surface is attached to the liver by connective tissue, elsewhere it is even connected to the liver by short mesentery. It typically lies in close proximity to the duodenum, pylorus, and hepatic flexure of the right colon and right kidney. For description purposes it is divided into Fundus, Body, Neck and infundibulum (Gladden. 2009

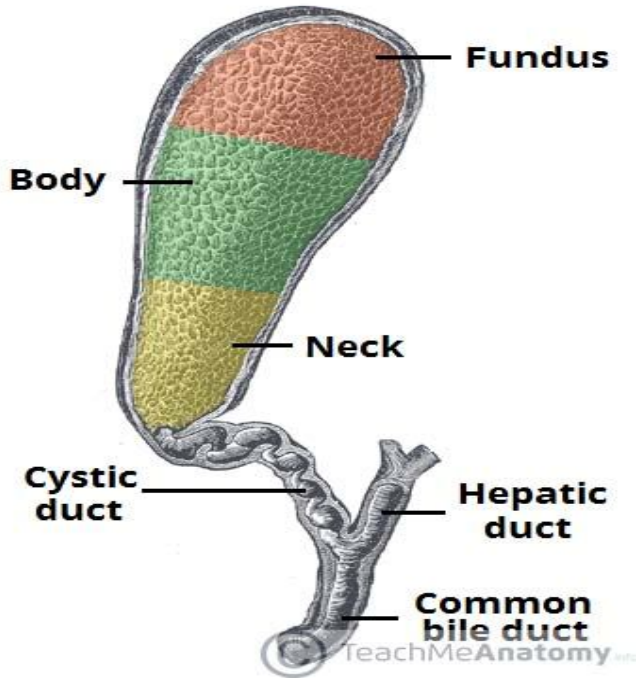

Figure:(2-7):ShowsGall bladder part(https:\\www.niddk.nih.gov/health)

The Fundus is rounded blind expanded end, projects down forward and to the right, extending beyond the inferior border to contact the anterior abdominal wall behind the tenth costal cartilage, where the lateral edge of the right rectus abdomens crosses the costal margin. It is generally the least well vascular zed portion of the gall bladder and therefore it is more susceptible to ischemic changes, including perforation. Interiorly the anterior colon near it is commencement. [These relations change when the gall bladder is lower, as it often in slender female. (Christoph F.2008).The body is directed up, back and to the gall bladder neck. Above it related to the liver, below is the transverse colon, and posteriorly the upper end of the second part of the duodenum.

The neck is narrow, curving up and forward and then aabruptly back and down to because the cystic duct, at which transition there is a constriction. The neck is attached to the liver by loose connective tissues containing the cystic artery. The mucosa of the neck is obliquely rigid, forming a spiral groove. It related superiorly tp the liver, and inferiorly is the first part of the duodenum.(christoph F.2008).

The Infundibulum is also known as the Hartman's pouch which is mall bulbous diverticulim. From the right side of the neck a small recess may project down and backswords the duodenum. It has been widely regarded as constant feature, but Davies and Hading (1942) have shown that it is always asequlae of pathological states, especially dilatation, when it is large the cystic duct arises from its upper left aspect and not from what appears to be gall bladder's apex. Gall stone lodged in the pouch may cause adhesions with the duodenum or bile duct, and may perforate into any one of them. .(christoph F.2008).

The cystic duct is 'S' shaped and 3-4 cm [1.5 inches approximately] in size. it passes back, down and to the left from the neck of the gall bladder, joining the

common hepatic duct to form the bile duct. It is adherent to the common hepatic duct for a short distance before joining it, usually near the portahepatis but sometimes lower, in which case the cystic duct lies along the lesser momentum's right edge. Its mucosa bears five twelve cresentric folds like those in the gall bladder neck. They project obliquely in regular succession, appearing like spiral value of Heist or. The function of the spiral value is believed to be strengthening of the wall.(NEngl J. 1980).

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The dimention is about 7.5cm long and 6mm in diameter. The bile duct runs forwards and back words, first in the free margin of the lesser momentum, then behind the first part of the duodenum and lastely behind or embedded in the head of pancreases. Near the middle of the left side of the second parts of duodenum it comes in contact with pancreatic duct and accompanies it in the wall of the duodenum, where the two ducts unite or the ampulla of vater It related in supra duodenal part (in the free margin of the lesser momentum) interiorly to the liver, posteriorly the portal vein and to the left is the hepatic artery. In retro duodenal part, interiorlyfirst part of the duodenum, posterior inferior venacava, and to the left gastro duodenal artery. In infra duodenal part, interiorly a groove in the upper

and lateral part of the posterior surface of the head of the pancrease, and posteriorly is the inferior venacava (Med Kiln. 2007).

The Blood supply Cystic artery is chief source of blood supply and is distributed to gall bladder, cystic duct, and hepatic duct upper part of the bile duct. Cystic artery is chief source of blood supply and is distributed to gall bladder.

The cystic artery usually arise from the right hepatic artery passes behind the common hepatic and cystic duct in the calot's triangle and reach the upper surface of the neck of the gall bladder, where it divided into superficial and deep branches. Occasionally, the cystic artery arises from the hepatic artery proper, and rarely from the gastro duodenal artery. Then it passes in front of, or behind, the bile duct or the common hepatic duct, to reach the upper surface of neck of gall bladder. (Med Klin.2007).

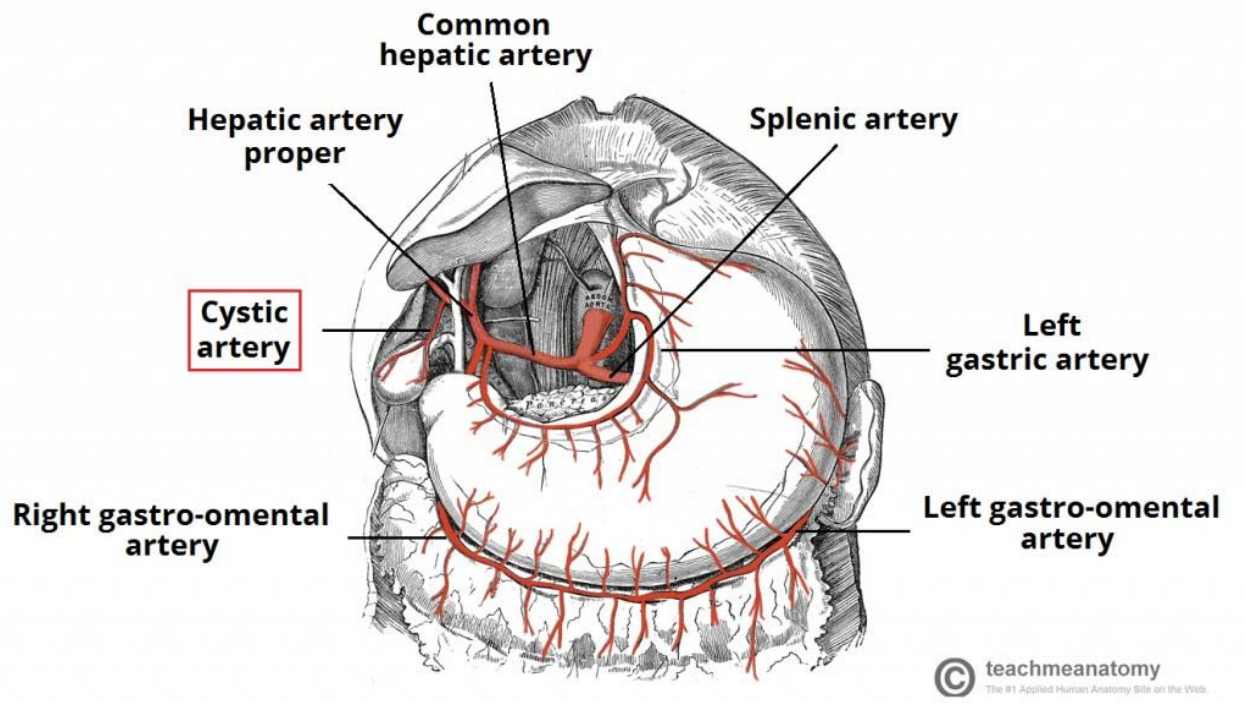


Figure :(2-8): Shows Blood supply(https:\\www.niddk.nih.gov/health)

About the venous drainage, the superior surface of gall bladder drains directly into the hepatic veins through the gall bladder fossa. Rest of gall bladder drains by one or two cystic veins, which can only enter the liver, either directly or after joining the veins drainage the hepatic duct and upper part of bile duct only rarely the cystic vein opens into the right branches of port al vein..(Christoph F.2000)

The cystic plexus nerves, supplying the territory of the hepatic plexus, which receives fibers from the coeliac plexus, left and right vagus and the right phrenic nerves. The nerve plexus supplies the lower part of the bile duct over the superior pancreatoduodenal artery. Parasympathetic nerves are vasomotor and motor to sphincter. Pain via sympathetic nerves is referred to the inferior angle of scapula. Pain via the phrenic nerve is referred to the right shoulder. (Ellis et al .2005).

2.3 Ultra Sonographic Anatomy of Gall bladder:

The GB is a pear – shaped anechoic structure indenting the infero medial aspect of the right lobe of the liver. Alinearecohgenic line representing fat in the main interlobar fissure is seen inter posed between the gallbladder and the right main portal vein. The gallbladder mucosa is hyper echoic, the sumbucosa and the muscle layer are hypoechoic, and the serosal surface fatty layer is hyper echoic. Gall bladder is widest at the Fundus and narrowest at the heck. The wall of the normal Gall bladder is predominantly hyper echoic and sharply defined, and it measure 3mm or less in thickness the measurements are most accurate when the anterior wall of the gallbladder is measured in the long axis view with the sound beam perpendicular to the wall of the gallbladder . Minor angulations of the transducer can cause pseudo- thickening of the gall bladder wall. The normal gallbladder is 8-12 cm in length, the AP diameter is measured on long axis view of the gallbladder, and the transverse diameter is normally less than 4cm in a duct. Dilatation of the gall bladder as known as Hydrop, several anatomic variations may occur within the gallbladder to give rise to its internal echo pattern on the sonogram. However the GB position is dependent on patient's body habitus. There are four typical body habitustypes – hyper sthenie, sthenic, hyposthenic and asthenic. The position of gall bladder varies as shown below in table.

(https:\\www.niddk.nih.gov/health).

