بسم الله الرحمن الرحيم

Sudan University of Science &Techno

College of Graduate Studies

Assessment of the Complications of Schistosomiasis in Sudanese Population using Diagnostic Medical Ultrasound

تقييم مضاعفات البلهارسيا للسودانين بإستخدام الموجات فوق الصوتيه التشخيصيه

A thesis submitted for requirement of partial fulfillment of M.Sc. degree in Medical Diagnostic Ultrasound.

By:

Osman Khalfallah Ibrahim Elsiddig

Supervisor:

Dr. Babiker Abd Elwahab Awad Alla

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الاية

بسم الله الرحمن الرحيم

قال تعالى:

(وَفِي أَنْفُسِكُمْ أَفَلا تُبْصِرُونَ)

صدق الله العظيم

سورة الذاريات - الآية 21

Dedication

To my beloved kind mother

To the soul of my father

To my colleagues

To all knowledge seekers

I dedicate this work

Acknowledgment

"I humbly thank Allah Almighty, the Merciful and the Beneficent, who gave me health, thoughts and cooperative people to enable me achieve this goal."

Special vote of thanks to my supervisor:
Dr. /BabikerAbdElwahabAwad Allah.

My thanks to everyone who helps me in way or another to make this work appear to light.

Abstract

The study aimed to assess the schistosomiasis complications using ultrasonography, which conducted in IBN SENA specialized hospital (Khartoum - Sudan) in period from March to July 2016.

There were 50 patients, 37 male and 13 female. all patients were scanned using Honda ultrasound corporation company machine with convex probe and low frequency 3.5MHz.

Results shows that the incidence of schistosomiasis was higher in male (74%) than female (26%).

The study also showed that the incidence of periportal fibrosis had very high occurrence.

The study concluded that the incidence of portal hypertension in schistosomiasis patients is high with (78%

Schistosomiasis mainly affects the farmers rather than others occupation.

Most of schistosomiasis patients show changes in liver and spleen size

Schistosomiasis affects different age groups .

Ultrasound scanning should be used in every patient with suspicion and assessment of schistosomiasis complications.

ملخص البحث

هذه الدراسة تهدف الي تقييم مضاعفات البلهارسيا لدي السودانيين باستخدام الموجات فوق الصوتية.

هذه الدراسه اجريت في مستشفي ابن سينا في الفتره من مارس وحتي يوليو 2016.

شملت هذه الدراسة الدراسة 50 مريض من كلا الجنسين 37 ذكرو 13 انثى عن طريق كل العينات تم فحصها بواسطة جهاز موجات فوق الصوتيه تصنيع شركة ميندراي ذو تردد منخفض يبلغ 3.5 ميغاهيرز.

وجدت الدراسه ان معدل الاصابه عند الرجال اعلي من الاناث بنسبه بلغت (74%) عند الزكورمقارنه مع الاناث(26%).

كما وجدت الدراسه ان نسبه حدوث تليف حول الوريد البابي للكبد لدي مرضي البلهارسيا عاليه جدا بنسبه بلغت 96 %.

كما اظهرت الدراسه ايضا ان نسبه حدوث ارتفاع ضغط الوريد البابي لدي مرضي البلهارسيا عاليه بلغت 78%

اظهرت الدراسه ان البلهارسيا تصيب المزارعين اكثر من غيرهم .

معظم مرضي البلهارسيا اظهرو تغيير في حجم كل من الكبد والطحال

تؤثر البلهارسيا علي مختلف الفئات العمريه .

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WHO	World Health Organization
U/S	Ultrasound
PPF	Periportal Fibrosis
PHT	Portal Hypertention
N	
UTI	Urinary Tract Infection
TIPS	Transjugular Intraparenchymal Porto-Systemic Shunt
ATP	Adenosine –Tri – Phosphate

Chapter one

Introduction

1-1Prelude

Schistosoma, commonly known as blood-flukes, are parasitic flatworms responsible for a highly significant group of infections in humans termed schistosomiasis. Schistosomiasis is considered by the World Health Organization as the second most socioeconomically devastating parasitic disease, (after malaria), with hundreds of millions infected worldwide. (Morgan 2003).

