بسم الله الرحمن الرحيم

Sudan University of since and technology

Collage of graduate studies

Characterization of abdominal organs in patient with portal hypertension using ultrasound

وصف اعضاء البطن لدي مرضي ارتفاع ضغط الدم البابي بأستخدام الموجات فوق الصوتية

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

By:

Rania Mahmoud Ibrahim

Supervisor:

Dr. Mona Mohamed Ahmed

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الآية

قال تعالي:

﴿اللَّهُ لاَ إِلَٰهَ إِلاَّ هُوَ الْحَيُّ الْقَيُّومُ لاَ تَأْخُذُهُ سِنَةٌ وَلاَ نَوْمٌ لَّهُ مَا فِي السَّمَاوَاتِ وَمَا فِي الأَرْضِ مَن ذَا الَّذِي يَشْفَعُ عِنْدَهُ إِلاَّ بِإِذْنِهِ يَعْلَمُ مَا بَيْنَ أَيْدِيهِمْ وَمَا خَلْفَهُمْ وَلاَ يُحِيطُونَ بِشَيْءٍ مِّنْ عِلْمِهِ إِلاَّ بِمَا شَاء وَسِعَ كُرْسِيُّهُ السَّمَاوَاتِ وَالأَرْضَ وَلاَ يَؤُودُهُ حِفْظُهُمَا وَهُوَ الْعَلِيُّ الْعَظِيمُ﴾

سورة البقرة (255)

DEDICATION

To my family

To my college

To my supervisor

Acknowledgment

Grateful thanks and grace to Allah for guiding and helping me finishing this research.

I would like also to express sincere thanks and gratitude to my supervisor dr. Mona Mohammed Ahmed for his knee supervision, guidance, and valuable comments and support the idea of this research until finishing.

Abstract

This descriptive study was conducted to assess the portal vein diameter with portal hypertension in Sudanese population in Khartoum state. 50 subjective (female 11, male 39) were enrolled in the study, their age ranged between 30 -90 years old. Abdominal ultrasound was performed with real time ultrasound machine using a 3.5 MHz transducer.

The result of the study showed that overall mean diameter of portal vein with portal hypertension was (15.61) mm.with minimum diameter (7) mm,maximum (24) mmand Std. Deviation (3.952) mm .the splenic vein diameter mean (12.10) mm. with minimum(7)mm, maximum(22)mm and Std. Deviation(3.253)mm.the spleen length mean was (16.24)cm. with minimum (11)cm, maximum(22)cm and Std. Deviation(2.454).

There strong correlation between portal vein diameter, splenic vein diameter and spleen length increase the portal vein diameter increase.

The study recommended further study with larger sample size and further evaluation.

ملخص الدراسة

أجريت ه الدراسة الوصفية لمعرفة متوسط الوريد البابي الكبدي لدي مرضي ارتفاع ضغط الدم البابي لدى السودانيين **في** ولاية الخرطوم . تم إجراء فحص موجات فوق الصوتية للبطن لعدد خمسين فرد في الفترة من شهر أغسطس الي سبتمبر للعام 2018 , تتراوح اعمارهم بين 30–90 عاما كان عدد النساء11 وعدد الرجال 39 .

تم المسح بأستخدام جهاز موجات فوق الصوتية مع خاصية (الزمن الحقيق) المتاح تجاريا بأستخدام محول 3.5 ميغاهيرز.

أظهرت الدراسة ان متوسط قطر الوريد البابي الكبدي لدي مرضي ارتفاع ضغط الدم البابي (15.61)ملم مع الحد الادني(7) ملم والحد الاقصي(24) ملم بإنحرغف معياري (3.952) ملم . ومتوسط قطر الوريد الطوحالي

(12.10) ملم مع الحد الأدني (7) ملم والحد الاقصي (22) ملم . ومتوسط طول الطوحال (16.24) سم , مع الحد الادني (11)سم والحد الاعلي (22) سم وإنحراف معياري (2.454) سم.

خلصت الدراسة أن هنالك علاقة قوية بين قطر و الوريد الكبدي وقطر الوريد الطوحالي وطول الطوحال.

ولقد اوصت الدراسة بعمل دراسات أخري بزيادة العينات وإعادة تقييم قطر الوريد البابي.

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List of abbreviations

Abbreviation	Full Name
HV	Hepatic vein
IMV	Inferior mesenteric vein
IVC	Inferior vena cava
MHz	Mega hertz
PV	Portal vein
SMV	Superior mesenteric vein
SV	Splenic vein

Chapter One

Introduction

Chapter one

1.1 introductions:

The liver receives a dual blood supply from both the portal vein and hepatic artery (Rumack, 2018). The main portal vein enters the liver at the porta hepatis, also referred to as the liver hilum(Steven M. pnnry, 2011). Although the portal vein carries incompletely oxygenated (80%) venous blood from intestines and spleen, it supplies up to half the oxygen requirements of the hepatocytes because of its greater flow.

The portal triad contains branch of the portal vein, hepatic artery, and bile duct. These are contained within a connective tissue sheath that gives the portal vein an echogenic wall on sonography and that distinguishes it from hepatic veins, which have an almost imperceptible wall (Rumac, k2018).

The main portal vein divides into right and left branches. The right portal vein, like the right hepatic lobe, is separated into anterior and posterior division. The left portal vein, like the left hepatic lobe, is separated into medial and lateral division, the left portal vein initially courses the caudate lobe. These vessels supply blood to their related segments.

The diameter of the main portal vein can vary with respiration, although typically measures less than 13mm in the anterioposterioer dimension. Enlargement of the portal vein is indicative of portal hypertension. Normal portal vein decrease in size as they approach the diaphragm.

Normal flow within the portal vein should be hepatopetal and monophasic, with some variation noted with respiratory changes and after meals (Rumack, 2018).

Portal hypertension (pht); is the elevation of the blood pressure within the portal venous system (Steven M. pnnry, 2011). also define as wedged hepatic vein pressure,or direct portal vein pressure more than 5mm Hg greater than IVC pressure ,or spelenic vein pressure greater than15mmHg(Rumack, 2018).

Normal flow toward the liver within the PV termed hepatopetal , but in the PHT the flow becomes reversed ,which is termed hepatofugal .these abnormal flow patterns result in the development of collaterals and varicosities within the abdomen.

In PHT the diameter of PV is enlarged exceed 13mm in the antroposterioer dimension, and SMV will exceed 10mm (Steven M pnnry, 2011).

Ultrasound is an imaging technology that uses high- frequency (non-ionizing mechanical and longitudinal sound waves) to characterize tissue. It is a useful and flexible modality in medical imaging, and often provides an additional or unique characterization of tissue, compared with other modalities. Ultrasound relies on properties of acoustic physics (compression, refraction, reflection, impedance, etc) to localize and characterize different tissue types. The frequency of ultrasound waves use in medical ultrasound is in the range of millions of cycles per second (megahertz, MHz). in contrast, the upper range of audible frequencies' for human is around 20 thousand cycles per second (20KHz).

An ultrasound transducer sends an ultrasound plus into tissue and then receives echo back.

1.2 Problem of study:

Portal hypertension is most common in the world and one of the causes of death due to related the liver disease. The portal hypertension (PHT) has many causes. Because of many diseases affect portal vein (PV) manifested as dilated or compressed.

1.3 Objective of study:

1-3-1 General objective:

To assess abdominal organs(liver and spleen)w in patient with portal hypertension using ultrasonography.

1-3-2 specific objective:

I. To determine the causes of portal hypertension.
II. The most age and gender affected.
III. To assess the size of portal and splenic vein.
IV. To assess the caudate lobe size, liver size, shape, echotexture and echogenicity.
V. Spleen size and echogenicity.
VI. To determine complication this occurs as result such as presence of avarices and ascites..
VII. To correlate causes with region from which the patient come, causes and splenic portal vein size.

1.4 Over view of study:

This study contain five chapters ,chapter one deal with the introduction, chapter two include studies, chapter three detailed the materials and methods, chapter four present the result and chapter five present the discussion, conclusion and recommendation, references and appendices.

Chapter two

Literature review

Chapter two

Literature review

2.1. Theoretical backgrounds:

2.1.1. Anatomy of the portal vein:

The portal vein (pv) is formed posterior to the pancreas by the union of the superior mesenteric vein and splenic veins at the level of l2. Its trunk is 5 to 7 cm in length). The portal vein courses posterior to the First portion of the duodenum and then between the Layers of the lesser omentum to the porta hepatis, where it bifurcates into its hepatic branches. It carries blood from the intestinal tract to the liver by means of its two main branches: the right and left portal veins. It drains blood from the gastrointestinal tract, from the lower end of the esophagus to the upper end of the anal canal, and from the pancreas, gallbladder, bile ducts, and Spleen. The portal vein has an anastomosis with the Esophageal veins, rectal venous plexus, and superficial Abdominal veins. The portal venous blood traverses the liver and drains into the inferior vena cava via the hepatic veins; the liver receives a dual blood supply from the portal vein and the hepatic artery. The portal vein supplies up longitudinal image of the hepatic vein draining the liver into the inferior vena cava. Note the thin-walled hepatic vein,(hv) compared with the thicker wall of the portal vein (pv).The portal vein or hepatic portal vein is blood vessel that carries blood from the gastrointestinal tract and spleen to the liver .this blood is rich in nutrients, it also filter toxins that may have been ingested with the food. 75% of total liver blood flow through the portal vein, with remainder coming from the hepatic artery the blood leaves the liver to the heart in the hepatic veins. (Henry gray 1901).

is the portal vein is not true vein, because it conducts blood to capillary beds in the liver and not directly to the heart. It is major component of the hepatic portal system, one of the two portal veins system in the body – with the hypophyseal portal system being the other (Henry gray, 1901).

The portal vein is usually formed by confluence of the superior mesenteric and splenic veins and also receives blood from inferior mesenteric, gastric, and cystic veins (Henry gray, 1901).

Conditions involving the portal vein cause considerable illness and death. An important example of such a condition is elevated blood pressure in portal vein. This condition, called portal hypertension major complication of cirrhosis (Henry gray 1901).

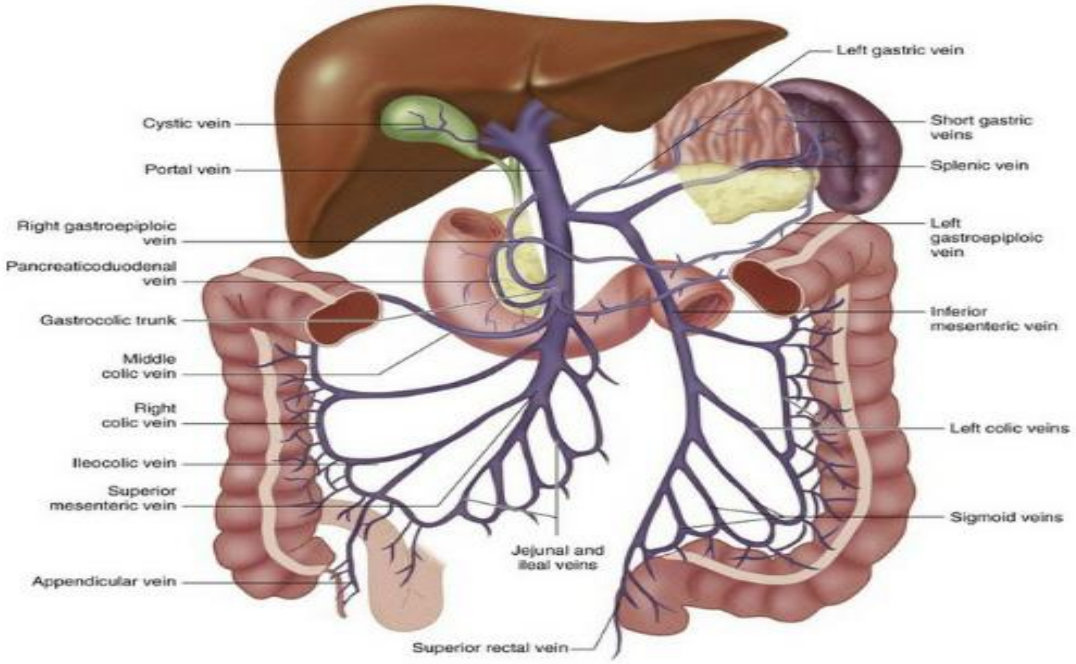


Figure (2.1) liver anatomy,anterioer view (Www. Radiology key .com 2015). Jeremy c.durack,Maureen p.kohi

2.1.2 Anatomy of Splenic Vein:

Splenic vein is a tributary of the portal circulation that drains blood from the spleen. It forms a major originating tributary for the portal vein.