Table (2-1) variable positioning of the gall bladder dependent upon body habitustypes:

Body habitus type	G.B position and orientation
Hypersthenic 5% of population (wide, deep, wide abdominal cavity)	The diaphragm, liver and GB tend to be high in the abdomen in the right upper quadrants, under the thoracic cage and this restricts transducer access. The liver is often difficult to access and inter costal scanning ad decubitus and erect positions can facilitate access. The stomach is also high and this can create problems with access to deeper structures due to over lying gas and food residue. The gall bladder is also often horizontally orientatedrat her than in its normal oblique position.
Hypostheric Tall, thin, narrow, chest not deep in AP diameter	The liver and gall bladder tend to lie lower than in above sthenicty be, often located in the right upper abdominal region and the gall bladder often lies in a more vertically orientated than sthenic.
Body habitus type	G.B position and orientation
sthenic	The liver and gall bladder tend to lies as expected in the right upper quadrant with

(average build)	the gall bladder Fundus just visible below lower costal margin in the mid clavicular plane and with the gall bladder lying obliquely.
A sthenic (extreme variant of above)	The liver and gall bladder tend toile low down in the abdomen, sometimes as low as the right iliac fossa. The gall bladder tends to lievertically

An understanding of these variant is essential for successful ultra sound scanning technique it is suggested that the practitioner looks at the pts as they enter scan room and assigns them to a body habitus type. This will help to know where to find the g.b and how to align the transducer to show the long and short axis of gall bladder.(www.encyclopedia.com/topic Gall stone.aspx).

An acronym has shown to be didactically helpful ["SSOTM"] when thinking abouzzinterpreting ultra sound images mean size, M is the measurements is the shape, O is out line and T is the texture (John T.2007).

In a fast state it should measured 1x 2.4 x 2.4 cm. but this depends on the volume of bile present. Typical bile volume is normally 40-60 ML, measured by rotating ellipsoid. However gall bladder volume estimation is highly unreliable as it shows a wide intra and inter operator variability. The G.B is asaccular structure which has appear or teardrop shape in long axis cross section when distended,normaly gall bladder wall is thin, smooth and mildly echogenic, measuring 1-3 mm in thickness in the normal state. There is no peri – cholecystic fluid around the gall bladder in

the normal state. The normal g.b lumen should contain bile and should not have any space occupying lesions. Normal bile appears anechoic, and devoid of any internal echoes. (John T.2007)

2.3.1 Sonographicapperance of bile duct:

Son graphically the CBD lies anterior and to the right of the portal vein in the region of the portahepatis and the gastro hepatic ligament. The hepatic artery lies anterior and to the left portal vein. On than transverse scan the CBD, hepatic artery and the portal vein have been referred as the “Mickey mouse sign”. To obtained this sign across section with directed transducer in slightly oblique path from the left shoulder to the right hip(Brown (1958).

On sagittal scan the right branches of the hepatic artery usually pass posterior to the CBD. The CBD is seen just anterior to the portal vein before it dips posteriorly to inter the head of pancreases. The pt may be rotated into slight (45 degree) or steep (90 degree) right anterior oblique position with the beam directed posteriomedialy to visualize the duct. This enables the examiner to cumber some bowel gas and use the liver as an acoustic window (Gladden et al. 2009). When the right subcostal approach is used, the main portal vein may by seen branches. As the right liver lobe, it can be flow laterally in longitudinal plane the portal vein appears as an (almond – shape) sono lucent structure anterior to the ivc (sotoetal 2005).

2.4 Physiology of Gall Bladder and Biliary System:

The gall bladder is sac located under the liver. It storage and controlled bile produced in the liver. Bile aids in the digestion of fats and is released from the gall bladder into the upper small intestine. Duodenum in response to food “especially fast ”condition which slow or obstruct the flow of bile out of gall bladder result in gall bladder disease(Kumar.2005).

2.4.1Secretion of Bile and the Role of Bile Acid in Digestion:

Bile is a complex fluid containing water, electrolytes and organic molecules including bile acids, cholesterol, phospholipids and bilirubnin that flow through the biliary tract into the small intestine. There are two important functions of bile in all species. Bile contains bile acids, which are critical for digestion and absorption of fats and fat soluble vitamins in the small intestine. Many waste products are eliminated from the body by secretion into bile and elimination in feces. Adult humans produce 400-800 ML of bile a day or daily, and other animals proportionately similar amount.(Kumar.2005).

The secretion of bile can be considered to occur in two stages, initiallyhepatocytes secrete bile into canaliculi, from which it flows into bile ducts. This hepatic bile acids, cholesterol and other organic molecules As the bile flows through the bile ducts it is modified by addition of a watery bicarbonate – rich secretion from ductal epithelial cells. The gall bladder stores and concentrates bile during fasting state. Typically, bile is concentrated five – fold in the gall bladder by absorption of water and small electrolytes eventually all of the organic molecules are retained.

2.4.2 Role of Bile Acid in fat digestion and absorption:

Bile acids are derivatives of cholesterol synthesized in the hepatocyte. Cholesterol is digested as part of the diet or derived from hepatic synthesis is converted into the bile acids. Bile acids are amphipathic, that is, they contain both hydrophobic (lipid soluble) and polar (hydrophilic) regions. The cholesterol portion of bile acid is hydrophobic and the amino acid conjugate is polar and hydrophilic (MedKlin .2007).

2.4.3 Role of bile Acids in Cholesterol Homeostasis:

Hepatic synthesis of bile acids accounts for the majority of cholesterol break down in the body. In humans, roughly 500mg of cholesterol are connected to bile acids and eliminated in bile every day. This route for elimination of excess cholesterol is probably important in all animals. But particularly in situation of passive cholesterolingestion (Watts G. (2009).

2.4.4 Pattern and control of Bile secretion:

The flow of bile is lowest during fasting, and a majority of that is diverted into the gall bladder for concentration. When chyme from an ingested meal enters the small intestine, acids and partially digested fats and proteins stimulates secretion of Cholecystokinin and secretion. As discussed previously, these enteric hormones have important effects on pancreatic exocrine secretion. They are both also important for secretion and flow of bile (Eugenene. 2002).

2.4.5 Cholecystokinin:

The name of this hormone describes its effect in the biliary system – cholecysto= gall bladder and kinin = movement. The most potent stimulus for release of Cholecystokinin is the presence of fat in the duodenum once released; it stimulates contraction of the gall bladder and common bile duct, resulting in delivery of bile into the gut (Ellis .2005).

2.4.6 Secretion:

This hormone is secreted in response to acid in the duodenum. Its effect on the biliary system is very similar to what was seen in pancrease. It stimulate biliary duct cells to secrete bicarbonate bile and increase its flow out into intestine, the processes of gall bladder filling and emptying described there can be visualized using an imaging technique called Scintgraphy. This procedure is utilized as a diagnostic aid in certain types of hepatobiliary disease. (Ellis .2005).

2.5 Scanning Techniques:-

To ensure adequate gall bladder distention, the examination should be performed after an over right fast of 8-12 hours fasting is necessary to avoid diagnostic errors. Physiologic gall bladder contraction causes the gall bladder to appear small and thick walled; this could be misinterupted as a pathologic condition. For most pts a sector transducer can be more optimally positioned sub costly or within rib interspaces. The highest frequency transducer that can be satisfactorily image the

all bladder should be used. For most pts 3.5Hz transducer should be used to provide superior resolution. Optimal images usually required the pt to suspend respiration following a deep inspiratory effort. The scan is performed from a lower inter costal or preferably asubcostal approach with the pt supine or in a left

posterior oblique position. Occasionally, however, scans should be performed with the pt in an erect or prone position in order to convincingly demonstrate calculi mobility. Special attenuation should be directed to the most dependant region of the gall bladder, where most calculi are found. In most patients this is a region of the gall bladder neck and the cystic duct (Doppler Ultrasound History. www.gall bladders.net).

In gall bladder survey the Longitudinal Scan is obtained by beginning with the transducer perpendicular, just inferior to the costal margin at the right medial angle of the ribs usually this area of the portal vein. Once the gall bladder is located, determine its longitude lie. This can be accomplished by rotating the transducer to the oblique scanning plane. We should put in mind that the longitudinal scan of gall bladder can lie in either the sagittal plane or transverse plane because of the variability in the gall bladder position. Rocking and sliding, move the transducer superiorly back on to the fundus and continue up through the body and neck until you are beyond the gall bladder (Ellis .2005).

When performing the transverse scan, still in the sagittal plane, locate the funds of the gall bladder, rotate the transducer 90 degree into the transverse scanning plane and transverse fundus, the Fundus will a pear round or ovale. An optional method for locating the gall bladder in transverse plane is locating the superior pole of the right kidney, in most cases the fundus of the gall bladder is seen immediately anterior to the superior right pole. Continue rocking and sliding the transducer superiorly into the fundus and continuous scanning up through the body and neck until you are beyond the gall bladder.(Ellis .2005).

For Biliary tract survey begins with sagittal approach, Begin by locating the neck of the gall bladder or the vain and looks for the longitudinal of the CBD anteriorly.

It may be necessary to rotate the transducer at varying degree to visualize the long axis of the common bile duct usually lies at a right angle to the costal margin. Slightly rock the transducer right to the left sweeping through the both sides of the duct and at the same time slowly side the transducer slightly superior and at right lateral through and beyond the common hepatic duct. The common bile can be difficult to see when it is behind the duodenum because of the bowel gas (Heute .2004).

Continue to scan through the duodenum and pick up the duct against just inferior to the duodenum or at the head of the pancrease. Giving the patient enough water to drink to fill the duodenum can aid in the evaluation of the retro duodenal portion of the CBD as the water displace the bowel gas (Ellis.2005).

2.6 Anomalies of Gall bladder and biliary tract:

2.6.1 Anomalies of the Gall Bladder:

Anomalies of the gall bladder are generally of minimal clinical significant. In rare circumstances they may be associated with more sever lesions, including cardiac malformations and poly cystic kidneys and a variety of musculo skeletal defects, anomalies of the gall bladder are as follows:

2.6.1.1 Abnormal Number:

1.2.6.1.1Hypoplasia or agenesis of gall bladder: it is due to the failure of the distal end of cystic duct to expand. There is a high incidence of common bile duct stones and duct dilatation in pts with agenesis of gall bladder. Autopsy incident of absent gall bladder is 0.03% - 0.06% with an equal male to female ratio but clinical cases are more common among the female when the ratio is about 21:12

Figure (2-9): Shows Gall bladder Agenesis

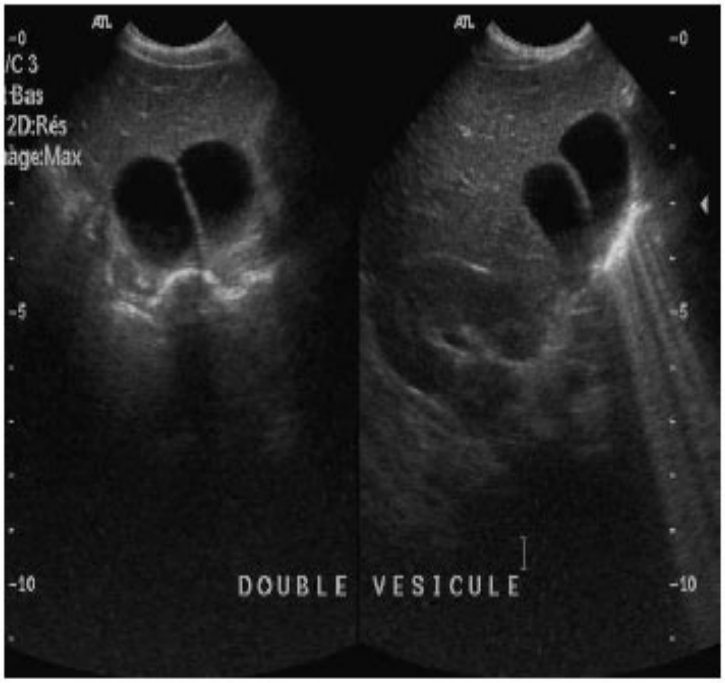


Figure :(2-10) Shows Double gall bladder (John .2007).