Adult flatworms parasitize blood capillaries of either the mesenteries or plexus of the bladder, depending on the infecting species. They are unique among trematodes and any other flatworms in that they are dioecious with distinct sexual dimorphism between male and female. Thousands of eggs are released and reach either the bladder or the intestine (according to the infecting species), and these are then excreted in urine or feces to fresh water. Larvae must then pass through an intermediate snail host, before the next larval stage of the parasite emerges that can infect a new mammalian host by directly penetrating the skin. (Morgan 2003).

It is thought that schistosomiasis has affected many people in Sudan for many centuries. It is spread associated with the trades who frequented the Nile valley in ancient times.

The first report of distribution of shistosomiasis in Sudan was in 1927.

The regions of wadihalfa , various sectors in northern province , and blue nile basin, and white Nile ,and various areas in province of Kordofan (Nuba mountains) and Darfur was noted to be endemic.

In 1950s, the prevalence in the Gezira region between the white Nile and blue Nile varied in different surveys. (WHO, 1987).

1-2 Problem of the study:

The prevalence of bilharsiasis is very high in Sudanese population (according to WHO reports), it has lethal complications.

1-3The objective:

1-3-1General objective:

To asses complications of bilharsiasis in Sudanese population using ultrasonography.

1-3-2 Specific objectives:

To identify the US finding of spleen in patients with bilharsiasis.

To study the effect of bilharsiasis in liver.

To study the effect of bilharsiasis in portal vein diameter and echogencity.

To find relationshipbetweenbilharsiasis complications andage.

To study the effect of bilharsiasis in spleen size.

1-4 Thesis outline:

This thesis is concerned with the assessment of complications of bilharsiasis in sudenesepopulations . It divided into the five chapters . Chapter one concerned with introduction ,deal with theoretical frame work of the study . It represent statement of study problems ,objectives of the study , it also provides an outlines of thesis . Chapter tow include theoretical background, and literature review (previous studies).

Chapter three deal with material and methods used to asses complications of bilharsias .Chapter four showed (results), data presentation. Chapter five discussed the data (discussion), analysis and conclusion, recommendations for this thesis and suggestions for the future.

Chapter Two

Literature review and previous studies

2-.1liver anatomy

The liver is the largest organ of the abdominal viscera, occupying a substantial portion of the upper abdominal cavity. It occupies most of the right hypochondrium and epigastrium, and frequently extends into the left hypochondrium as far as the left lateral line. As the body grows from infancy to adulthood the liver rapidly increases in size. This period of growth reaches a plateau around 18 years and is followed by a gradual decrease in the liver weight from middle age. The ratio of liver to body weight decreases with growth from infancy to adulthood. The liver weighs approximately 5% of the body weight in infancy and it decreases to approximately 2% in adulthood. The size of the liver also varies according to sex, age and body size. It has an overall wedge shape, which is in part determined by the form of the upper abdominal cavity into which it grows. The narrow end of the

wedge lies towards the left hypochondrium, and the anterior edge points anteriorly and inferiorly. The superior and right lateral aspects are shaped by the anterolateral abdominal and chest wall as well as the diaphragm. The inferior aspect is shaped by the adjacent viscera. The capsule is no longer thought to play an important part in maintaining the integrity of the shape of the liver. (Susan,2008)

Throughout life the liver is reddish brown in colour, although this can vary depending upon the fat content. Obesity is the most common cause of excess fat in the liver (also known as steatosis): the liver assumes a more yellowish tinge as its fat content increases. The texture is usually soft to firm, although it depends partly on the volume of blood the liver contains and the fat content. (Susan,2008)

The liver performs a wide range of metabolic activities required for homeostasis, nutrition and immune defense. For example, it is important in the removal and breakdown of toxic, or potentially toxic, materials from the blood and the regulation of blood glucose and lipids, the storage of certain vitamins, iron, and other micronutrients, and in breaking down or modifying amino acids. It is involved in a plethora of other biochemical reactions. Since the majority of these processes are exothermic, a substantial part of the thermal energy production of the body, especially at rest, is provided by the liver. The liver is populated by phagocytic macrophages, components of the mononuclear phagocyte system capable of removing particulates from the

blood stream. It is an important site of haemopoiesis in the fetus (Susan,2008)

2.1.1 Gross Anatomical Lobes

Historically, the liver has been considered to be divided into right, left, caudate and quadrate lobes by the surface peritoneal and ligamentous attachments.