Splenic vein begins at the hilum of the spleen by union of several small veins. It is then joined by the short gastric and left gastroepiploic vines.

After its origin, it passes to the right within the splenorenal ligament and runs behind the pancreas below the splenic artery.

It ends by joining the superior rmesentericvein behind the neck of the pancreas. This union forms the portal vein (mananatomy.com).

2.1.3. Anatomy of superior mesenteric vein (SMV):

The superior mesenteric vein arises from small intestine, ascending colon, and transverse colon. It carries blood through the hepatic portal vein into the liver's hepatic portal system, rather than returning this blood to the heart (innerbody.com).

2.1.4. Anatomy of inferior mesenteric vein (IMV):

The IMV branches of the portal vein, which also branches into the superior mesenteric vein. The IMV also has its own branches. These include the sigmoid vein, which drain the sigmoid, and left colic vein, which drains the descending colon. As a whole, the IMV drains away deoxygenated blood from the colon, where it will eventually be returned to the right ventricle and atrium in the heart, as well as pulmonary veins in the lungs (health line.net).

2.1.5. Portal vein embryology:

The vascular architecture of the human liver is established at the end of the complex embryological history. The hepatic primordium emerges at the 4^{th} week and is in contact with two major venous system of the fetal circulation: the vitelline veins and the umbilical veins. The fetal architecture of the afferent venous circulation of the liver is acquired between the 4^{th} and 6^{th} week. At the end of this process, portal vein is formed from several distinct segments of the vitelline veins; the portal vein sinus, deriving from the suphepatic intervitelline anastomosis, connect the umbilical vein, which is the predominant vessel of the fetal liver, to the portal system; the ductus venosus connects the portal sinus to the inferior vena cava. At birth, the umbilical vein and the ductus venosus collapse. The portal vein becomes the only afferent vein of the liver. The efferent venous vessel of the liver derives from the vitelline veins and is formed between the 4^{th} and 6^{th} week. The

hepatic artery forms at the 8th week; intrahepatic arterial branches progressively extend form the central to the peripheral areas of the liver between the 10th to the 15th week. Hepatic sinusoidal appear very early, as soon as hepatic cords invade the septum transverse at the 4th week. They then progressively acquire their distinctive structural and functional characters through multistage process (Collardeau-Frachon S, et al Anat RecHoboken, 2008).

2.1.6. The portal circulation:

Veins from the digestive organs and spleen send their blood through the hepatic portal vein to the liver. This circulatory pathway allows the liver to modify the blood returning to the heart, such as by removing excess glucose or toxin, such as bacteria or alcohol. Specifically, the blood from capillaries of the spleen, stomach, pancreas, gallbladder, and intestines flows into the superior mesenteric vein and splenic vein. Theseveins converge to form the portal vein. Blood from the left and right gastric vein empties into the hepatic portal vein. The portal vein channels the blood into the liver. The blood is then distributed to innumerable microscopic sinusoids. Which are the capillaries of the liver. The blood out of the sinusoids into the hepatic vein from there, the blood flows into the inferior vena cava, where it is returned to the heart (Sadikatul Bari Sadik, 2016).

2.1.7. Physiology:

The portal vein and hepatic arteries the liver's dual blood supply. Approximately 75%of hepatic blood flow is derived from the portal vein, while the remainder is from the hepatic arteries (Plinio Rossi, L.Broglia, 2000)

Unlike most veins, the portal vein dose not drain into the heart. Rather, it is part of a portal venous system that delivers venous blood into another capillary system, the hepatic sinusoids of the liver. In carrying venous blood from the gastrointestinal tract to the liver, the portal vein accomplishes two

tasks: it supplies the liver with metabolic substrates and it insures that substances ingested are first processed by the liver before reaching the systemic circulation (Plinio Rossi,L.Brogila, 2000).

This accomplishes two things.

First, possible toxins that may be ingested can be detoxified by the hepatocytes before they are released into the systemic circulation. Second, the liver is first organ to absorb nutrients just taken in by the intestine after draining into the liver sinusoids; blood from the liver is drained by hepatic vein. (Plinio Rossi,L.Brogila 2000).

2.1.8.Pathology:

PHT divided intopresinusoidal, intrahepaticgroups, depending on whether the hepatic wedge pressure in normal (presiusoidal) or elevated in (intrahepatic).

Presinusosidal PHT divided into**:** extra hepatic and intrahepatic.

2.1.9. Causes of extra hepatic:

Thrombosis of the hepatic or splenic vein (ascites, splenomegaly and avarices).

Occurs in children secondary to umbilical catheterization, omphalitis, and neonatal sepsis.

In adults the PV thrombosis include ,trauma ,sepsis ,HCC ,Pancreatic carcinoma , pancreatitis ,portacaval shunt , splenectomy , and hyper coagulable state.

2.1.10. Causes of intrahepatic sinusoidal:

Are results of disease affecting the portal zone of the liver, not ably shistosomiasis, primary biliary cirrhosis, congenital hepatic fibrosis, and toxic substances.

Cirrhosis is the most common cause of intrahepatic PHT and account of greater than 90% of all causes of PHT in the west.

Diffuse metastatic liver disease also produce PHT, thrombotic disease of IVC and hepatic veins , as well as constructive pericarditis and other causes of sever right- sided heart failure, will lead to contrilobular fibrosis, hepatic regeneration ,cirrhosis, and finally PHT(Carol M .Rumack 2018).

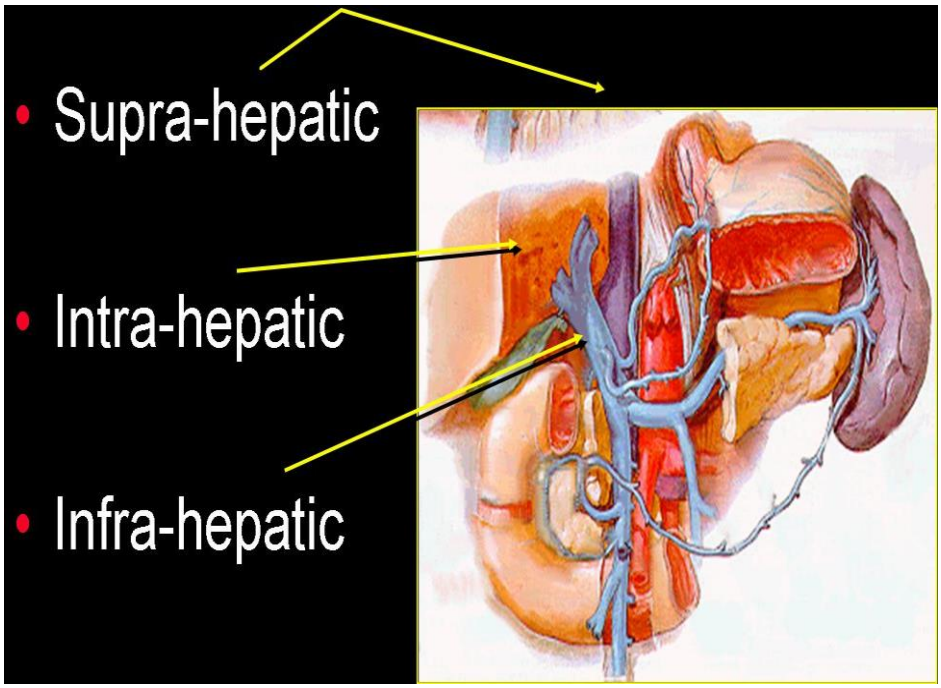


Figure (2.2) anterior view, pathological region of PHT anterior view (abdominal Doppler ultrasound 2013)

2.1.11. Sonographic apperance of normal portal vein (pv):

It is generally accepted that color Doppler ultrasound enables the detection of the presence and direction of the blood flow in the portal venous system.continous hepatofugal flow in the portal vein trunk is found with an overall prevalence of 8.3% in patients with liver cirrhosis. Prevalence did not differ in relation to the etiology of liver cirrhosis. Reversed portal venous blood flow develops when the intrahepatic resistance is greater than the resistance of portosystmeic collaterals.it is likely that the increase of intrahepatic resistance owing to structural abnormalities,i.e. hepatic vein sclerosis and hepatocyte enlargement. A possible association has been found between abnormal flow direction and presence of oesophgeal varices, ascites

and spontaneous portosystemic shunts, with the strongest association being with shunt analysis of the direction of flowin the portal vien is there forstrongly warranted in assessing portal hypertension. Continues hepatofugal flow in branches of the portal vein is specific sign of portal hypertension. Portosystamic collateral blood vessels develop from pre-existing small portal vessels and may lead to portosystmic hunting. Depending on collaterals size and amount of blood drainage from portal venous system, hepatofugal portal venous flow may be found in portal venous trunk,

Section of the portal venous system or only in small portal venous branches, e.g. left gastric vein. (Wd et al 2003).

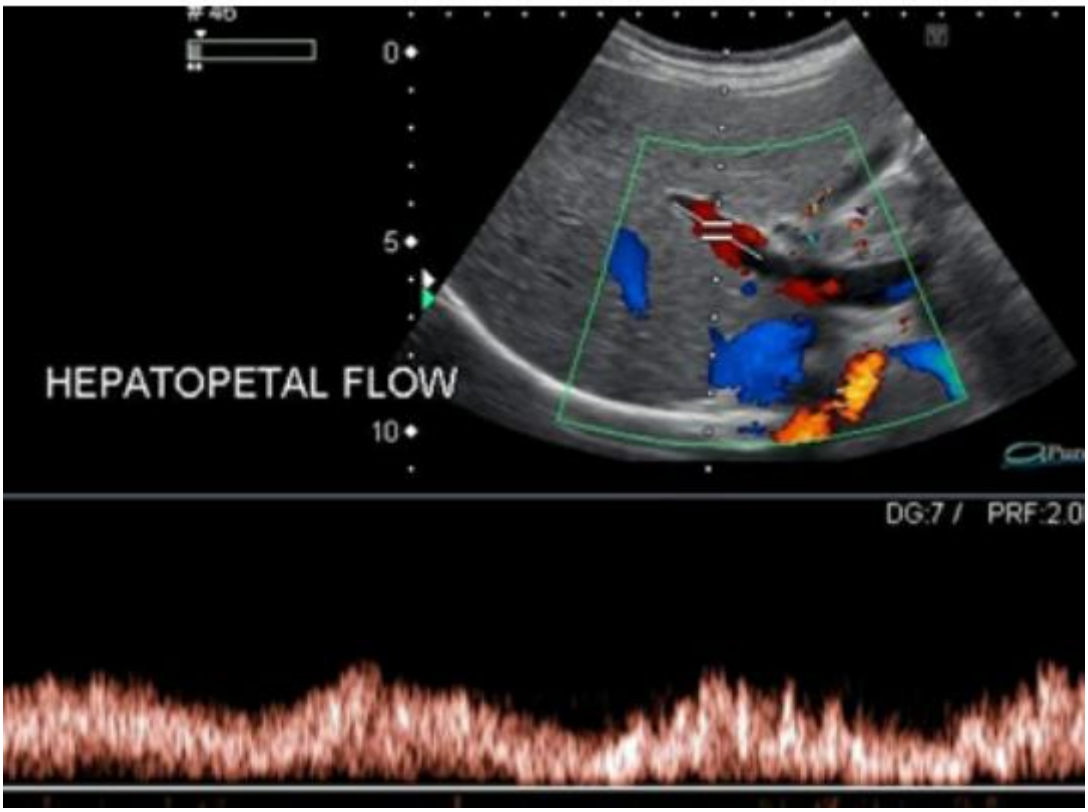


Figure (2.3) trans abdominal, longitudinal view normal flow of Portal Vein

(Www. Ultrasoundpaedia.com 2018),Dr Daniel J Bell ,et al.