2.6.1.2Abnormal Shape:

2.6.1.2.1Phrygian cap or folded fundus:

In which the gall bladder fundus is constricted and turned back on itself and appears segmental on contrast studies. It is incidence is 2-6%

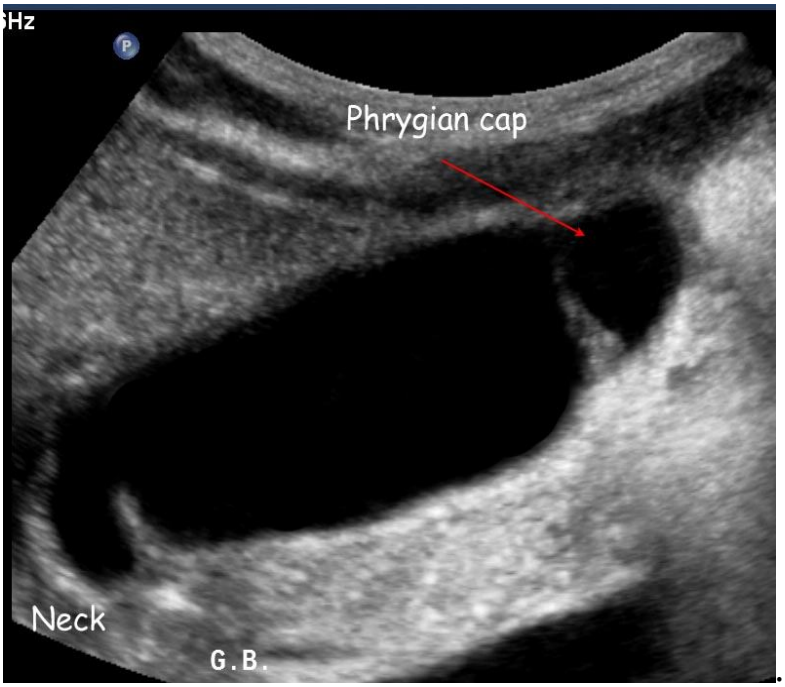


Figure :(2-11): Shows Phrygian (John. 2007)

2.6.1.2.2Bilobulated Gall Bladder:

This is an exaggerated form of the above

Figure (2- 12): Shows Bilobulated Gall bladder (Gladden . 2009)

2.6.1.2.3Hour glass Gall Bladder: septum which divided the GB into two cavities joined by a canal has been described as an hour glass gallbladder.

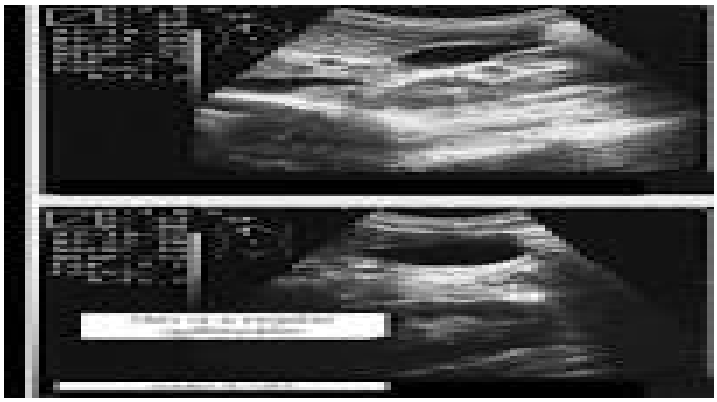


Figure :(2-13) Shows Hour Glass G.B(Beliby, 1967)

2.6.1.3. Abnormal position of Gall Bladder:

2.6.1.3.1Intra Hepatic Gall Bladder: it is so common that it is typically not even considered to be abnormal.(Hunter.2000).

Figure :(2-14)Shows intra hepatic g.b with stones(Hunter.2000)

2.6.1.3.2 Trans Position or left sided G.B:

It is found under the left liver lobe or in between the two lobes of the liver to the left of flaciform ligament. Occasionally, the gall bladder may lie to the left of flaciform ligament. This anomaly results from a failure during the rotational phase of embryonic development.(Beliby, 1967)

Figure :(2-15):Shows Left sided gall bladder(Beliby1967)

2.6.1.3.3Retro displacement of Gall Bladder:

Fundus extends back words into the free margin of the lesser omentum

(Hunter JB 2000).

2.6.1.3.4Trabeculated Gall Bladder: the gall bladder wall is sonly Mild thickened, and tenacious dark green and the mucosa of the gall bladder appear fibrotic with fire trabiculation. This leads to impaired function of gall bladder.

Figure :(2-16) Shows Gall Bladder Trabiculation(Ellis .2005)

2.6.1.3.5Floating Gall Bladder:

A common anomaly occurs when the Gall bladder is attached to the liver by a large mesentery.

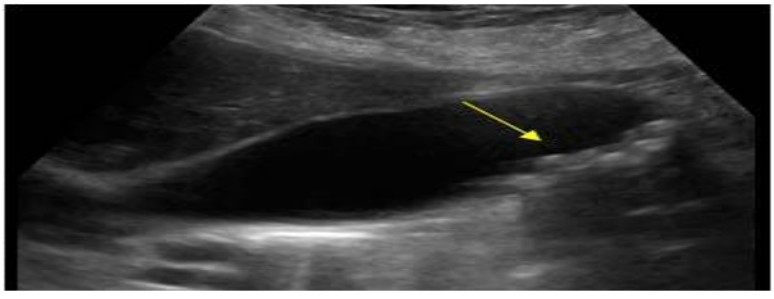
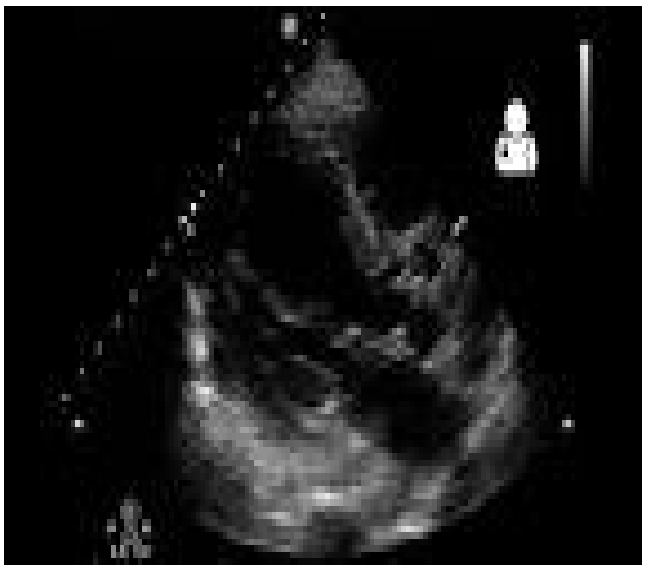


Figure :(2-17)Shows floating gall bladder(Beliby1967)

2.6.1.3.6Aphasia of the Gall Bladder:

Initially the gall bladder is a hollow organ, but, as a result of proliferation of its epithelial lining, it becomes temporarily solid. The defitcitive lumen develops by reconalisation of the epithelium when this failed to occur, the gall bladder remains atretic and does not develop. Agenesis was reported. (Beliby1967)



Figure(2-18) Shows AphasiaOf Gall bladder (Beliby1967)

2.6.2 Anomalies of Duct:

2.7.1 Accessory hepatic duct: Also known as bile duct of lushka and about 1-2mm in diameter. It may emerge more often from the right lobe to join the main hepatic duct or, rarely, the gall bladder itself.

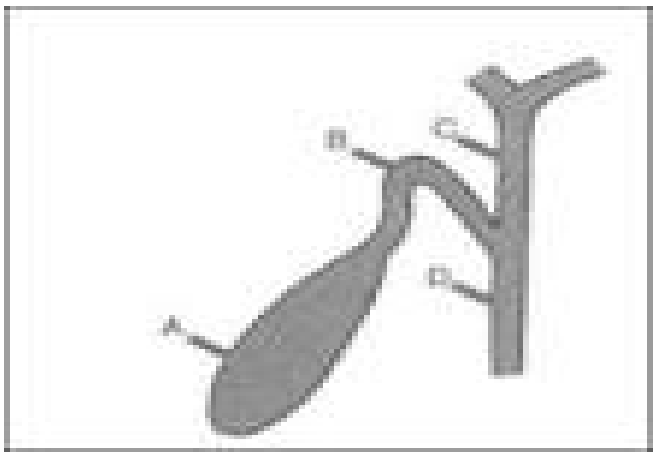


Figure (2-19): Shows Accessory hepatic Duct (Beliby.1967)

2.6.2.1 Extra Hepatic Biliary Artesia:

The extra hepatic duct goes through solid stage in the development. If the lumen fails to re open, the ducts will appears as narrow fibrous cord.

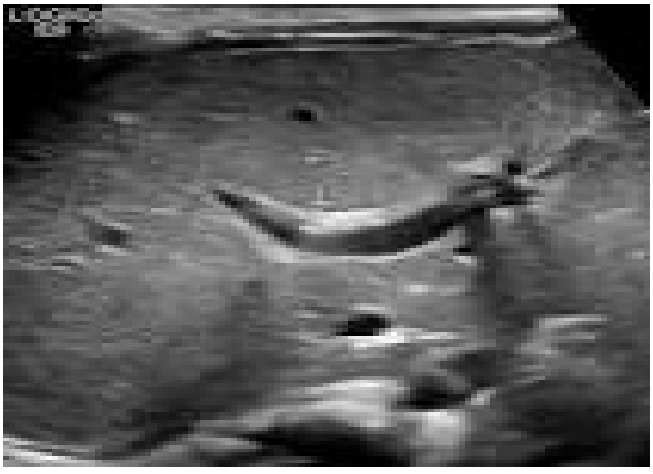


Figure (2- 20): Shows Extra hepatic biliary atresia (Beliby.1967).