Right lobe

The right lobe is the largest in volume and contributes to all surfaces of the liver. It is divided from the left lobe by the falciform ligament superiorly and the ligamentum venosum inferiorly. On the inferior face to the right of the groove formed by the ligamentum venosum there are two prominences separated by the porta hepatis: the caudate lobe lies posterior, and the quadrate lobe anterior, to the porta hepatis. The gallbladder lies in a shallow fossa to the right of the quadrate lobe. (Susan,2008)

Left lobe

The left lobe is the smaller of the two main lobes, although it is nearly as large as the right lobe in young children.

It lies to the left of the falciform ligament with no subdivisions, and is substantially thinner than the right lobe, having a thin apex that points into the left upper quadrant. (Susan,2008)

Quadrate lobe

The quadrate lobe is visible as a prominence on the inferior surface of the liver, to the right of the groove formed by the

ligamentum venosum (and thus is incorrectly said to arise from the right lobe although it is functionally related to the left lobe). It lies anterior to the porta hepatis and is bounded by the gallbladder fossa to the right, a short portion of the inferior border anteriorly, the fissure for the ligamentum teres to the left, and the porta hepatis posteriorly. (Susan,2008)

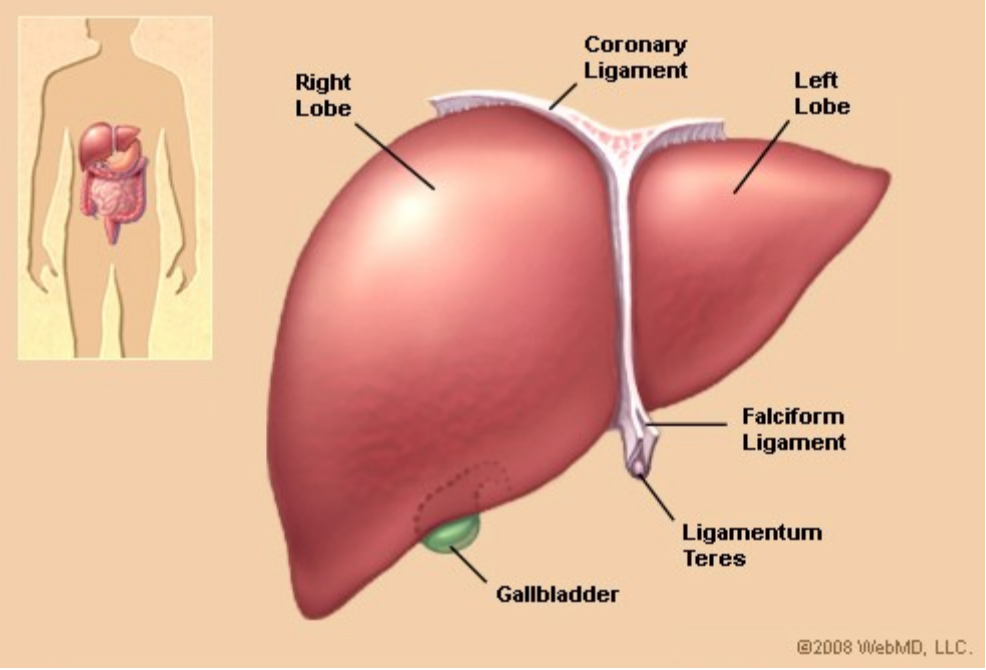


Figure (2-1) anterior view of the liver (http://www.webmd.com)