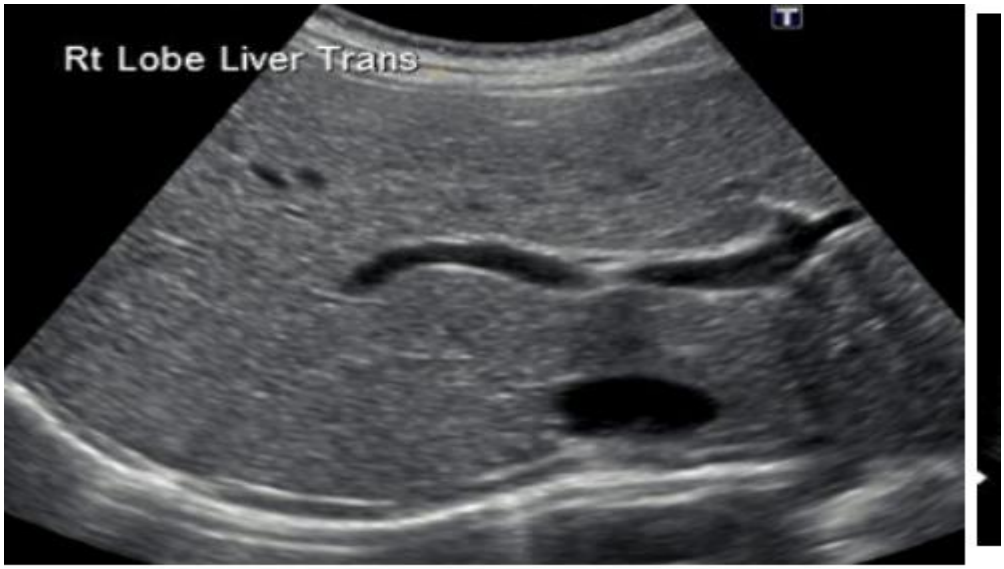


Figure (2.4) trans abdominal view sonographic feature of PV, (www.ultrasoundpaedia.com 2018) Dr Daniel J Bell ,et al.

Normal portal venous velocity varies in the same individual, increasing after a meal and decreasing after exercise. The diameter is measured at the broadest point just distal to union of splenic and superior mesenteric vein, normally measuring 11 ± 2 mm. Color and spectral Doppler imaging demonstrates the portal venous system to be an isolated vascular unit with a relatively monophasic flow pattern with fluctuations with cardiac or respiratory movements. The Valsalva maneuver results in portal vein dilatation. The normal portal vein velocity is 14-18 cm/s (angle of insonation >60°).

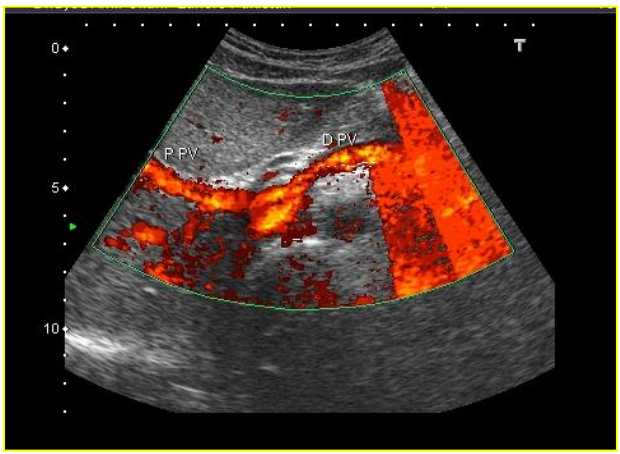


Figure (2.5) transverse plan normal flow of PV after meal, (www.startradiology.com 2016) W.D.M Middleton et al.

2.1.12. Doppler Measurements of portal vein;

Congestion index (CI) of the portal vein, portal vein area = diameter A x diameter B x O/4, flow velocity = 0.57 x maximum portal vein velocity (angle <60°), CI = portal vein area/flow velocity, The normal value for the CI is 0.070 ± 0.029 cm/s and increases to 0.171 ± 0.075 cm/s in patients with cirrhosis.

2.1.13. sonographic feature of portal hypertension:

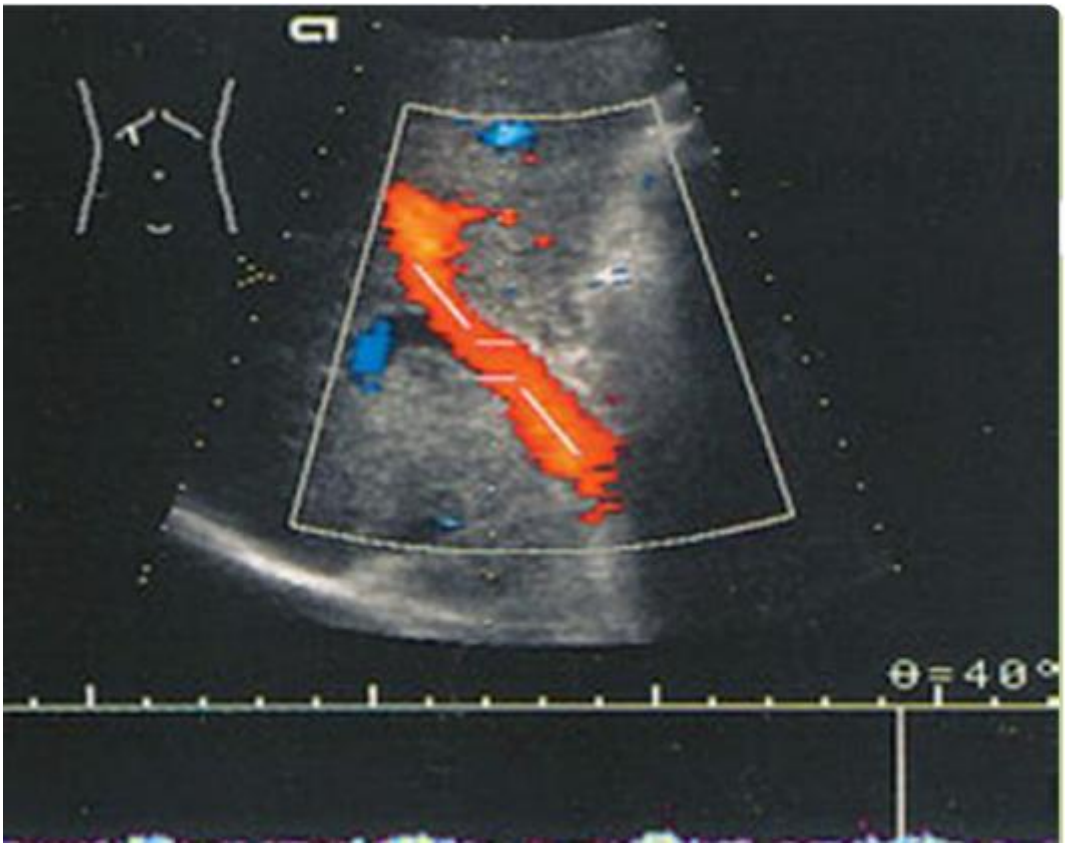


Figure (2.6) sub costal sonographic feature of Portal hypertension, ((**www.startradiology.com 2016)** W.D.M Middleton et al.

Dilated portal vein(>13mm), Dilated splenic v, SMV, IMV, Splenomegaly, Collaterals(Gastro-oesophageal avarice, Para-umbilical veins, Miscellaneous), Flow changes(biphasic or reverse flow, collateral vessels/varices), splenomegaly, Ascites, Cirrhotic liver and Portal vein thrombosis

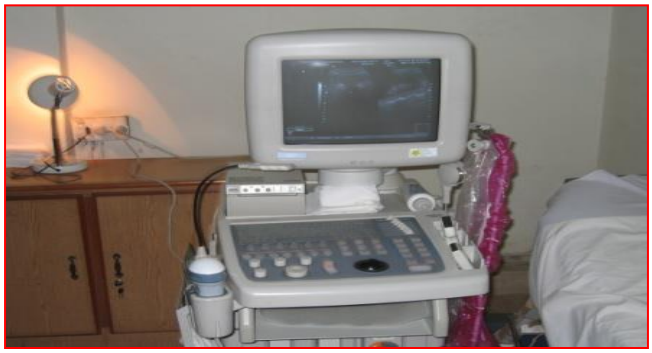
2.14. Physics and equipments:

2.14.1 Physics:

Ultrasound is a high frequency sound, exceeding the upper limit of human hearing -20.000 cycles per second (20KHZ). Knowledge of basic ultrasound physics is essential for understanding image formation, echo machine setting optimization, advantages and limitation of the technique (scardio 2010).

2.14.2 Equipments:

In thesis study transabdominal scanning was done by using (mindery) device , with (3.5 MHz), convex probe, and measure diameter of portal vein to asses portal hyper tension in Sudanese population **.**



Ultrasound screen

keyboard machine

(2.0-5.0 MHz curvilinear transducer)

2.2 previous studies:

Abdalmahmoud ali at 2011 aimed to assess of portal vein diameter with portal hypertension in Sudanese population using ultrasongraphy said: (the value of main portal vein with portal hypertension are ranging between 10mm and 21mm with the main value approximately 17.5mm(with 1.5mm standard deviation) .the main value of main portal vein diameter is decrease in patient with a history intestinal bleeding(heamatonesis and/or maleana), and in patient under treatment (endoscopic injection sclerotherapy) .

Presented study identified that the commonest cause of PHT in Sudanese population is peri-portal fibrosis (PPF) due to shistosomiasis (91%), and least common cause is a liver cirrhotic disease (9%).

PHT has high incidence in Sudan, and the concentration of cases in the Gazira state (high incidence in farmers).

PV thrombosis is common complication of PHT especially in patients with (PPF) due to shistosomiasis which is the commonest cause of PHT in Sudan).

This study to assess the etiological reason for portal hypertension in adult patients attending tertiary care center in southern India during July 2009 to July 2010(A total of 583 adult patients >18 yr old were enrolled in the study. Commonest causes of portal hypertension is chronic liver disease (35%) , chronic liver disease due to alcohol (29%), hepatitis B (17%) or hepatitis C (9%), **(WWW.ncbi.nlm.nih.gov).**

Chapter Three

Material and Method

Chapter three

Material and method

3.1 materials:

3.1.1 Patient:

3.1.1.1 Sample of the study:

This is descriptive and analytical study conducted in Khartoum state. 50 subjects (female11 22%& male39 78%) with portal hypertension disease were enrolled in the study, there age ranged between 30 - 85 Years old.

3.1.1.2 Inclusive:

Patient with portal vein pathology (portal hypertension).

3.1.1.3 Exclusive:

Pediatric and pregnant ladies.

3.1.1.4 Area and duration of the study:

The study was conducted in ultrasound department in KhartoumEbn Sienna and Ashorta hospital from July to November 2018.

3.1.3 Equipments:

The researcher used sono scape ultrasound machine model –Siemens. The feature of the machine are superior contrast, Trans abdominal convex high resolution transducer (3.5 to 5) MHz and ultrasound gel.

3.1.4 Gel:

Is a type of conductive medium that enables a tight bond between the skin and probe or transducer, letting the waves transmitting directly to the tissue beneath and to the parts that need to be imaged. It is formulated to act as a coupling agent and reduce static.

3.2 Methods:

3.2.1 Scanning technique:

Using low frequency transducer (3.5-5MHz), The ultrasound examination was conduct in the supine position ultrasound gel was applied, and transducer placed in the epigasterium in both transverse and longitudinal

plans to evaluate the main portal vein, the intrahepatic portal vein in some patient s were also examined in sub- costal by place the probe just below xiphoid with steep angulations with the patient either in supine.

Right anterior oblique or left posterior oblique as needed. In patients with excess gas in the duodenum and antrumof the

Stomach that obscured the distal extra hepatic portal vein, they were placed in an erect right anterior oblique position to displace the air. The measurement of portal vein made during deep inspiration.

3.2.2 Interpretation:

All cases in the study requested for US PHT, the portal vein detection by US sonographer and thenIperformedthe scan to take the measurement.

3.2.3 Analysis (spss)(chi):

Using computer statistic procedure in analysis of data well performed it, number of 50 Sudanese populations for abdominal investigation in ultrasound department with different age and hospital in Khartoum state.

3.2.4 Data collection:

The data collected by using data collecting sheet, it is designed as age, gender, region, vein caliber, echo texture and echogenicity of the liver and spleen.