2.6.2.2 Choledochal cyst:

Cystic disease may involve any portion of the intrahepatic or extra hepatic biliary tract. This is heterogeneous congenital disorder. These lesions are present in fewer than 1 in 50,000 patients.

It is more in females. Excision of the cyst as the treatment of choice. The highest population about 60% of the cases are diagnose in first 10 years of life. Female to male ratio is 4:1(Watts 2000).

2.6.2.3 Anomalies of the common bile Duct:

Both ducts may open independently into the ampulla of vater.

Both ducts may not join, but each may separately enter and discharge on the eminence of the duodenal papilla. Both ducts may join together extra duodenal to form a common duodenum, also common bile duct may be absent and this is very rare, the right and left hepatic ducts join the gall bladder and the duct draining the gall bladder takes the course of normal common bile duct to the duodenum.

The bile duct only.(Wats.2000).

2.7 Pathology of Gall bladder:

Ultra sound is an essential first line investigation in suspected gall bladder and biliary duct disease. It is highly sensitive, accurate and comparatively cheap and is the imaging modality of choice. Gall bladder pathology is common and in over s13% of the population is asymptomatic. Gall bladder pathology include:

2.7.1 Sludge “EchogeSludge characteristically display medium echogensity and is not associated with shadowing unless stones are present. Sludge type is divided into Sludge balls, Milk of calcium bile and Hemobilia. (Wats. 2000).

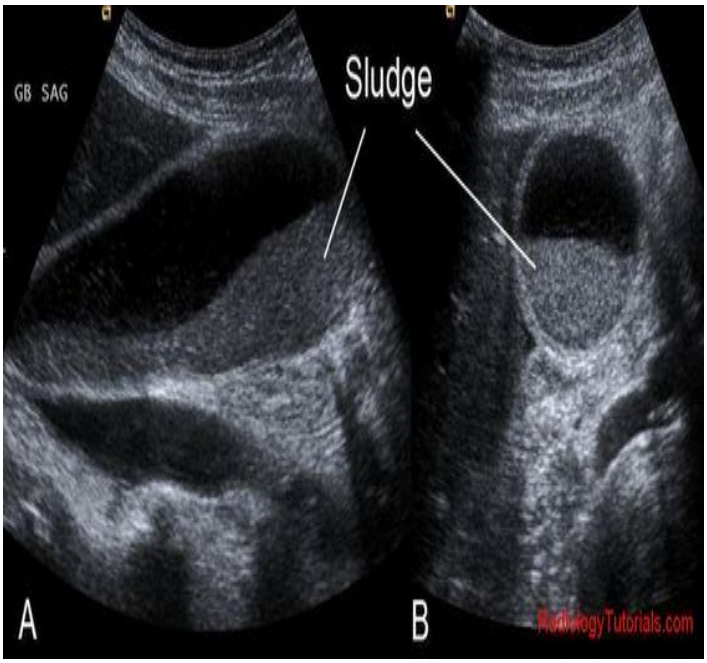
z 

Figure :(2-21)shows Sludge(Beliby1967)

2.7.2 Cholethithasis (gall stones):

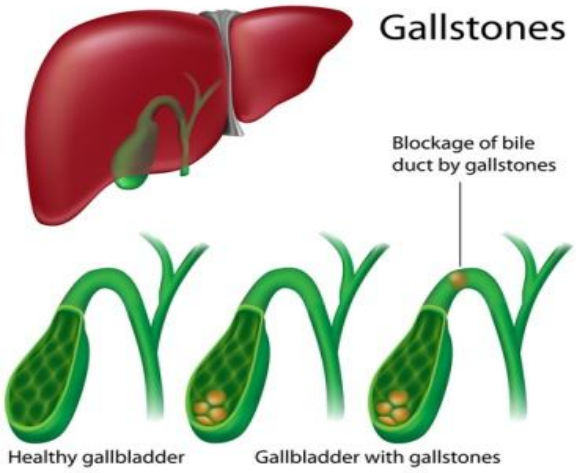


Figure (2- 22):Shows Area Of Gall stone Formation(Hunter1990)

This chapter focuses on path physiology and epidemiology of gall stone with the clinical disease of the gall bladder colic gall stone disease continues to be major shealth problem in the world. The major driving forces in litho genesis are cholesterol saturation of the bile and haemolysis. It is important to note that both cholesterol and unconjugated bilirubnin are virtually in soluble in water. the amount of cholesterol solublisied in the bile is about2 million times greater than its aqueous solubility. This solublistaiton is accomplished and dependent on the level of bile salts and to a lesser extent lecithin. Accordingly any super saturation of the bile by cholesterol relative to the bile salts and any increase in the unconjugated bilirubnin contents are lithogeni(John .2007).

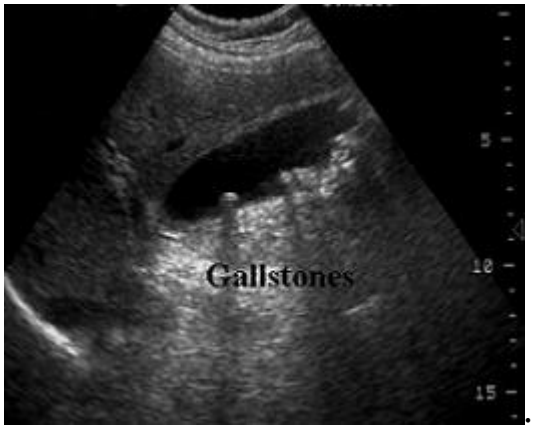


Figure :(2- 23) Shows Gall stone appearance (Hunter.1990)

Types of gall stones are cholesterol (most common), (pigment, and mixed stones. The formation of each type is caused by the crystallization of bile into stones. Cholesterol stones are the most common type of stone. Normally, bile acids, lecithin and phospholipids help to maintain cholesterol as a solute. Pigment stones, which comprise 15% of gall stones, are formed by the crystallization of calcium bilirubinate. Diseases that lead to increased destruction of red blood cells

(hemolysis), abnormal metabolism of hemoglobin (cirrhosis), or infectious) predispose people to pigment stones. Black stones and brown stones exist. Black stones are found in people with hemolytic disorders. Brown stones are found in the intra hepatic duct or extra hepatics. .(Hunter.1990))

There are three stages for gall stone formation. Cholesterol saturation, Nucleation and Stone Growth. Cholesterol saturation is due to excessive hepatic secretion of cholesterol into bile. There appear to be “bio chemical mosaic” of several defects in most gall stone patients that result in an expansion of the hepatic cholesterol pool destined for biliary excretion. Nucleation is the process by which the cholesterol monohydrate crystals form and aglomerate to become macroscopic.

There must be specific factors present or absent that promote or ret and the process of nucleation.(Berkely. 1998).

Gall stone formation occurs in concentration that approaches the limits of their solubility. When bile is concentrated in the gall bladder, it can become subsaturaed with these substances, which then precipitate from solution as microscopic crystals’ (Gladden. 2009)

In Mixed gall stones. Cholesterol gall stones may became colonized with bacteria and can elicit gall bladder mucosal inflammation. Patients having gall a stone presents in a number of different ways such as asymptomatic gall stones. It has been estimated that up to 50% of all patients with gall stones, regardless of the type, are asymptomatic.

Biliary colic post parandial right upper quadrant pain precipitated by a fatty or protein rich meal occurs 30 to 60 minutes after eating, lasts for several hours and then resolves. This constellation of symptoms is referred to as biliary colic it is the most common presentation. The pain of biliary generally in the right have pain

referred to inferior medial aspect of scapula or shoulder or to the mid- epigastrics. The onset of pain is related to impaction of stone in the cystic duct or Hartman, pouch, with obstruction to outflow of bile occurring secondarily. (Hunter1990).

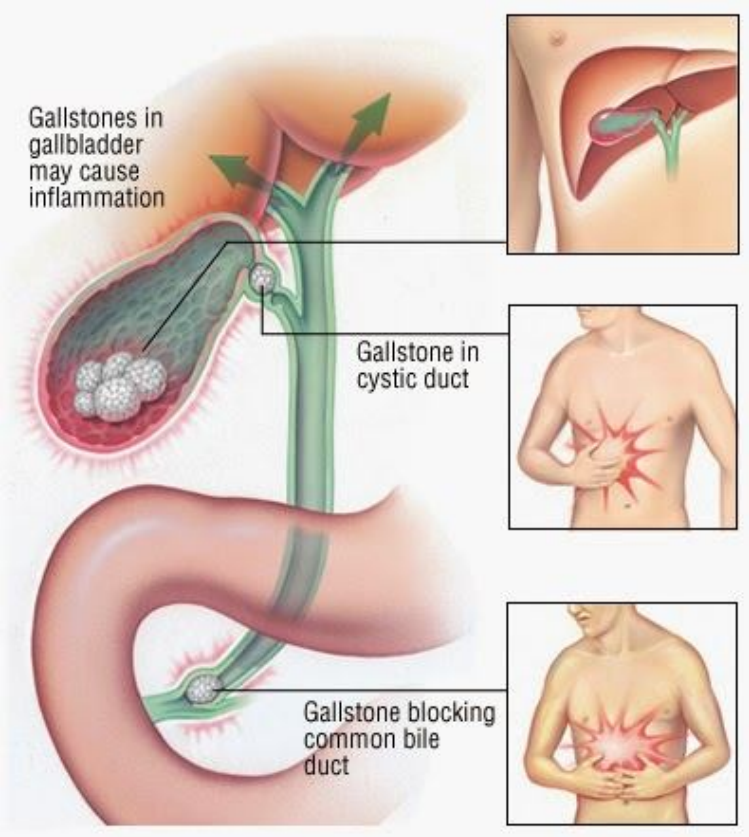


Figure :(2- 24): Shows Area Of Gall Stone Attack(Hunter1990)

Risk factors of Gall stone formation are Age, Sex, High fat diet, High cholesterol diet, Low fiber diet, Having family History of G B stone, Having Diabetes, Being American and Indian, Losing of weight very quickly , to be pregnant ant.(John .2007).

Gall stone is common after the age of forty and uncommon in children. If they do, they are more likely to have congenital anomalies, biliary anomalies, or hemolytic pigment stones. Gall stones are more common in women. Etiology may be due to variation of estrogen causing increased cholesterol secretion and progesterone causing bile stasis. Some oral contraceptive or estrogen replacement therapy may increase the gall stone risk they find that females are at least twice as “Lithogenic” as male. Fatty food can result in gall stones. This is cause what happened if you already have gall bladder stone and eat fat Weigh(Donald.1958.)