Caudate lobe

The caudate lobe is visible as a prominence on the inferior and posterior surfaces to the right of the groove formed by the ligamentum venosum:

It lies posterior to the porta hepatis. To its right is the groove for the inferior vena cava. Above, it continues into the superior

surface on the right of the upper end of the fissure for the ligamentum venosum. In gross anatomical descriptions this lobe is said to arise from the right lobe, but it is functionally separate. (Susan,2008)

2.1.2 Vascular Supply And Lymphatic Drainage

The vessels connected with the liver are the portal vein, hepatic artery and hepatic veins. The portal vein and hepatic artery ascend in the lesser omentum to the porta hepatis, where each bifurcates. The hepatic bile duct and lymphatic vessels descend from the porta hepatis in the same omentum.

The hepatic veins leave the liver via its posterior surface and run directly into the inferior vena cava. (Susan,2008)

Hepatic artery

In adults the hepatic artery is intermediate in size between the left gastric and splenic arteries. In fetal and early postnatal life it is the largest branch of the coeliac axis. The hepatic artery gives off right gastric, gastroduodenal and cystic branches as well as direct branches to the bile duct from the right hepatic and sometimes the supraduodenal artery. After its origin from the coeliac axis, the hepatic artery passes anteriorly and laterally below the epiploic foramen to the upper aspect of the first part of the duodenum. It may be subdivided into the common hepatic artery, from the coeliac trunk to the origin of the gastroduodenal artery, and the hepatic artery ‘proper', from that point to its bifurcation. It passes anterior to the portal vein and ascends anterior to the epiploic foramen between the layers of the lesser

omentum. Within the free border of the lesser omentum the hepatic artery is medial to the common bile duct and anterior to the portal vein. At the porta hepatis it divides into right and left branches before these run into the parenchyma of the liver. The right hepatic artery usually crosses posterior (occasionally anterior) to the common hepatic duct. This close proximity often means that the right hepatic artery is involved in bile duct cancer earlier than the left hepatic artery. Occasionally the right hepatic artery crosses in front of the common bile duct and may be injured in surgery of the common bile duct. It almost always divides into an anterior branch supplying segments V and VIII, and a posterior branch supplying segments VI and VII. The anterior division often supplies a branch to segment I and the gallbladder. The segmental arteries are macroscopically end-arteries although some collateral circulation occurs between segments via fine terminal branches. (Susan,2008)

Small number of normal variants is important to demonstrate angiographically because they may influence surgical and interventional radiological procedures. A vessel that supplies a lobe in addition to its normal vessel is defined as an accessory artery. A replaced hepatic artery is a vessel that does not originate from an orthodox position and provides the sole supply to that lobe. Rarely a replaced common hepatic artery arises from the superior mesenteric artery and is identified at surgery by a relatively superficial portal vein (reflecting the absence of a common hepatic artery that would normally cross in front of the

vein). More commonly a replaced right hepatic artery or an accessory right hepatic artery arises from the superior mesenteric artery. In this case they run behind the portal vein and bile duct in the lesser omentum and can be identified at surgery by pulsation behind the portal vein. The accessory right hepatic artery may be injured during resections of the pancreatic head because the artery lies in close proximity to the portal vein. Occasionally, a replaced left hepatic artery or an accessory branch arises from the left gastric artery: these vessels provides a source of collateral arterial circulation in cases of occlusion of the vessels in the porta hepatis but may also be injured during mobilization of the stomach as it lies in the upper portion of the lesser omentum. Rarely, accessory left or right hepatic arteries may arise from the gastroduodenal artery or aorta. The presence of replaced arteries can be lifesaving in patients with bile duct cancer: because they are further away from the bile duct they tend to be spared from the cancer, making excision of the tumour feasible. Knowledge of these variations is also important in planning whole and split liver transplantation. (Susan,2008)

Variations in the intrahepatic arteries are common and may be surgically important. For example, the segment VI artery most commonly arises from the left hepatic artery, but in about 10–20% of cases it arises from the right hepatic artery or the main hepatic artery. Failure to recognize this variation may compromise the blood supply to segment IV following right hepatectomy, and

is especially important following right lobe donation for live donor liver transplantation. (Susan,2008)