Chapter four

Results

Chapter four

Result

Table (4.1) frequency distribution of age

Age\years	Frequency	Percent
30-39	10	20.0
40-49	14	28.0
50-59	10	20.0
60-69	7	14.0
70-79	5	10.0
80-88	4	8.0
Total	50	100.0

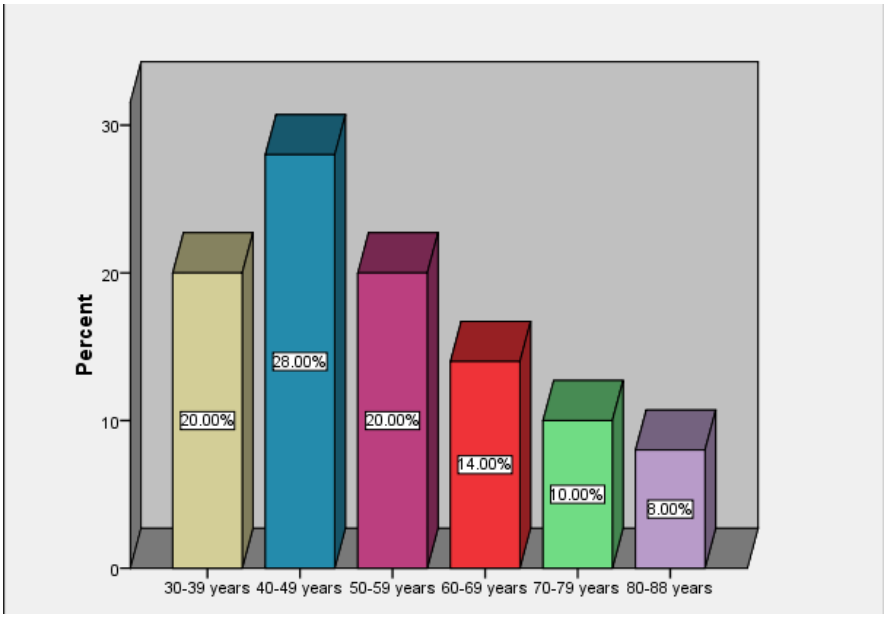


Figure (4.1) frequency distribution of age

Table (4.2) frequency distribution of gender

Gen	Frequency	Percent
Female	11	22.0
Male	39	78.0
Total	50	100.0

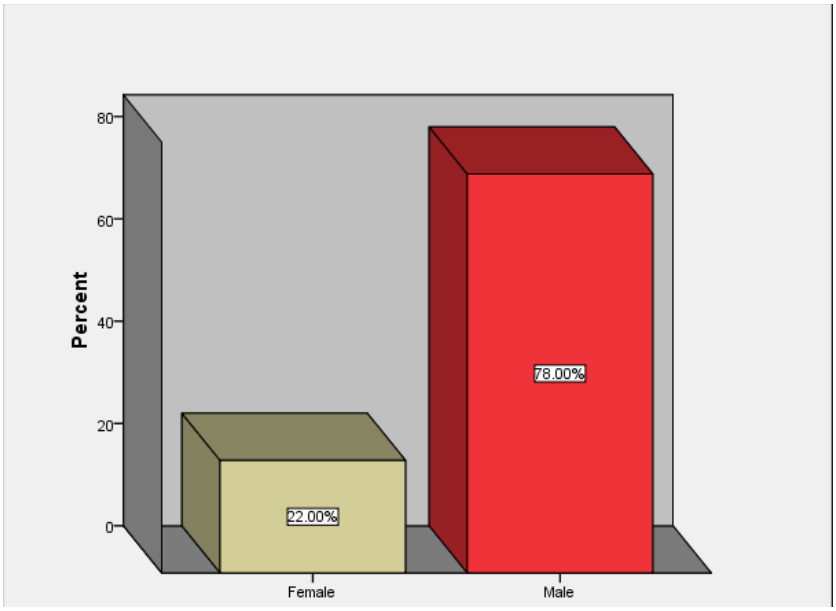


Figure (4.2): Frequency distribution of gender

Table (4.3) frequency distribution of region

Region	Frequency	Percent
Gazera	32	64.0
North	3	6.0
Sennar	4	8.0
West	11	22.0
Total	50	100.0

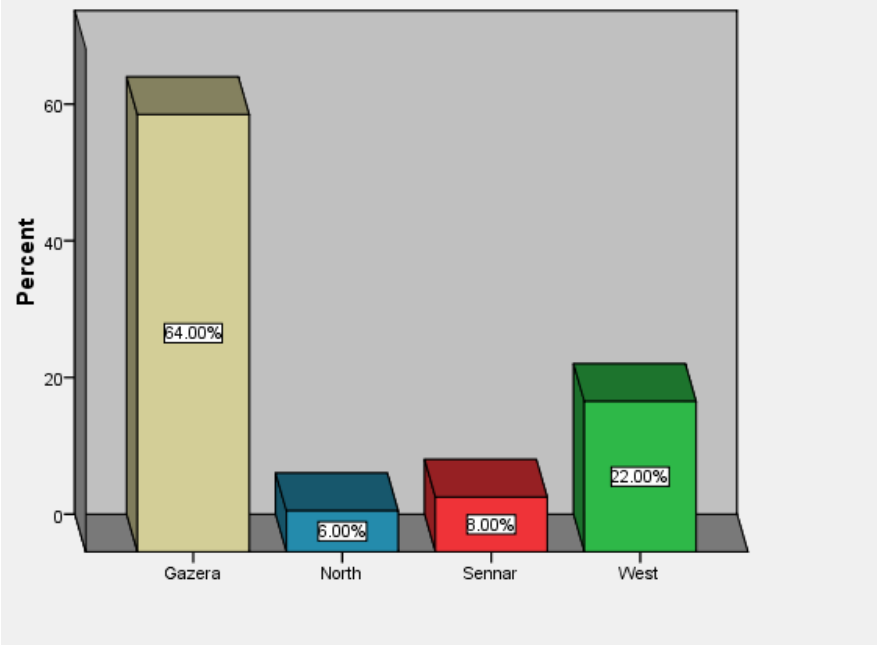


Figure (4.3) frequency distribution of region

Table (4.4) descriptive statistic for age, portal vein diameter, SVD, SPL (minimum, maximum mean ± Std. Deviation)

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Patient age	50	30	88	53.12	15.257
Main portal vein caliber	49	7	24	15.61	3.952
Splenic vein caliber	50	7	22	12.10	3.253
Spleen length	50	11	22	16.24	2.454
Valid N (listwise)			49		

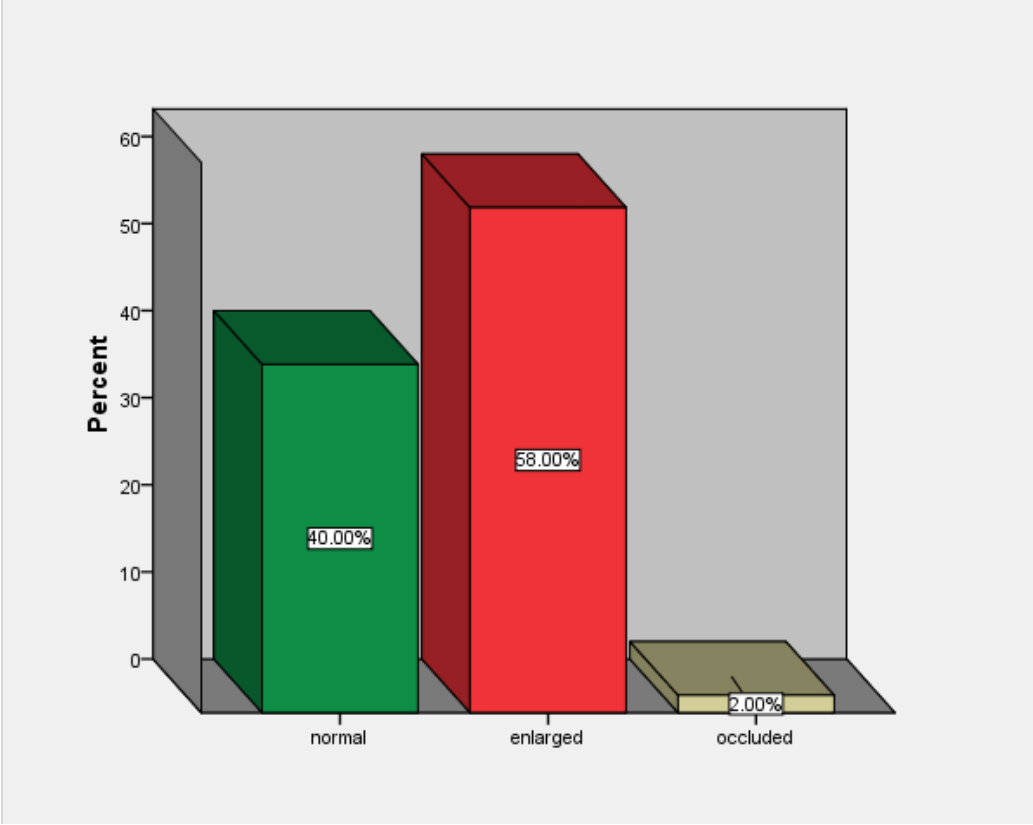


Figure (4.4) frequency distribution of PVD

Table (4.5) frequency distribution of PVD

PVD	Frequency	Percent
Normal >13mm	20	40.0
Enlarged <13mm	29	58.0
Occluded	1	2.0
Total	50	100.0

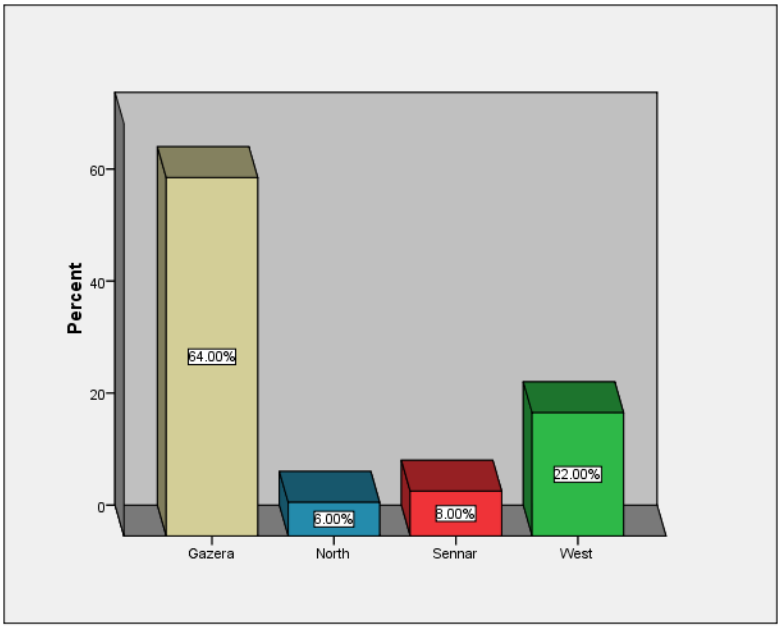


Figure (4.5) frequency distribution of PVD

Table (4.6) frequency distribution of SPV Diameter

SPV diameter	Frequency	Percent
Normal >10mm	25	50.0
Enlarged <10mm	25	50.0
Total	50	100.0

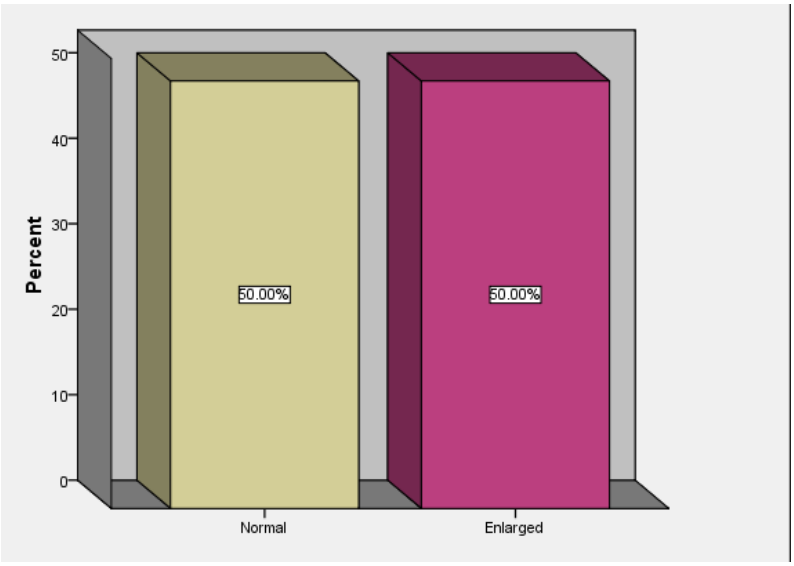


Figure (4.6) frequency distribution of SPV Diameter

Table (4.7) frequency distribution of liver size

Liver size	Frequency	Percent
Enlarged <15mm	3	6.0
Normal =15mm	8	16.0
Small >15mm	39	78.0
Total	50	100.0