The genetics of gall stone is complex because a number of interacting genes regulate biliary cholesterol homeostasis during pregnancy, exactelyafter the first trimester of pregnancy. Gall bladder volume during fasting and residual volume after contraction were twice as large as they find it. In complete emptying of the gall bladder in late pregnancy leaves a large residual crystal retention which leads to gall stone formation.(Donald .1958)

Gall bladder features are highly reflective, mobile and cast a distal acoustic shadowing. In the majority of cases, all these properties are demonstrated. The reflective nature of the stone is enhanced by its being surrounded by echo-free bile. Calculi are more difficult to see when they are small (2-3 mm insize) and in small number. The gall bladder filled with stones (the “shell” sign) can be easily confused with air in the digestive tract, if the examiner is not sufficiently experienced. .(Donald.1958.)

Figure :(2-25) Show mobility of gall stone**(**Desantiet al2000)

A survey say that classical ultra sound appearance of the gall bladder lumen with posterior acoustic shadowing bladder stone is hyperechoicstructure, within the gall bladder lumen with posterior acoustic shadowing.

Figure :(2- 26) Shows gall stone shadowing**(**Desantietal .2000)

The ability to display a shadow posterior to stone depends upon the size of stone in relations to beam width. A shadow will occur when the stone fill the width of the beam this will happen easily with large stones but a small stone may occupy less space than the beam, allowing sound to continue behind it, so a shadow is not seen. (Beliby.1969).

2.7.3 Acute Chole cystitis:

Cholecystitis is defined as inflammation of the gall bladder and is frequently classified as acute or chronic. Acute cholecystitis is the most frequent complication of gallbladder neck or cystic duct. 50% have bacterial infection (E.coli, Entero Acute cholecystitis can be divided into either gall stone associated (acute calculus cholecystitis). Or non gall stone associated (a cute acalculuscholecystitis). .(Donald .1958)

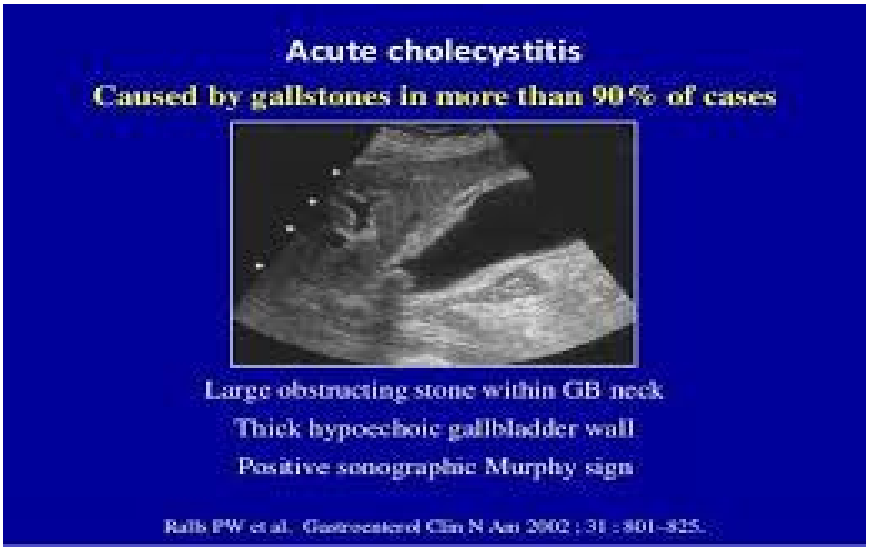


Figure :(2- 27)Shows AcuteChole cystitis(Hunter1990)

Complications of acute Chole cystitis are Gangrene,Perforation,chronic and

Empyaema. Gangrenous Cholecystitis a small percentage of patient, acute gall bladder inflammation progresses to gangrenous cholecystitis. Area of necrosis developed within the gall bladder wall, the wall itself may bleed and small abscesses formation. (Gladden. 2009)

2.7.4Perforation of the gall bladder:

Site of perforation is either at the fundus which is farthest away

From the blood supply or less commonly at the neck from the pressure.

Figure :(2- 28) Shows Gall Bladder Perforation(Hunter1990)

2.7.5 Empyema of Gall bladder: It may be a sequel of A.C.C or the result of the mucocele coming infected. It has incidence of 2-3%. It present as tender mass in the right hypochondrium and usually, effect elderly patients in whom systemic signs, including pyrexia, and leucocytosis are minimal(Hunter1990)

2.7.6 Chronic Cholecystitis:

Chronic cholecystitis is sonongrphically characterized by an irregular thickened gall bladder wall, mainly caused by chronic inflammation and intermittent obstruction of gall bladder neck/ cystic duct gall stone often cause biliary colic. .(Donald .1958)

2.7.7 Gall Bladder Polyps:

Benign gall bladder tumors' are divided into: adenoma of gall bladder (typically) demonstrating central vessels penetrating the polyp using Doppler imaging), myosis, cholesterol polyps (containing cholesterol vessels), hyper plastic/ met plastic polyps, granular cell tumors.(Hunter2000)

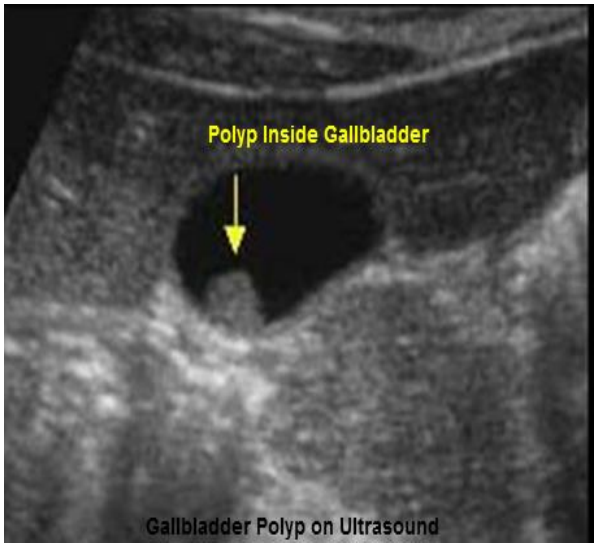


Figure :(2- 29) Shows Gall Bladder polyp.(Berkely. 1998).

2.7.8 Gall Bladder Carcinoma:

Gall bladder carcinoma is rare but highly fatal malignancy, associated in almost 100% of the cases with cholecystolithiasis and is more frequent in patients older than 60 years, the risk of developing gall bladder cancer in patient with gall bladder stones is 0.3% over 30 years and the published data suggest a much higher cancer risk in stones larger than 3cm. .(Christoph. 2000)

Figure :(2-30)shows Gallbladder Carcinoma(Besset etal.1988).

2.7.9 Hydrop of the gall bladder:

An abdominal distention of the gallbladder with fluid. The gall bladder can be distended with mucus or with pus. Anomaly sized gall bladder usually maintains.

Figure :(2- 31):Shows Gall Bladder Hydrop(Berkely . 1998)

2.7.10 Porcelain gall bladder:

It is found in 0.5% of cholecystectomy. The association (> 20%) with gall bladder carcinoma is well known. There for cholecystectomy is indicated when a porcelain gall bladder is diagnosed on ultrasound.

Figure :(32): Shows porcelain Gall Bladder (Ellis. 2007)

2.7.11 Typhoid Gall bladder: Occasionally, salmonella typhodium can infect the gall bladder. Acute cholecystitis can occur. more frequently, being a typhoid carrier excreting the bacteria in the bile. Gall stone may be presents. (Gladden. 2009)

2.8 Pathology of biliary Duct and Biliary tree:

2.8.1 Choledochlethiasis:

Appearance of Gall stone in the bile duct obstruction of the CBD by gall stones leads to symptoms and complications that include pain, jaundice, cholangitis, pan certainties and sepsis. (Beliby. 1967)

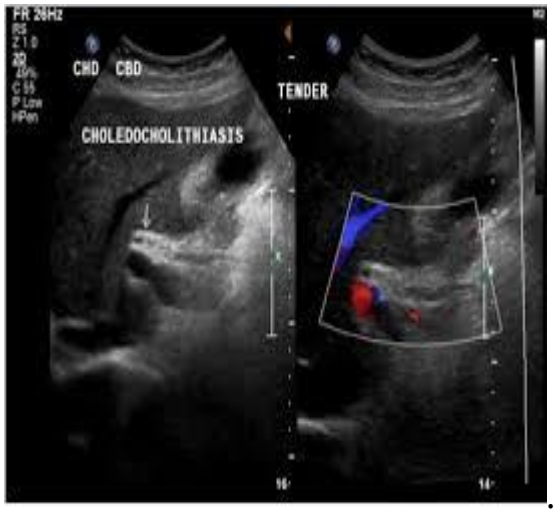


Figure :(2- 33):Shows choledochlethiasis(Beliby. 1967)

2.8.2 Choledochal cyst:

Choledochal cysts are congenital bile duct anomalies. These cystic dilatation of the biliary tree can involve the extra hepatic biliary radicals, intrahepatic biliary radicals, or both. Berkely.1998)

Figure :(2-34)Shows choledochal cyst(Beliby. 1967)

Table (2-2) Todani classification for choledochal cyst:

Type	Description
Type 1	Segmental or diffuse fusiform dilatation of common bile duct (50-90%)
Type 2	Diverticulum of CBD
Type 3	Dilation of inraduodend CBD
Type 4	Multiple extra hepatic bile ducts cysts
Type 5	One or more cysts of intra hepatic ducts (Carole's disease)

2.8.3 Choloangio Carcinoma:

CholeAngioCarcinoma are malignancy of the biliary duct. Originating in the liver and terminating at the ampulla of vater. It is of 3 categories.

Intra hepatic, extra hepatic and distal hepatic or extrahepaitic biliary epithelium..(Beliby. 1967)

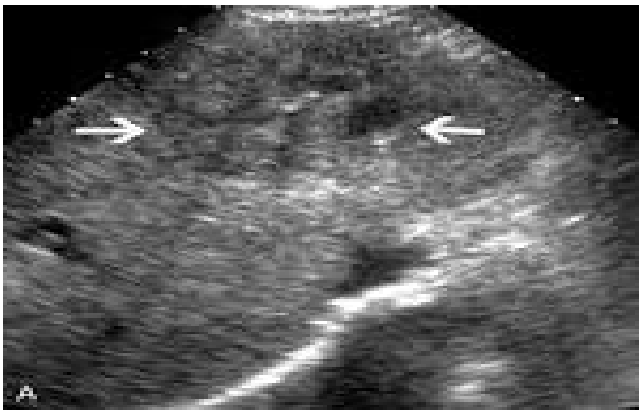


Figure (2-35); Shows CholeAngioCarcinoma.(Beliby. 1969)

Table (2-3) Showed clacification of CholeAngioCarcinoma

Bismuth corlette – c	Description
I	Tumors below the left and right hepatic duct con flounce
II	Tumors stretching the confluence
III	Tumors occluding Common hepatic duct
VI	Tumors involved right and left hepatic duct

2.8.4 Biliary tract dilatationDilatation of The point of the union ofcystic duct sand the common hepatic duct can’t be exactly defined on ultrasound.