Veins

The liver has two venous systems. The portal system conveys venous blood from the majority of the gastrointestinal tract and its associated organs to the liver. The hepatic venous system drains blood from the liver parenchyma into the inferior vena cava. (Susan,2008)

Portal vein

The portal vein begins at the level of the second lumbar vertebra and is formed from the convergence of the superior mesenteric and splenic veins. It is approximately 8 cm long and lies anterior to the inferior vena cava and posterior to the neck of the pancreas. It lies obliquely to the right and ascends behind the first part of the duodenum, the common bile duct and gastroduodenal artery. At this point it is directly anterior to the inferior vena cava. It enters the right border of the lesser omentum, ascends anterior to the epiploic foramen to reach the right end of the porta hepatis and then divides into right and left main branches which accompany the corresponding branches of the hepatic artery into the liver. In the lesser omentum the portal vein lies posterior to both the common bile duct and hepatic artery. It is surrounded by the hepatic nerve plexus and accompanied by many lymph vessels and some lymph nodes. (Susan,2008)

The main extrahepatic tributaries of the portal vein are the coronary or the left gastric vein, which ends in the left margin of

the portal vein, and the posterior superior pancreatoduodenal vein nearer to the head of the pancreas. The portal vein divides into right and left branches at the hilum. The left portal vein has a longer extraparenchymal course (4–5 cm) and tends to lie slightly more horizontally than the right portal vein, but is often of smaller calibre. It has horizontal and vertical portions. The horizontal portion runs along the base of segment VI and often gives branches to segment I and sometimes to segment VI in this part of its course. The branch to segment II continues laterally but the main left portal vein takes a more anterior and vertical course in the umbilical fissure (the vein of the umbilical fissure) where it gives branches to segments III and IV and receives the obliterated left umbilical vein (ligamentum teres). The majority of the supply to segment IV comes from the left portal vein, and only occasionally from the right via proximal branches of the main vein or branches from veins to segments V or VIII. The right portal vein is only 2–3 cm in length and usually divides into a right medial (anterior) sectoral division supplying segments V and VIII, and a right lateral (posterior) sectoral division supplying segments VI and VII. The medial division may give a branch to segment I. (Susan,2008)

Variations usually involve the right portal vein: absence of a right portal vein with the resulting portal trifurcation in the form of left portal vein, right medial and right lateral portal veins, is present in 10–15% of livers. Occasionally the right medial vein arises from the left portal vein, a variant which is important to remember

during left sided liver resection. The portal trifurcation has implications for split liver and live donor liver transplantation, where its presence might be considered as a relative contra-indication. On rare occasions, the portal bifurcation is absent, in which case the main portal vein enters the liver giving off the right segmental branches and then turns left to supply the left lobe of the liver (a contraindication to major liver surgery). Occasionally one or more of the segmental branches of the right lobe (especially segment IV) arises proximally. (Susan,2008).