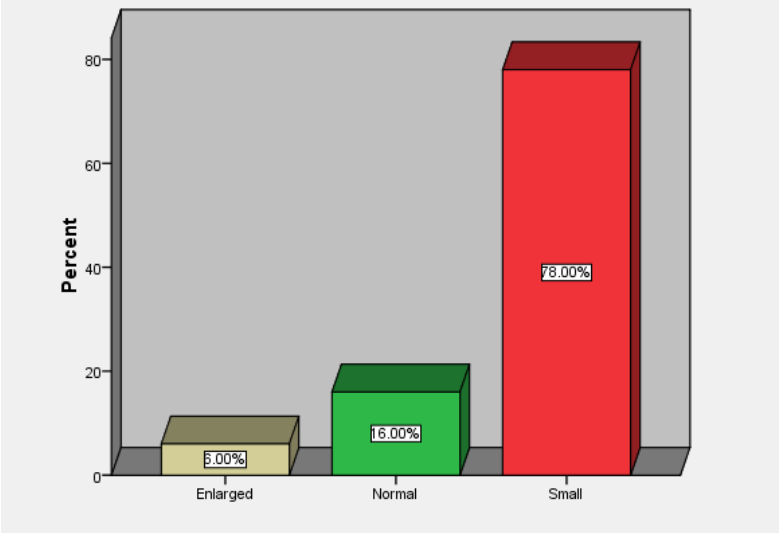


Figure (4.7) frequency distribution of liver size

Table (4.8) frequency distribution of liver echo-texture

Liver echo-texture	Frequency	Percent
Heterogeneous	42	84.0
Normal	8	16.0
Total	50	100.0

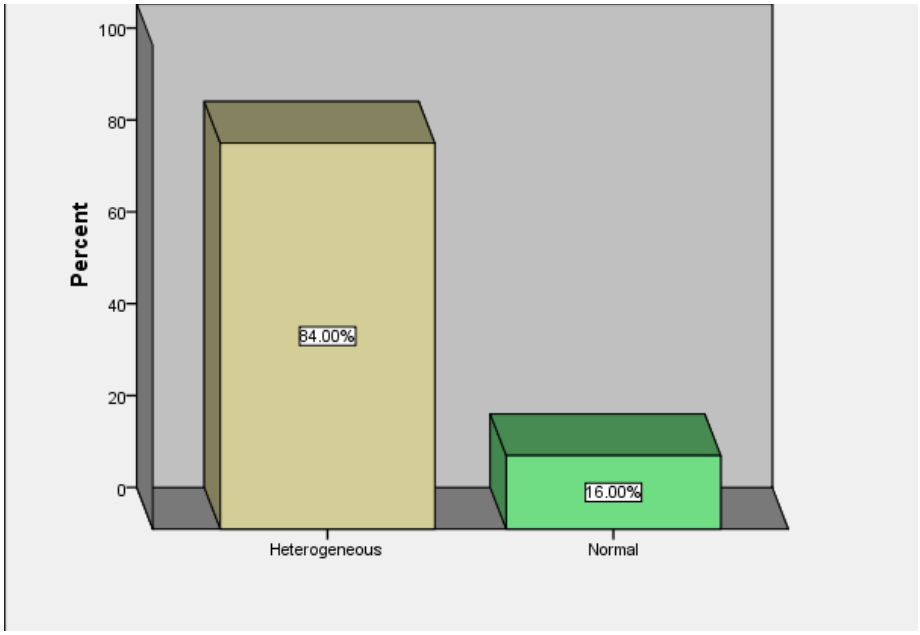


Figure (4.8) frequency distribution of liver echo-texture

Table (4.9) frequency distribution of liver echogenicity

Liver echogenicity	Frequency	Percent
Decreased	5	10.0
Increased	36	72.0
Normal	9	18.0
Total	50	100.0

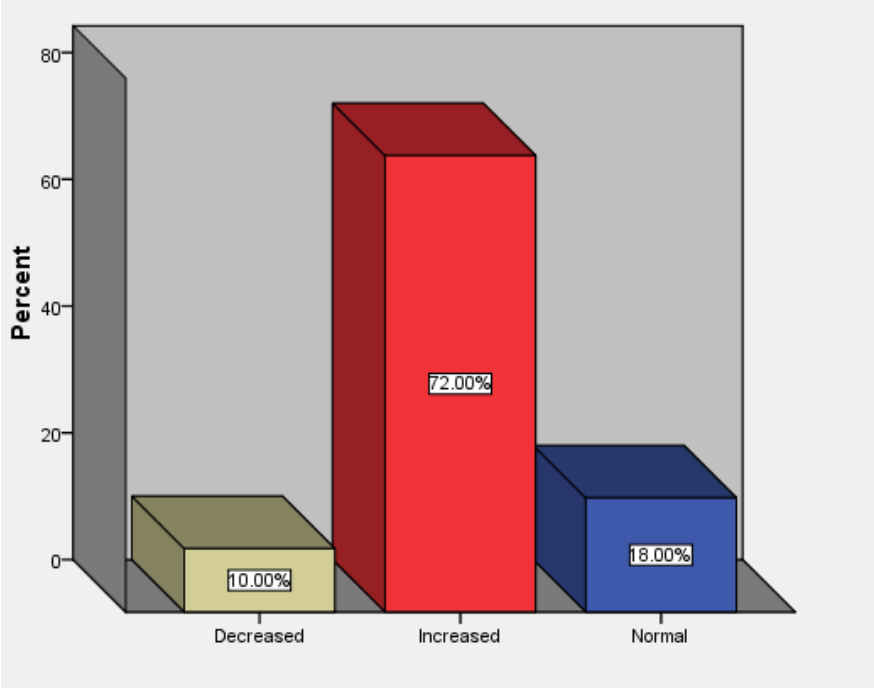


Figure (4.9) frequency distribution of liver echogenicity

Table (4.10) frequency distribution of spleen size

Spleen size (length)	Frequency	Percent
Normal =13mm	7	14.0
Enlarged >13mm	43	86.0
Total	50	100.0

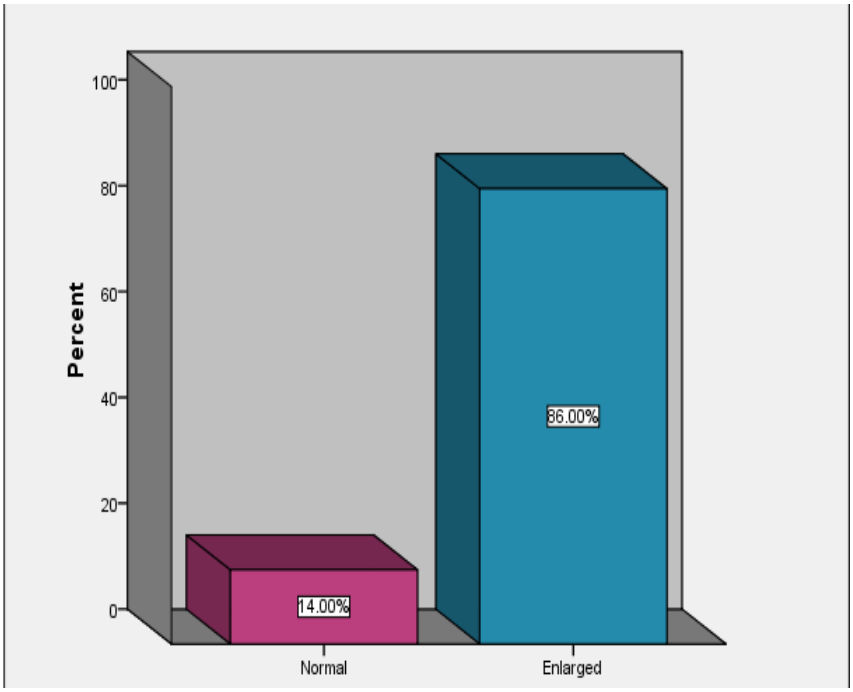


Figure (4.10) frequency distribution of spleen size

Table (4.11) frequency distribution of PPF

PPF	Frequency	Percent	Valid Percent	Cumulative Percent
Absence	19	38.0	38.0	38.0
Presence	31	62.0	62.0	100.0
Total	50	100.0	100.0	

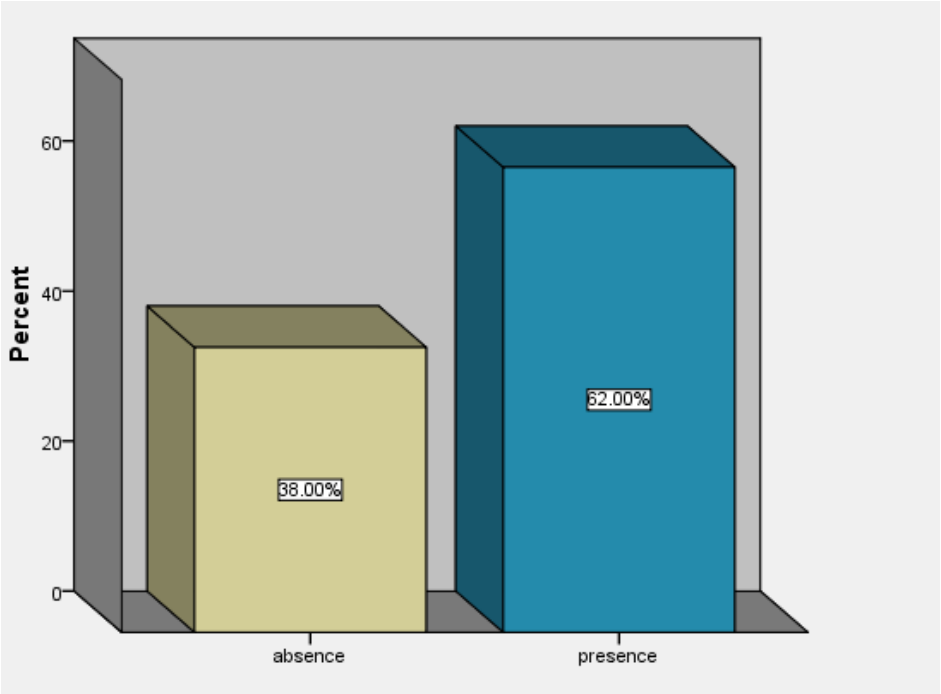


Figure (4-11) frequency distribution of PPF

Table (4.12) frequency distribution of ascites

Ascites	Frequency	Percent
Abdomino –pelvic	10	20.0
Abdomen	10	20.0
No	22	44.0
Pelvic	8	16.0
Total	50	100.0

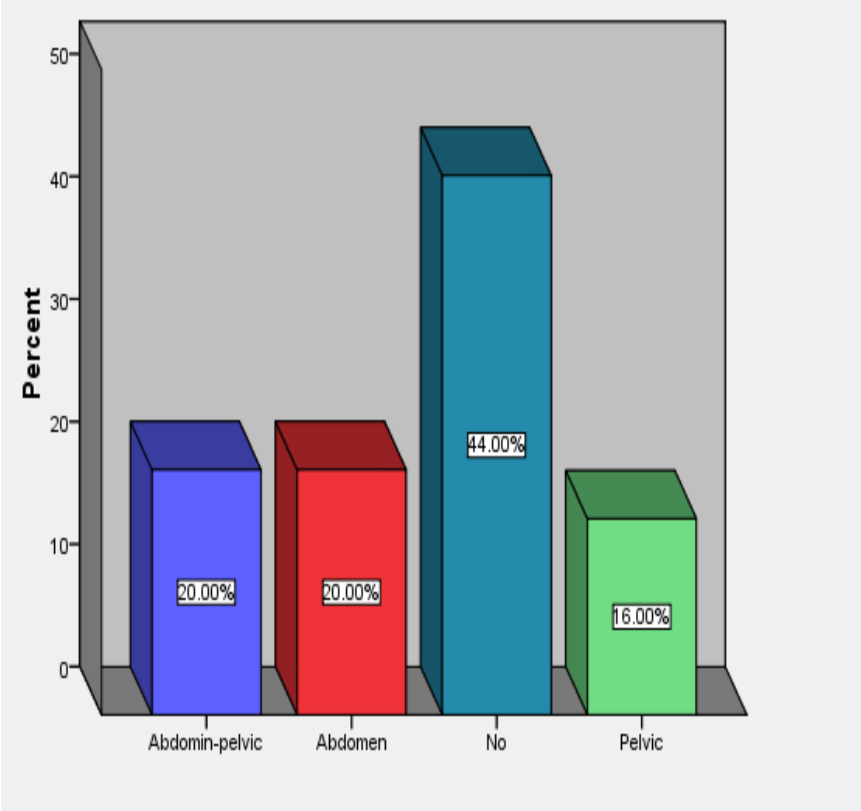


Figure (4.12) frequency distribution of ascites

Table (4.13) frequency distribution of varicose vein

Varicose vein	Frequency	Percent
No	29	58.0
Esophagus	2	4.0
Rectum	2	4.0
Splenic	17	34.0
Total	50	100.0