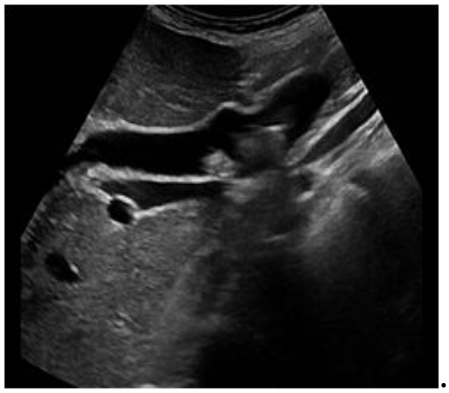


Figure (2-36): shows Biliary Tract dilatation. (Gladden. 2009)

2.8.5 Primary sclerosing cholangitis:

Is chronic inflammatory liver disease characterized by progressive fibrosis and destruction of the inra- and extra hepatic biliary tree leading to stricturing of the intra hepatic and/ or extra hepatic bile ducts(Donald .1958.)

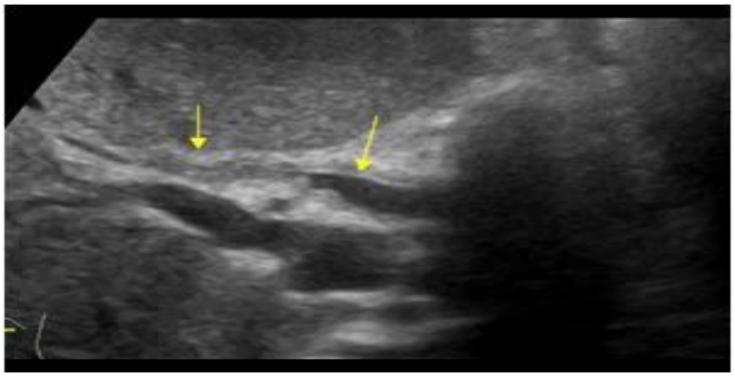


Figure: (2- 37) shows: Primarysclerosingcholangitis (Beliby.1967)

2.8.6 Secondarysclerosingcholagnitis:

Decades ago secondary sclerosing cholangitis was much more common than primary type. Typical cause is biliary obstruction caused by post operative, choledochlethiasis, chronic pancreatitis, choledochal cyst or biliary atresia. (Beliby.1967)

2-9 Imaging modalities of gall stone:

2.9.1 Radiology:

Stone are radio opaque and visible on x-ray 10-30% of instances,

Calcium or pigment stone are more likely to be observed on x-ray,

A porcelain gall bladder is seen on the plain film are aring of calcium lining the gall bladder wall. Milk of calcium bile has fairly characteristic appearances. The abdominal plain radiograph the following signs should be assessed: GB enlargement, opacities projects over the GB, linear calcification in GB wall, focal gas and air- fluid level in gallbladderlumen. The degree of confidence of plain Abdominal x-ray findings is that usefully undifferentiating between GB disease and not and Ac. The role of plain radiograph has been superseded by ultrasongoraphy.(WatKins.1999)

Figure (2-38):Shows Gall Stone In Plain Radiograph. .(Beliby, 1967)

2.9.2 Ultra sound:

Ultrasound is the technique which answers most of clinical questions posed in patient with suspected gall stone and biliary tract pathology.

It is often the only investigation necessary in confirming calculus disease. It is sensitivity in detection of gall stone mean that careful correlation between clinical presentation and ultrasound finding had to be made to insure that unnecessary treatment is not carried out particularly cholecystectomy in patient with gall stones as an incidental finding. In most cases ultra sound is the first imaging test for gall bladder stone. This test is non- invasive, using no good images for gall bladder and the small ducts. In the liver and the higher Part of the major bile duct.however the lower part of the duct, where it enters the GI tract, is where gall stones often get stuck. Ultra sound image is extremely safe, It give a clear picture of soft tissues that don't show up in x-ray image..*(Berkely.1998)*

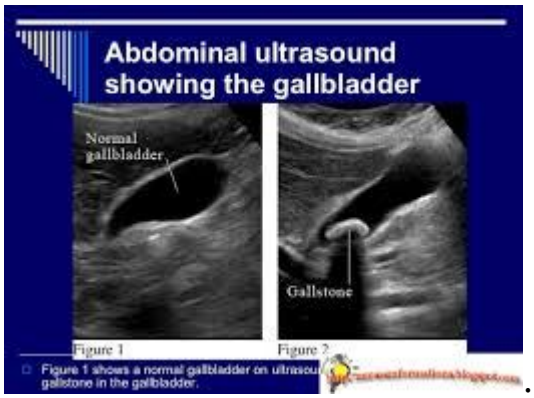


Figure (2- 39)Shows Normal Gall Stone Appearances(Beliby, 19)

2.9.3 Computerized Tomography:

The recent advent of non surgical treatment of gall stones requires accurate in vivo analysis for their chemical composition in order to select the best candidate. Those results were correlated with in vitro lithotripsy of gall stones. CT appearances were

classified as follows: laminated (43%), dense (32%), rimmed (11%), isodense (8%) and faint (6%). The contents, As the CT density increased, the calcium contents in gall stones density were well correlated with their chemical composition, there for invio CT examination for ESWL candidates are desirable. .(Beliby, 1967)

Table (2-4) Distribution of CT pattern of Gall stones:

Pattern	Total stone population
Dense	32%
Laminated	43%
Rimmed	11%
Isodense	8%
Faint	6%

2.9.4 Magnetic Resonanance imaging:

This may carried out to look for gall stone. This type of scan use strong magnetic fields and radio waves to produce detailed images of the inside of the body. For an MRI test pt is placed inside the magnet so that the body is inside the strong magnetic field. MRI can find changes in the structure of organ of other tissues. (Hodge.et al 2002).

 .

Figure (2-40): Shows Gall Stone In MRI..*(Berkely. 1998)*

2.9.5Endoscopic Retrograde Cholangiopancreatography (ERCP):

It is often performed by gastroenterologist or surgeons, this test involve putting a table into the patient mouth, down the throat, into the stomach, through the duodenum and then, into the common bile duct. ERCPCS performed with the pt sedate. Looking through the tube, we can able to the bile comes in from the CBD. A smaller tube or catheter is passed through this hole and contrast material is injected. Hodge.et al 2000).

Figure :(2-41): Shows Gall Stone In ERCP (Beliby1976)

2.9.6 Magnetic Resonance cholangiopancreatography MRCP:

It is a new technology being employed for gall stone detection. This noninvasive diagnostic procedure is performed using MRI technology that uses magnets and radio waves to produce computer images of the bile ducts. Pts are not required to undergone endoscopy preparation and they don't under – primarily in patients who may have failed or who are not good candidates for ERCP, in those who don't want to undergo an Endoscope procedure, and in individual an Endoscope procedure, and in individuals considered to be at low risk of having a bile duct disorder

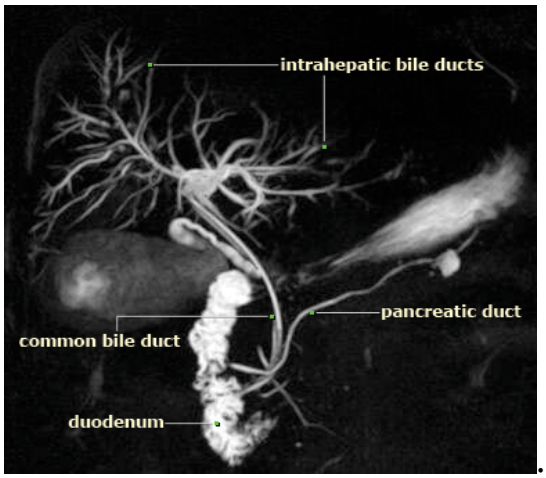


Figure: shows (2- 42): Showed MRCP (Beliby1976)

2.9.7Scintgraphy Technetium 99m (^{99m} TC):

Hepatoiminodiacetic acid (HIDA) Scintgraphy is occasionally useful in the differential diagnosis of acute abdominal pain. it is highly accurate forthediagnosisof cysticductobstruction. (Beliby1976)

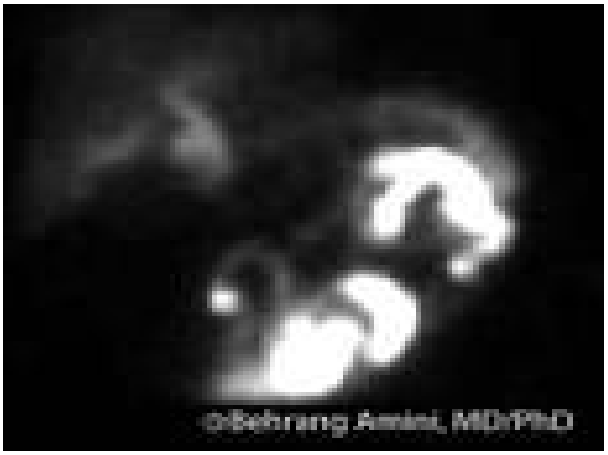


Figure (2-43)ShowsHida scan Beliby(1976)

2.9.8 Percutanious Trans hepatic chol angiography (PTC):

It is the modality of choice in patients in whom ERCP is difficult e.g., those with previous gastric surgery or distal obstructing CBD stone, in the absence of an experienced endoscopies, and in pt with extensive intra hepatic duct stone disease. Along large – bore needle is advanced percutanoesly and transpehatcially into an intra hepatic duct and cholangiography is performed. Catheter can be placed in the biliary tree over a guide wire.(Beliby, 1967)

Figure (2-44); Shows PTC.(Beliby, 1967)

2-10 Previous studies :

Astudy done by Shaffer EA in 2005 to evaluate the relation ship between gall stone formation and gender .Among 60 patients with typical signs and symptoms of gall bladder stone reported that females patients has amostcomplling association with gall stone disease .75% of patients were females ,while 25% were males ,especially females during fertile life .Woman are almost twice as likely as mens to form gall stones.