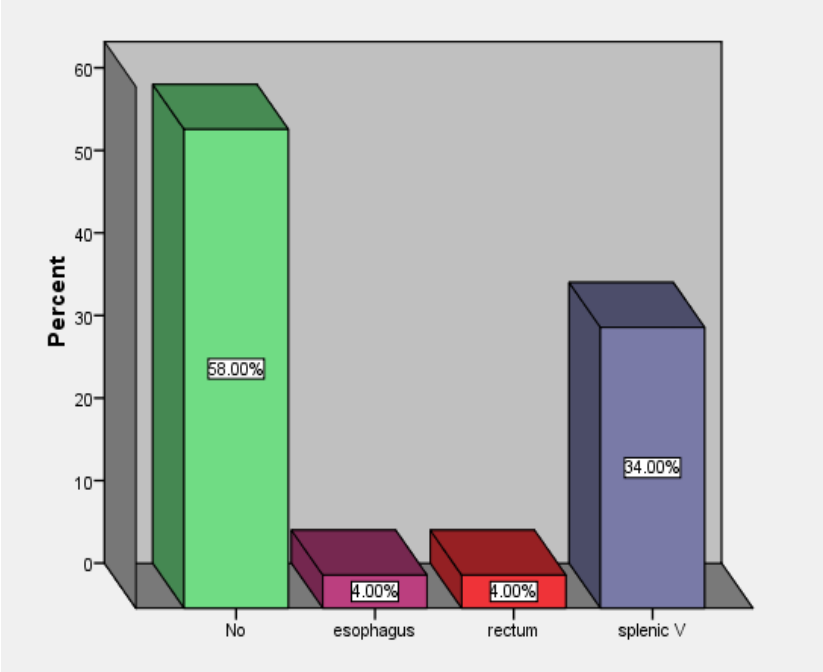


Figure (4.13) frequency distribution of frequency caudate lobe

Table (4-14) frequency distribution of caudate lobe

Caudate lobe	Frequency	Percent
Enlarged <65% to right lobe	30	60.0
normal =65% to right lobe	20	40.0
Total	50	100.0

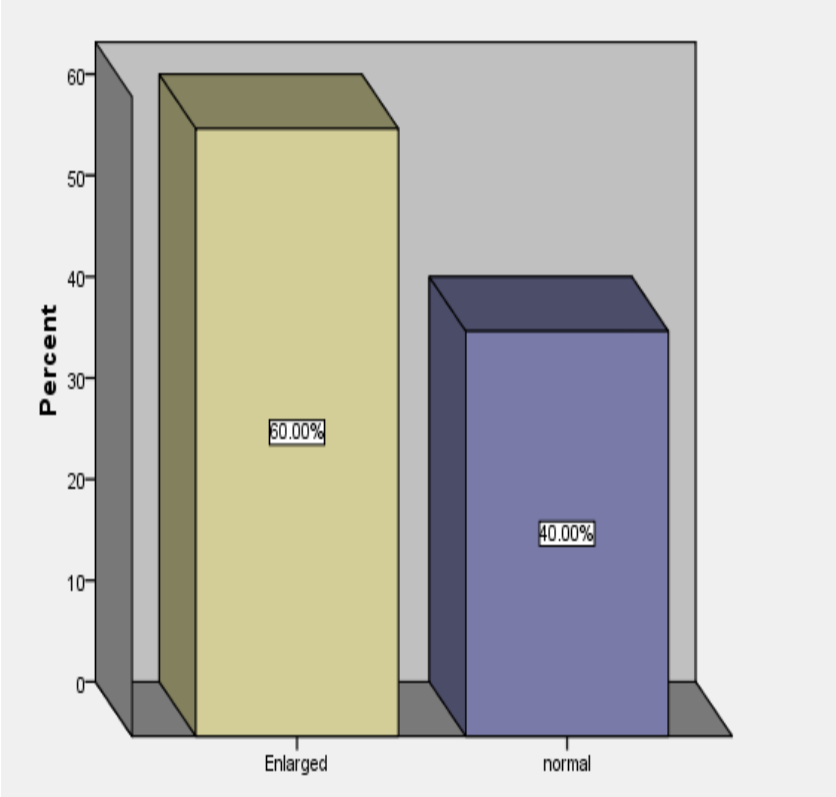


Figure (4.14) frequency distribution caudate lobe

Table (4.15) frequency distribution of other associated finding

Other ultrasound finding	Frequency	Percent	Valid Percent	Cumulative Percent
Ca colon	1	2.0	2.0	2.0
dilated GB	1	2.0	2.0	4.0
dilated GB +Echogenic spleen	1	2.0	2.0	6.0
Echogenic spleen	5	10.0	10.0	16.0
Enlarged prostate	1	2.0	2.0	18.0
HCC	2	4.0	4.0	22.0
Hepatitis	1	2.0	2.0	24.0
No associated finding	9	18.0	18.0	42.0
PPF	10	20.0	20.0	62.0
PPF+ thick wall GB	17	34.0	34.0	96.0
PPF+ thick wall GB+ stone	1	2.0	2.0	98.0
Umbilical hernia	1	2.0	2.0	100.0
Total	50		100.0	100.0

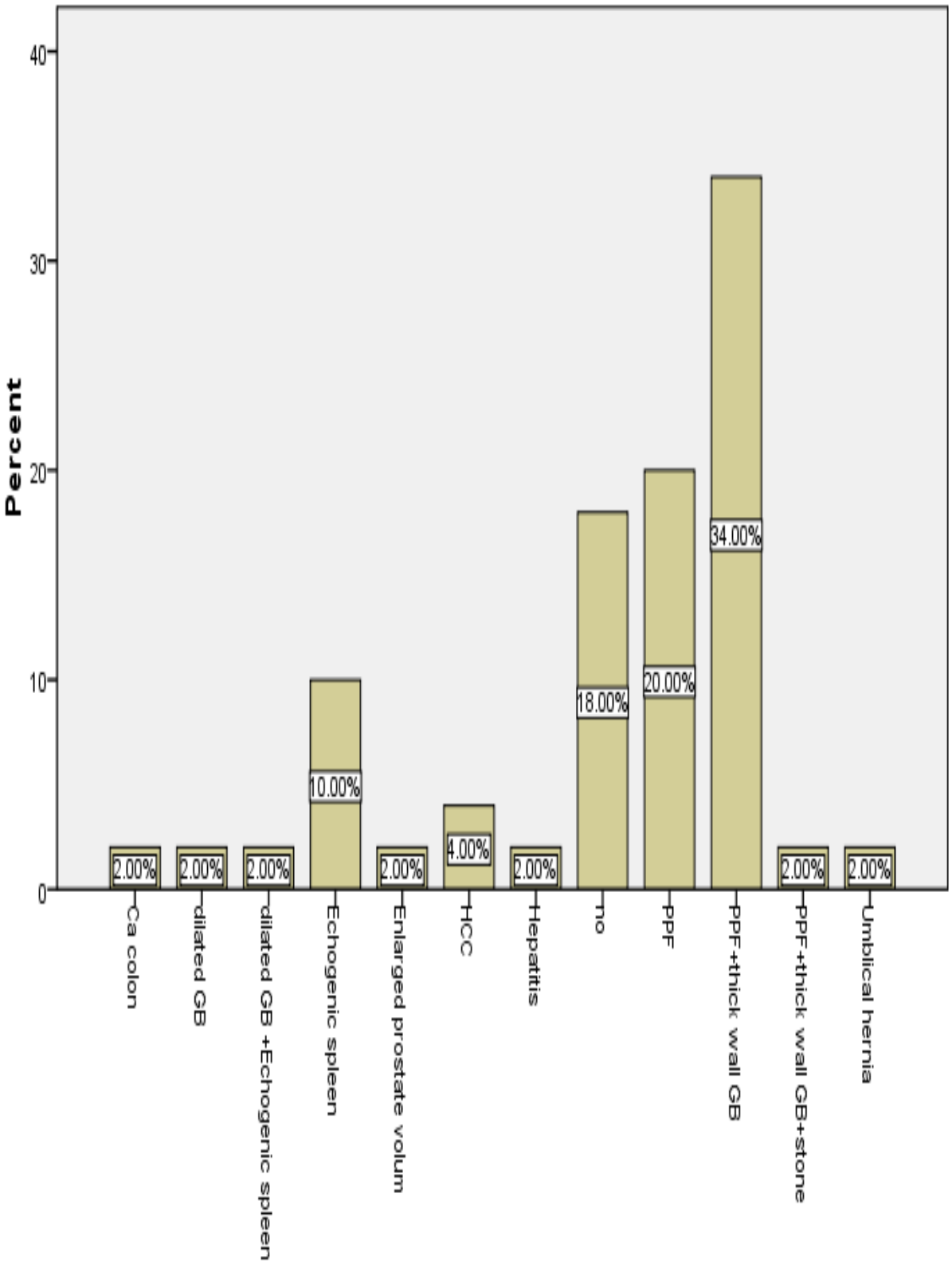


Figure (4.15) frequency distribution of other associated finding

Table (4.16) frequency distribution of causes

Causes	Frequency	Percent
Alcoholic abuse	5	10.0
Belharziasis	30	60.0
Hepatitis	6	12.0
Unknown	9	18.0
Total	50	100.0

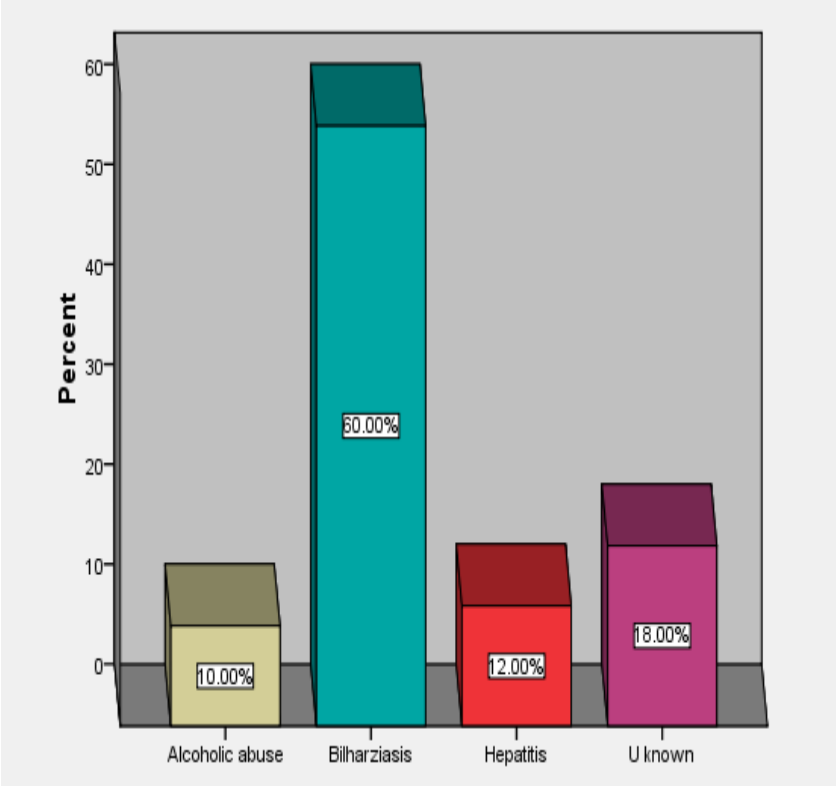


Figure (4.16) frequency distribution of causes

Table (4.17) cross tabulation causes and region

Region		causes		Total	
Alcoholic abuse		Bilharziasis	Hepatitis		Unknown
Gazera	0	26	0	6	32
North	2	1	0	0	3
West	2	2	5	2	11
Sennar	1	1	1	1	4
Total	5	30	6	9	50
P = 0.000					

Table (4.18) cross tabulation causes and PVD

PVD		Causes		Total	
Alcoholic abuse		Bilharziasis	Hepatitis		Unknown
normal	3	7	4	6	20
enlarged	2	22	2	3	29
occluded	0	1	0	0	1
Total	5	30	6	9	50
P = 0.174					

Table (4.19) cross tabulation causes and PPF

Causes	PPF		Total
absence		presence	
Alcoholic abuse	3	2	5
Bilharziasis	8	22	30
Hepatitis	3	3	6
Unknown	5	4	9
Total	19	31	50
P =0.240			

Table (4.20) cross tabulation presence of peri-portal fibrosis(PPF) and region

Region	PPF		Total
absence		presence	
Gazera	10	22	32
North	0	3	3
West	8	3	11
Sennar	1	3	4
Total	19	31	50
P = 0.039			

Table (4.21) cross tabulation liver size and caudate lobe size

Liver size	caudate lobe size		Total
Enlarged		normal	
enlarged	0	3	3
normal	0	8	8
small	30	9	39
Total	30	20	50
P =0.000			

Chapter five

Discussion, conclusion and recommendation

Chapter five

discussion, conclusion and recommendation

5.1 discussions:

The study showed that there was strong relationship between the portal hypertension and gender show in figure (4-2) affected in male by (78%) than female (22%).