Relation of gall bladder stone formation and obesity was discussed in 2006 by Carroll M . This study showed that the explonding prevalence of obesity was reach epidemic level in both developed and developing nations ,like Africa ,obesity is awell established risk factors for gall stone formation .The study was done in 100 patients ,of them there was 60 females and 40 males .Their weight was between 65-120KG in womens and 50-85KG in mens.The result was increasing of gall stones incidence in womens of 80-200 KG .

Cruz F in 1993 found that during pregnancy the percentage of women suffering from gall stone attack was increased. When female sex hormones increase, it leads to form biliary sludge which consist of cholesterol and calcium bilirubinate that will increase the risk of gall stone disease .

Abdallah et al in 2004 were conducted at the diabetes centre at Khartoum bahri, they study 80 diabetes patient in insulin. The result was increasing of gall stone incidence among this patients .They find that insulin resistance is predispose to cholesterol stone formation and impaired the gall bladder motility.

One study of nursing home residence, Ann j in 2003 reported that 66% of the women and 51% of the men had gall stones .men who have their gall bladder removed are more likely to have severe diseases and surgical complications s than

women .About 20% of men have gall stones by the time they reach age 75 .Chapter Three: Materials &Methods

3.1 Materials:

3.1.1Patients Sample:

Fifty (50) participant, comprising 20male and 30females, were investigated in Omdurman military hospital, between .Ultra sound examination of the gall bladder were performed in the ultra sound department.

The patients were divided into four groups according to age:

Group one (9-30)

Group two (31-50)

Group three (51-70)

Group four (71-90)

3.1.2 Machine used:.-

Model	Type of probe	Energy of probe
Esaote Europe B.V	Curvilinear	3.5-5MHZ
Esaote Shenzhen industry CO.,Ltd	Curvilinear	3.5-5MHZ
Siemens medical solution USA,Inc	Curvilinear	3.5-5MHZ

*All these machine have printer with thermal paper

Esaote Shenzhen industry CO.,Ltd

Siemens medical solution USA,Inc

Esaote Europe B.V

3.2Methods:

3-2-1Ultra sound Technique:Using a3.5-5MHZtransducer .initial right upper quadrants scan was performed to inspect the gall bladder and biliary tree. with the patient inleft lateral decubitus position ,further imaging of the gall bladder was carried out with the transducer positioned at about the right mid sub costal region to obtain longitudinal and transverse image of gall bladder. Graded compression at the right upper quadrant has been applied to confirm the Murphy's sign. Many images were printed on film. All data was stored in data collection sheet (questioner), ultra sound image and computer. Scanning gall bladder in two plane position and steeping from side to side.

3-2-2: patientPreperation: All patients were fasting for more than 8hours to avoid diagnostic errors, if patient is not well prepaired,repeat the scanning with an over night fasting.

3-2-3: Image Interpret ion: Every patient was scanned twice according to international guide line and protocols, first by the student, then by competent sonologist.

3-2-4 Data Analysis: In this study we used the statistical method spss for data entery; we analyzed our finding result and data by using statistical method. Also we designed different type of tables and graphs to analyzed our data and results

3-2-5 Data collection:. The data was collected sheet, other researches and references.

ChapterFour: Results

This study comprise of 50 patients developed gall bladder stone evaluated by ultra sound for a period of six months from march 2016 to august 2016 in Omdurmanmilitary hospital .

4-1Shows patient's distribution according to gender:

Gender	Frequency	Percentage%
Male	20	36
Female	30	64
Total	50	100

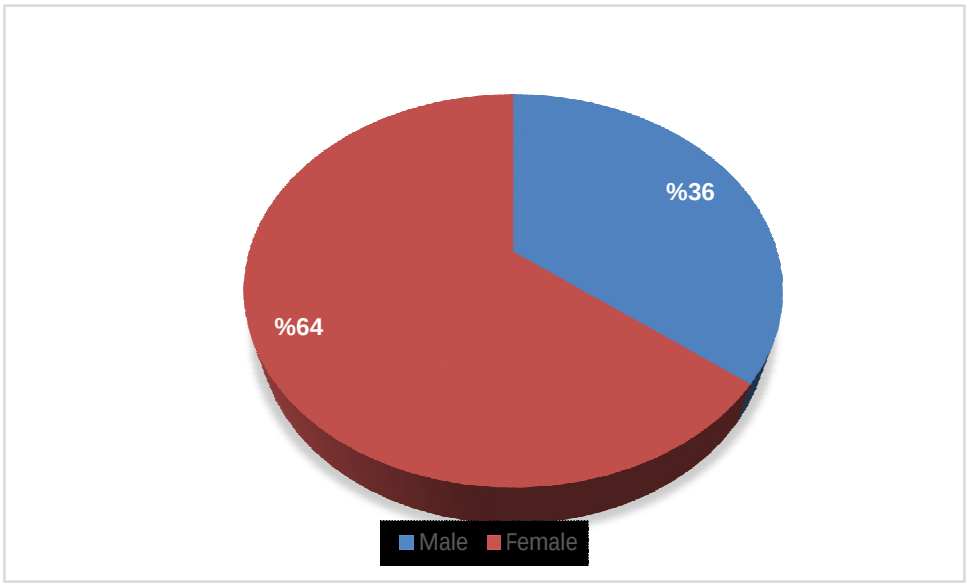


Figure 4.1 shows distribution of gender

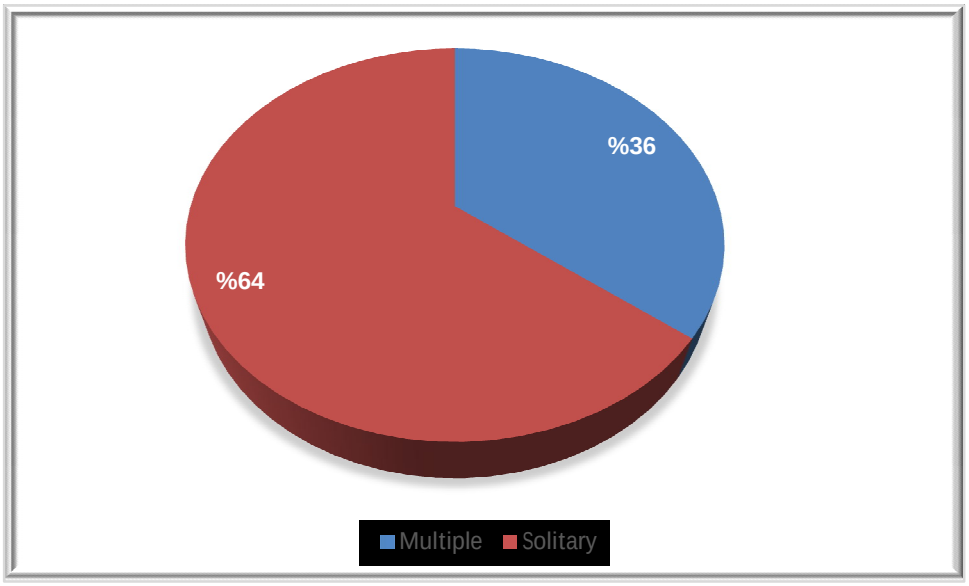


Figure 4.2 Shows clacification of gall stone according toit is type

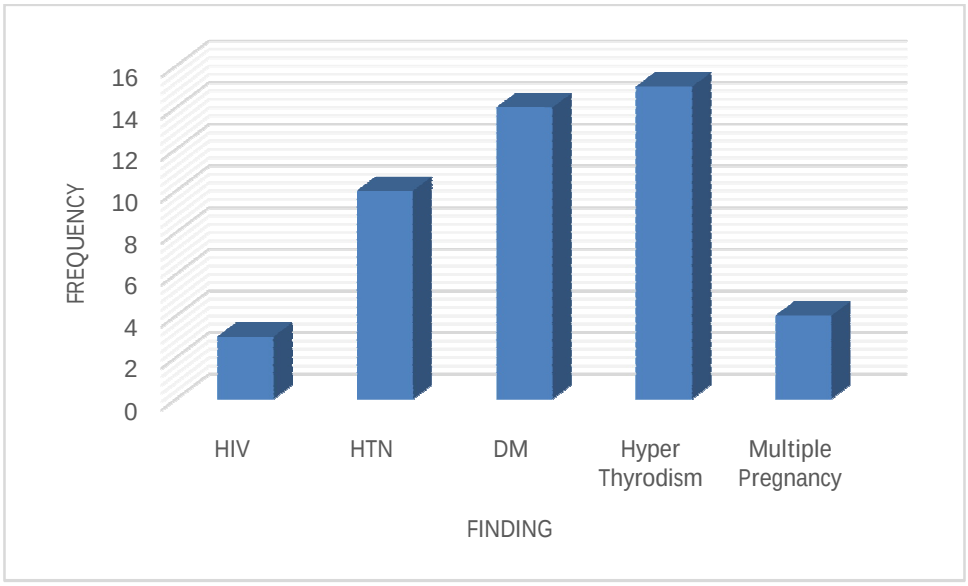


Figure 4.3 Shows distribution of patients according to diseases and other findings

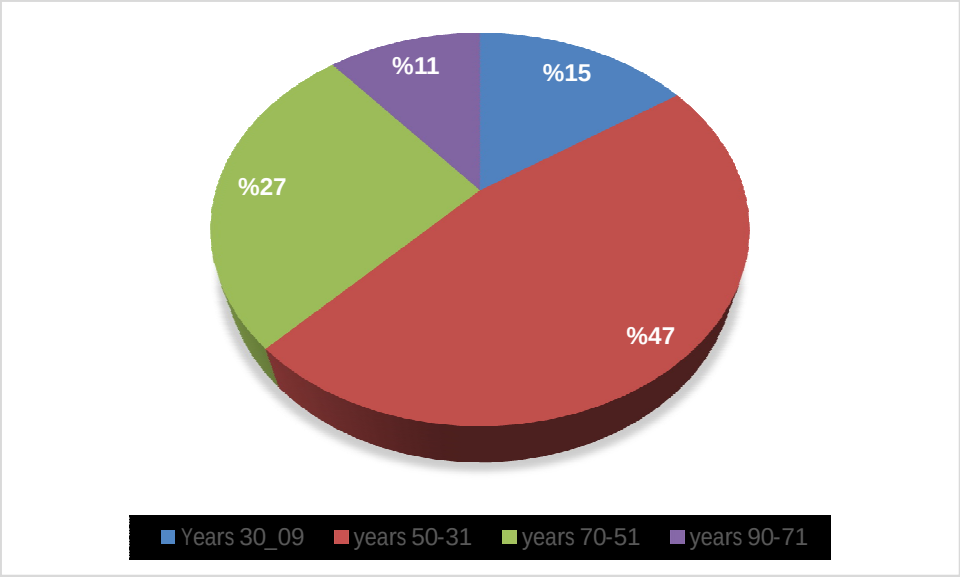


Figure 4.4 shows distribuation of patients according age group

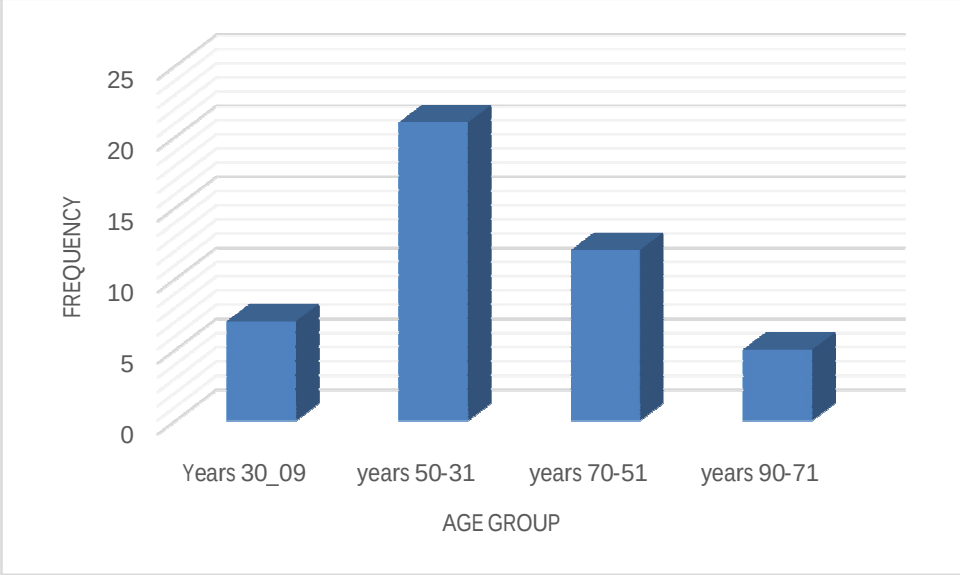


Figure 4.4 shows disstribuation of patients according age group

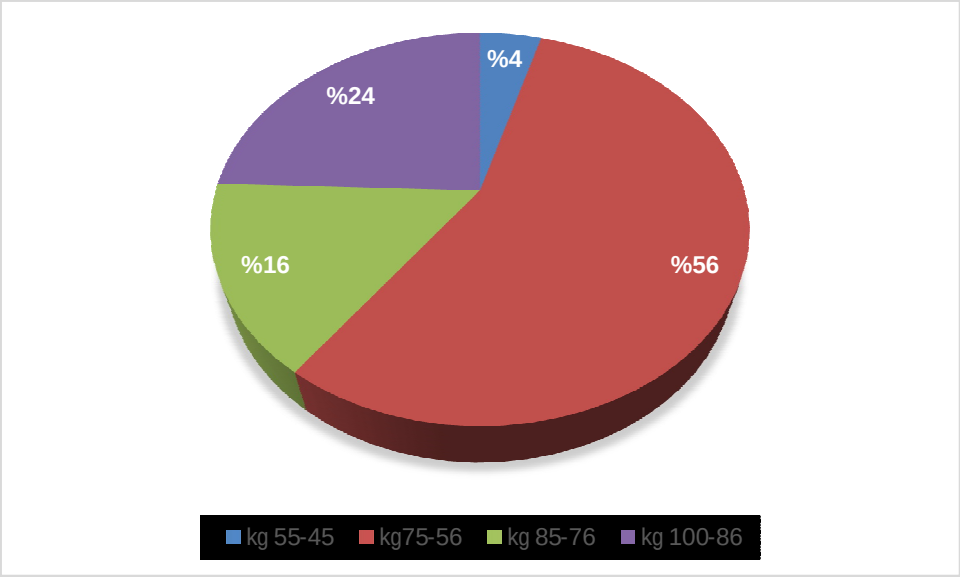


Figure 4.5 disstribuation of patients according to their wight

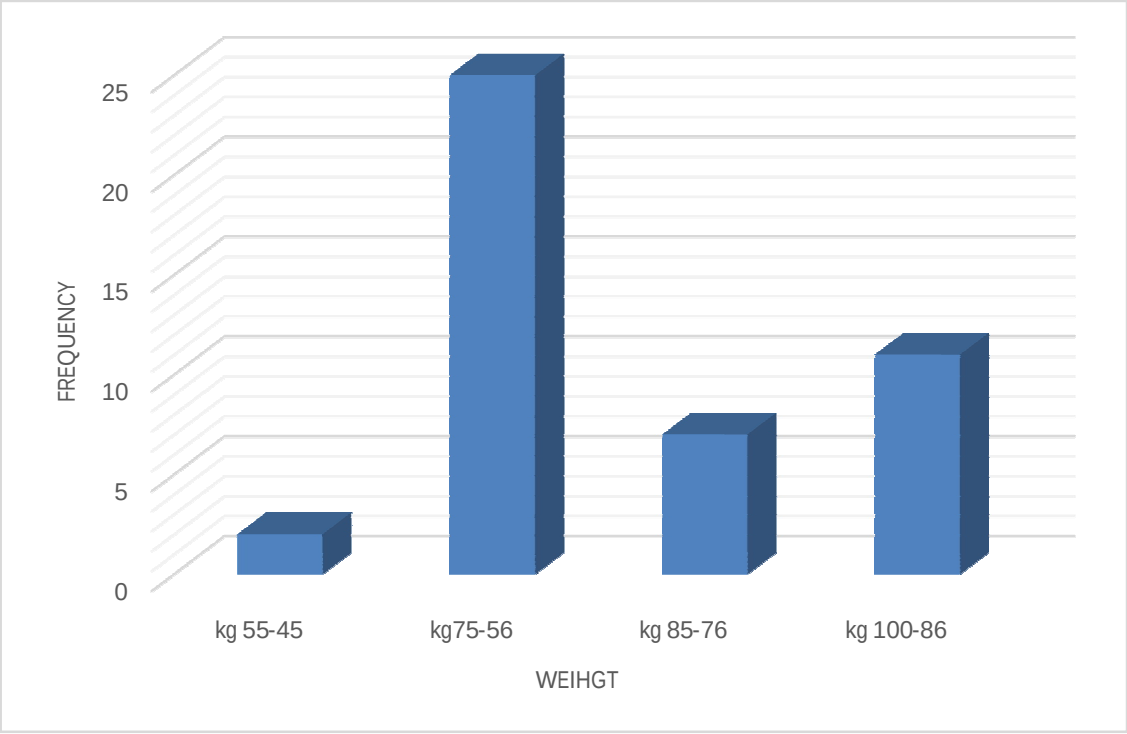


Figure 4.6 Shows distribuation of patients according to their wight

Chapter Five: Discussion, Conclusion and recommendations

5-1Discussion:

Of the 50patient with symptomatic gall stone, there was (64%) female patient and (36%) male. Table (4-1).

The high incidence of gall stone in age group (31-50) years. Figure(4-5). The study showed that female patients were found to be more affected than male. Figure (4-1).The youngest in our study was 9 years old while the younger was 86 years old. The study also showed most of gall stones were involving in age between (9-86) years. (47%) of cases between (31-50) years .Figure (4-4).

A study done by Shaffer EA in 2005 to evaluate the relationship between gall stone formation and gender .Among 60 patients with typical signs and symptoms of gall stone he reported that females patients has most compelling association with gall stone disease.75%of patients were females .while 25% were males, especially during fertile life women are almost twice as likely as men to form gall stones. (Shaffer EA 2005) .This results agree with those results in this study.

A study of Carroll M in 2006shows that the exploding prevalence of obesity was reach epidemic level in both developed and developing nations, like Africa ,obesity is well established risk factor for gall stone formation .At least 25 of morbidity inobese individual have evidence of gall bladder stone .Females with obesity have an even increased risk of gall stone .The study was done in 100patients ,of them there was 60 females and 40 males .their weight was between 65 _102KG in women and 50_85 KG for men .The result was increasing of gall stone incidence

in women of 80_100KG.(Carroll M .2006).This result is agree with the result of this research .

In figure (4-3) we observed increases of incidence of gall stone in female with multiple pregnancy .Cruz F in 1993found that during pregnancy the percentage of women suffering from gall stone attack was increased. When female sex hormones increase, itleads to form biliary sludge which consist of cholesterol and calcium bilirubinate that will increase the risk of gall stone disease (Cruz F. 1993).

Abdullah et al in 2004, were conducted at the diabetes centre at Khartoum bahri, they study 80 diabetes patient in insulin. The result was increasing of gall stone incidence among this patients .They find that insulin resistance is predispose to cholesterol stone formation and impaired the gall bladder motility.(Abdullah et al.2004).This was agree with the result of this research.

One study of nursing home residence, Ann j in 2003 reported that 66% of the women and 51% of the men had gall stones .men who have their gall bladder removed are more likely to have severe diseases and surgical complications s than women .About 20% of men have gall stones by the time they reach age 75.(Ann j. 2003).

5-2 Conclusion

The study concluded that ultra sound is valuable, non invasive method and the least expensive imaging modality and can be provide good information about presence of gall bladder stone.

The vast majority of patients in this study were female (64%) and the male were (36%) there was association between patientweight, age and gall bladder stone appearance.

There is also relationship between gall stone, diabetic, hypertensive and multiple pregnancy.

The study showedthat most of gall stone involved in the age group between (31-50) years.

In female Obesity, sudden weight loss, hormone replacement therapy and multiple pregnancy are gall stone causes.

Ultra sound can be used by bed-side of severely ill patients

5-3 Recommendations

-Being save,cheap,available,saving time and easy to operate ultrasound scanning is recommended for patient with gallbladder s stone.

-Abdominal ultrasound scanning is significant for relevant findings relating to causes, sign and symptoms of gall stone, inorder to improve patient care and save hospital resources.

_Ultrasound is an operator dependant investigation so that operators should updated their knowledge about technique and any information that will improve their skills.

-Doppler ultra sound should be performed because we can early detect the possibility of gallbladder cancer.

_Gall bladder should be examined in fasting state, because it can be difficult tovisualize or give false diagnosis in non fasting patients

_We recommended that we should make available data for researchers; this will be achieved by making an ideal ultrasound department with modern system saving all patients data

_Always we should take patient history including previous cancer, any related diseases, bloodresults, family history and past surgery.

_Performing an initial over all scan without imaging to get an idea what pathology there might be and how it might relate to the patient current complain.

_Further researches should be done, likethat we can reach to quick diagnosis anddecisions.

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