In table (4-2) the study shows that is increase incidence in age between (40-49) years old percentage 28%.

The study show in figure (4-3) portal hypertension has high incidence in Sudan, and there is concentration of cases in the gazira state, and that is similar to Abdalmahmmoud ali (2012).

The study found there was strong relationship between portal vein caliber in PHT patient and splenic vein caliber and spleen length that show in table (4-4).

The study demonstrates that the value of main portal vein diameter in Sudanese adult population with PHT are ranging between (7) mm and (24) mm, with the mean value (15.61) mm, and Std Deviation (3.952) mm. that result different to abdamahmmoud du to sample size.

The study presented that the commonest causes of PHT in Sudanese population is pier- portal fibrosis (PPF) due to shistosomiasis (60%), hepatitis (12%) and cirrhotic diseases due to alcoholic abuse (10%) , that show in table (4-15), and also similar to abdalmahmoud ali (2012).

The study show in table (4-13) the higjest incidances of varicouse happened in splenic vein percentage (34%).

The study show in table (4-14) there was strong relationship between portal hypertension (PHT) and enlarges caudate lobe size in (60%) of patient, and also very Strong relationship more than (87%) between portal hypertension (PHT) and decrease right lobe of the liver. And there is inverse realation ship between right lobe and caudate lobe size showed in table (4-21)

The study demonstrate that the dilated in portal vein diameter percentage (58%) and dilated in splenic vein (50%) this percentage clear up the relation between portal and splenic veins incidence.

The study show in table (4-17) there is very strong relationship between causes of portal hypertension and region (gazira), and also very strong revers relationship between caudate lob sizes and right lobe size, that show in table (4-21).

The study show in table (4-18) there is no relation between causes of portal hypertension and dilated of portal vein , and also no relation between region and peri-portal fibrosis that show in table (4-20).

5.3 recommendations:

The US diagnosed dilated PV with PHT noted in 58% of cases and normal PV diameter was noted in 42% of cases.

Ultrasound plays very important role in the diagnosis and management of PHT. The goals of ultrasound assessment should be three foaled (make the diagnosis, establish the causes and evaluate the risk of complication.)

I recommended further studies with large sample size inclusive different age and region to estimate PV caliber with PHT.

I recommended further studies to measure blood supply flow velocity in PV by using Doppler ultrasound machine.

5.2 conclusions:

The study concluded the average of portal vein with portal hypertension was (15.6) mm .strong significant correlation with gender and region weak significant correlation with causes.

PHT occur when the pressure in PV is increased, this may happen in chronic liver disease, particularly in cirrhotic stage, when the nodular and fibrosis nature of the liver parenchyma happened.

By the end of this study we measure the main portal vein diameter for 50 patient with PHT, were studied over and three month from(July to November 2018), the range of patient age from 30 to 90 years old.

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Abdalmmahmmoud Ali, measurement of portal vein diameter in portal hypertensionpatient in Sudanese population by using ultrasound Msc(2011)

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Tertiary care center in southern India (july2009- july2010) assessed the etiology region in portal hypertension in adult patient

Wd et al(2003), portal vein histology and son graphic finding of normal portal vein

Appendices

Appendix 1

Data collection sheet

Demographic data:-

Patient age……

Gender: male…… female…….

Region……..

Patient history:-

Diabetic……. Hypertension…….

Others liver disease …….

Previous operation……

Ultrasound finding:-

Main portal vein caliber……

Liver size……

Liver echo-texture……..

Liver echo genticity……

Caudate lobe size……

R/C ratio……..

Preiportal fibrosis grading……

Spleen size……..

Splenic vein caliber……..

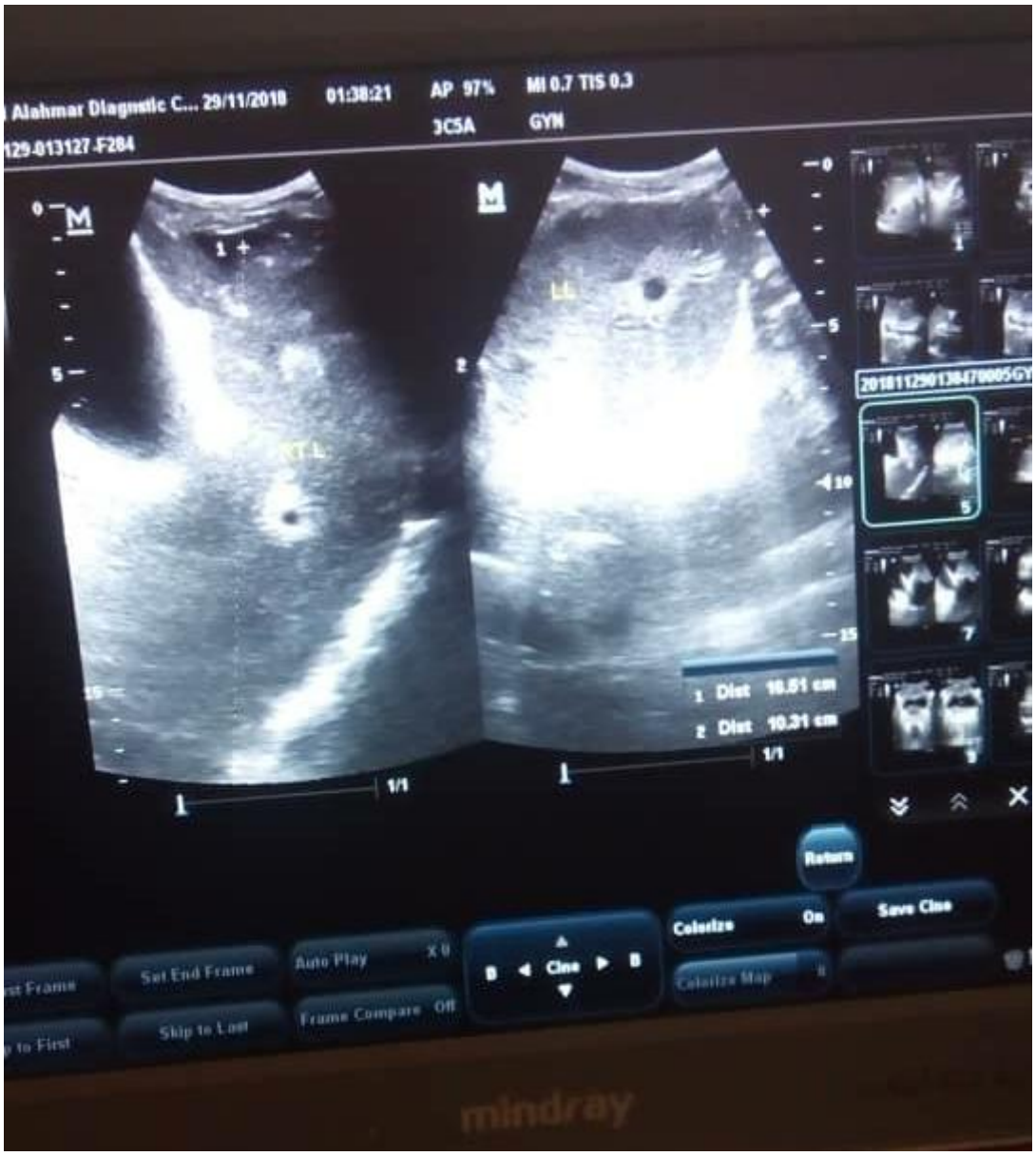
Avarices……..

Ascites…….

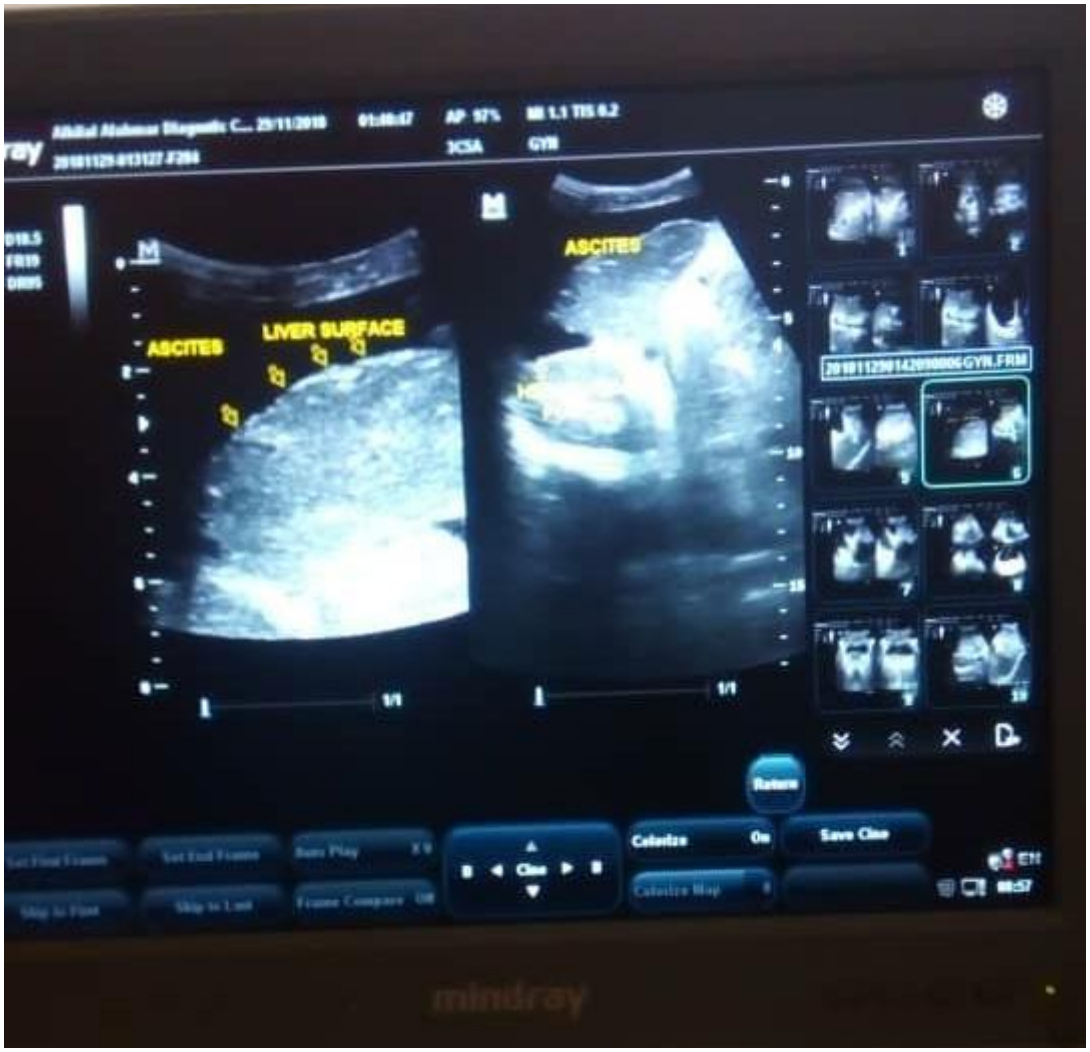
Other sonographic finding ……..

Conclusion…….

Appendix 2

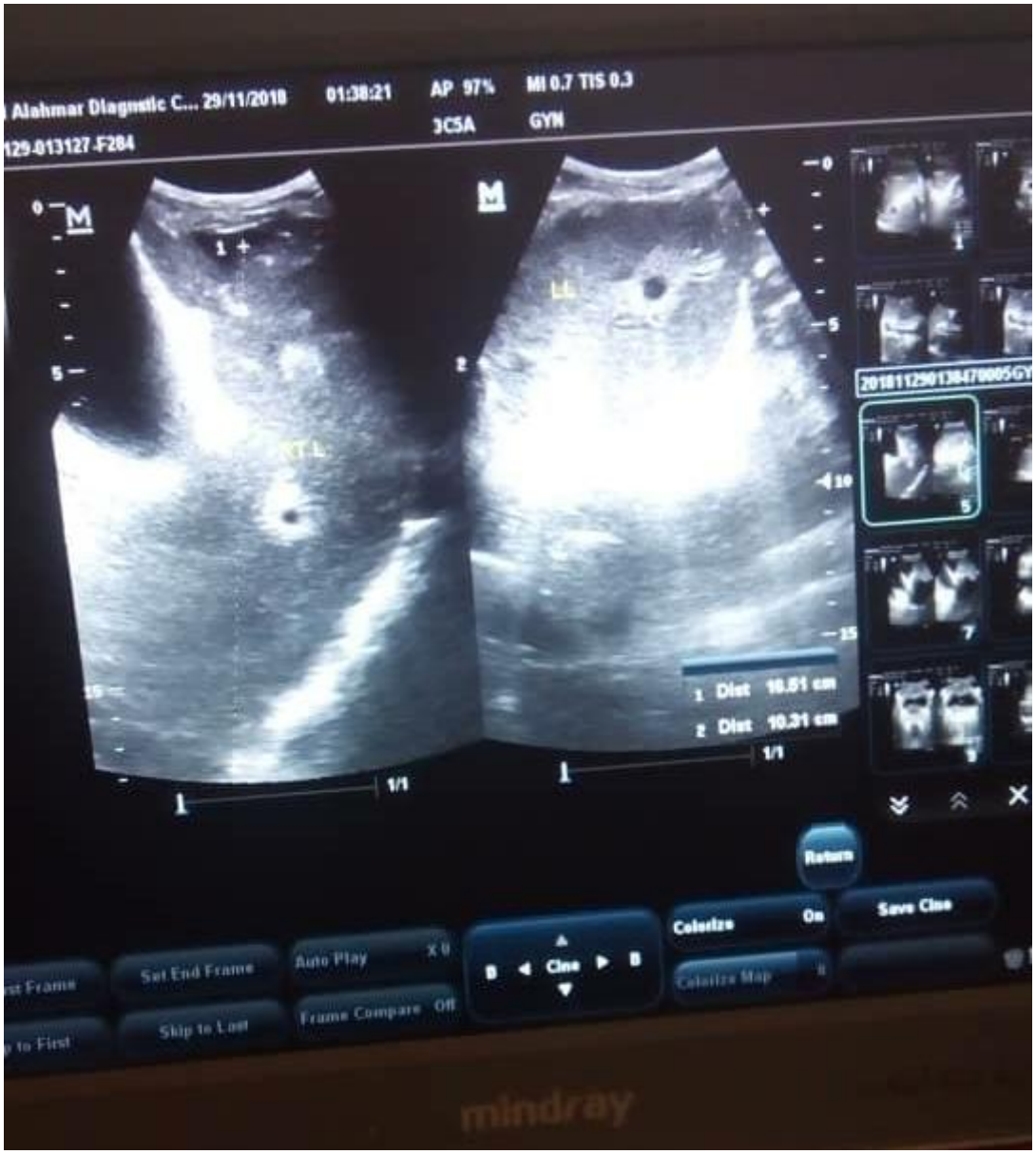


Tran's abdominal, 42 years old male show prei-portal fibrosis and ascites

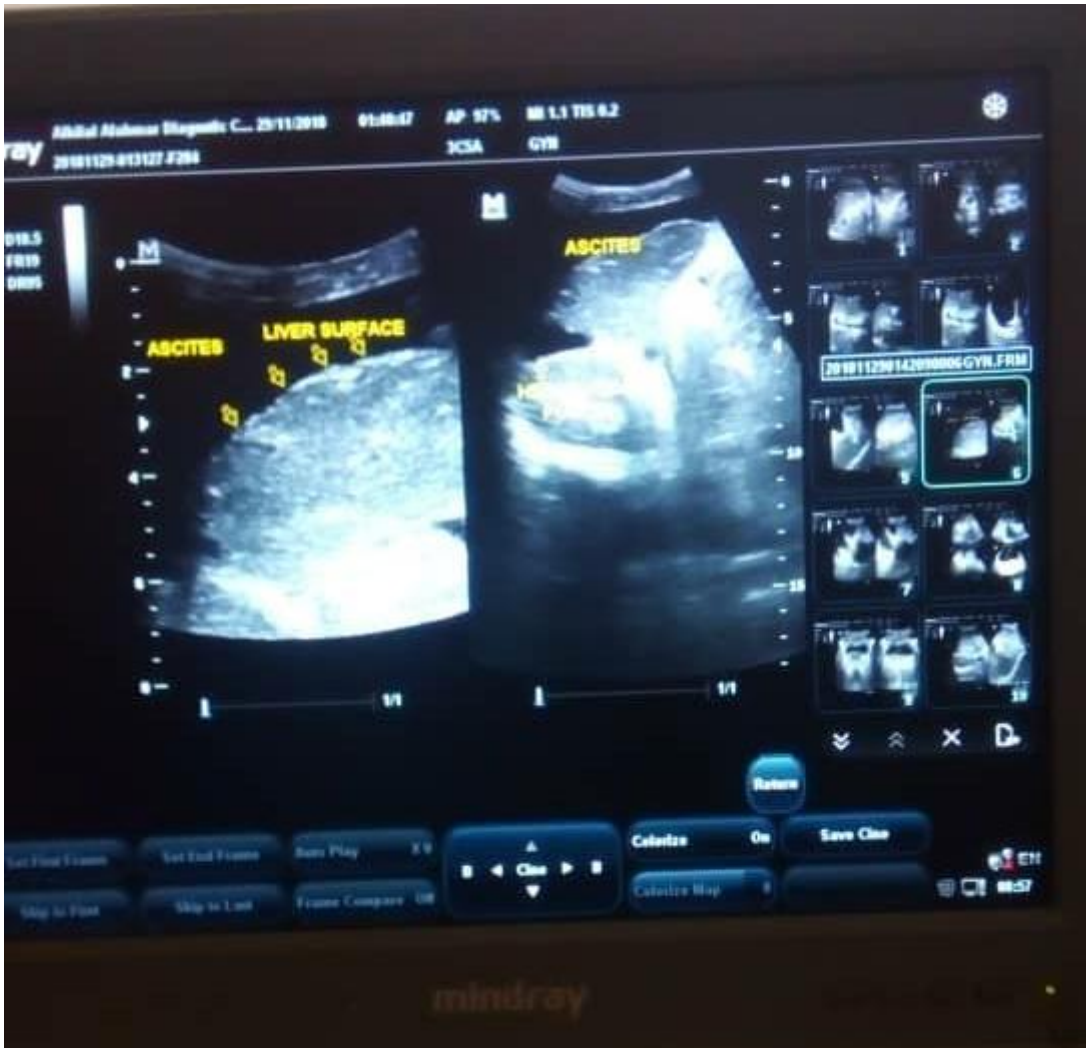


transabdominal, 50 years old patient, show cirrhotic liver and ascites

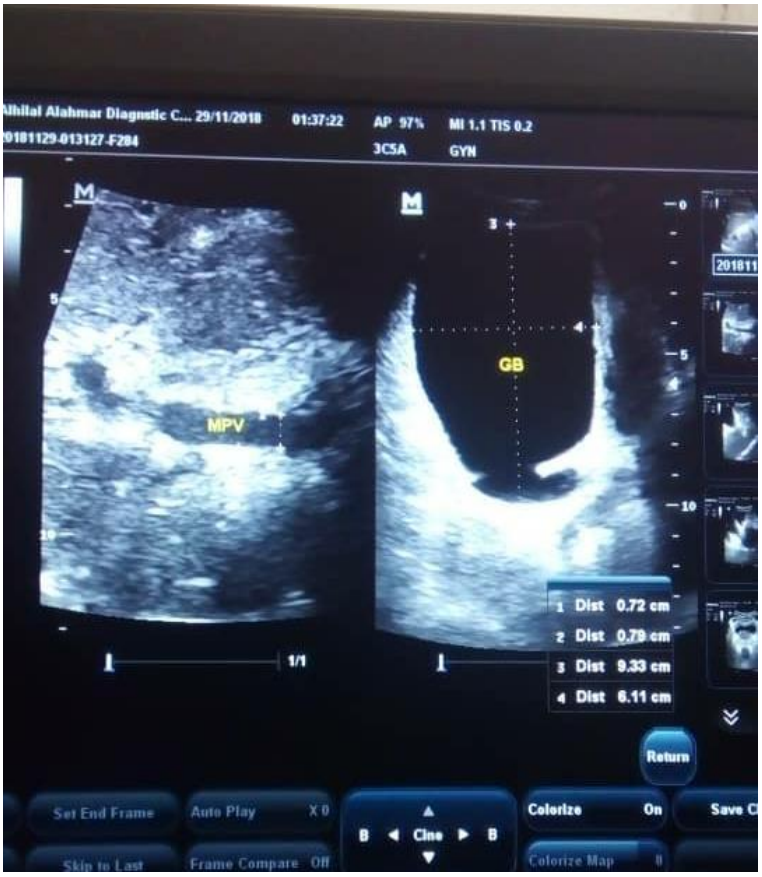
Appendix 2



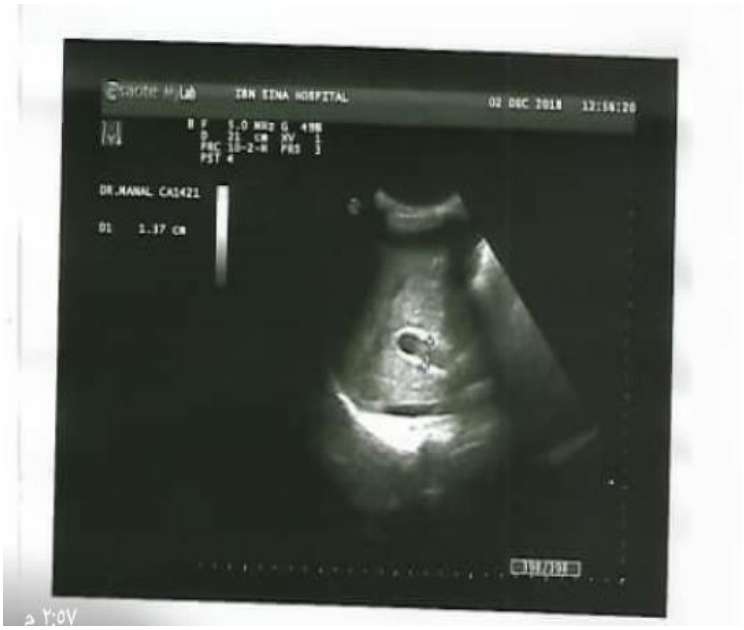
Tran's abdominal, 42 years old male show prei-portal fibrosis and ascites



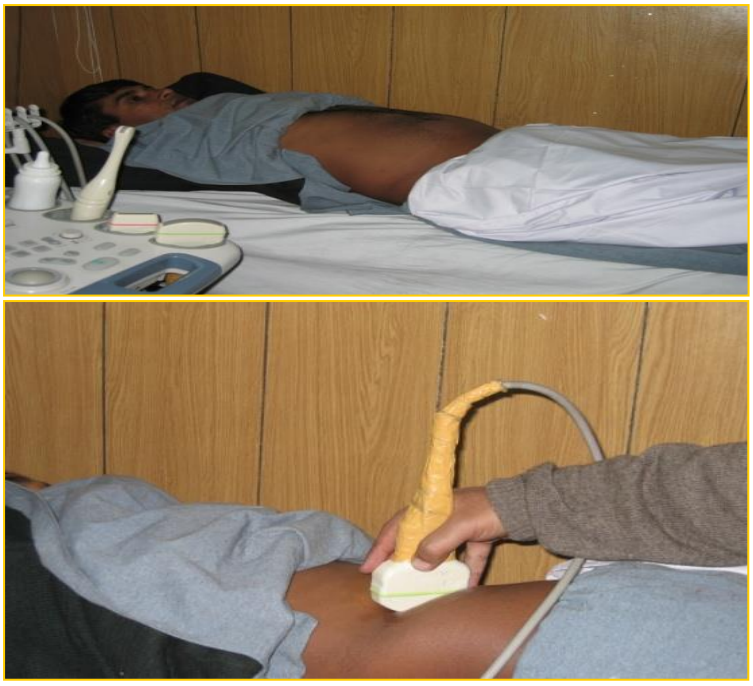
transabdominal, 50 years old patient, show cirrhotic liver and ascites



Sub costal, transverse view,35 years old patient, show dilated PV ,with dilated GB and thick wall



Sup-costal view, 55 years old female, show dilated portal vein



- *Right longitudinal intercostals approach. Supine and right anterior oblique.*