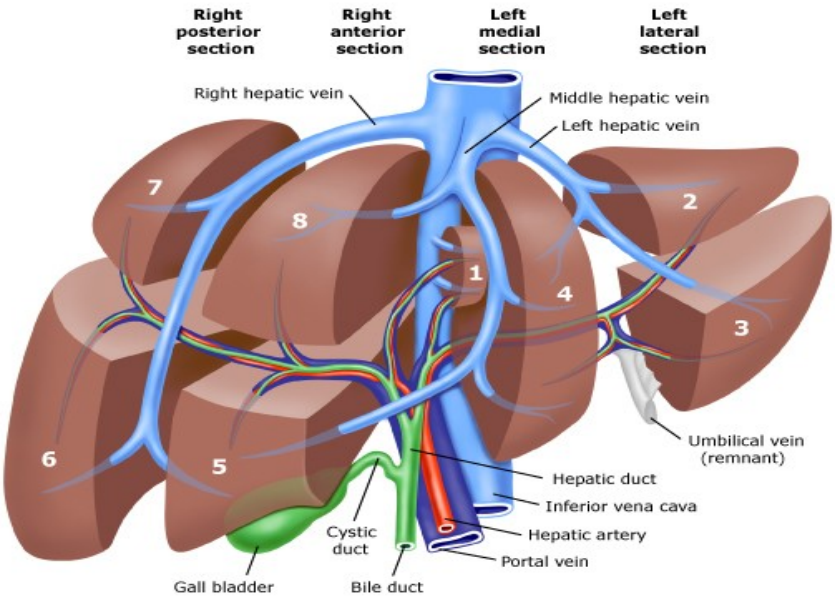


Figure (2-2) Coincoidalclassifications .(www.livertransplants india .com)

Porto-systemic shunts

Increased pressure within the portal venous system may result in dilatation of the portal venous tributaries: a reversal of flow may occur where these veins form anastomoses with veins which drain

into the systemic venous circulation. The common sites where porto-systemic shunts may occur, and the associated clinical implications, are listed in Table 2-1

Table 2-1 Common sites of occurrence of porto-systemic shunts, and associated clinical implications (Susan,2008)

Portal veins	Systemic veins	Clinical presentations
Left gastric and lower oesophageal veins	Lower branches of oesophageal veins that drain into azygos and accessory hemiazygos veins	Oesophageal or gastric varices
Superior rectal veins	Middle and inferior rectal veins that drain into internal iliac and pudendal veins	Rectal varices
Persistent tributaries of left branch of portal vein, running in ligamentum teres	Peri-umbilical branches of superior and inferior epigastric veins	Caput medusae’
Intraparenchymal branches of right branch of portal vein, lying in liver tissue exposed in ‘bare area’	Retroperitoneal veins that drain into lumbar, azygos and hemiazygos veins	Retroperitoneal dilated veins are at risk during surgery or interventional procedures
Omental and colonic veins in the region of the hepatic and splenic flexure	Retroperitoneal veins in the region of the hepatic and splenic flexure	
Patent ductus venosus connected	Inferior vena cava	Is rare

to the left branch of the portal vein		

Hepatic veins

The liver is drained by three major hepatic veins into the suprahepatic part of the inferior vena cava and a multitude of minor hepatic veins that drain into the intrahepatic inferior vena cava. The three major veins are located between the four major sectors of the liver (Susan,2008)

Right hepatic vein

This is the longest and the largest vein and also the most variable. It is usually single, but occasionally it remains as two trunks until it terminates by draining into the inferior vena cava. The right hepatic vein runs into the intersectoral plane between the right medial and right lateral sectors. It drains the whole of segments VI and VII and parts of segments V and VIII. The extent of its contribution to the drainage of segments V and VIII is variable, and depends upon the size of the veins that drain these segments into the middle hepatic vein. The right hepatic vein is formed near the anterior and inferior edge of the liver and lies in a coronal plane through most of its course. It drains into the inferior vena cava near the upper border of the caudate lobe. Of all the three major veins the right hepatic vein is the one which is the most variable in its size not only due to the differential contribution to segments V and VIII drainage along with the

middle hepatic vein but also due to the occasional presence of an accessory right middle and right inferior veins. (Susan,2008)

Middle hepatic vein

The middle hepatic vein lies along the plane between the right medial and the left medial sectors of the liver. It usually joins with the left hepatic vein and terminates into the inferior vena cava as a common trunk. It drains the central part of the liver receiving constant branches from segments IV, V and VIII. The sizes of the branches draining segments V and VIII are variable and are of surgical importance in terms of right lobe living donation. (Susan,2008)

Left hepatic vein

The left hepatic vein lies between the left medial and left lateral sectors of the liver. It drains segments II, III and occasionally IV. Small veins draining segment II and occasionally the superior part of segment IV may drain directly into the inferior vena cava in the minority of livers. Usually a major tributary of the left hepatic vein, the umbilical fissure vein runs in the intersegmental plane between segments III and IV and contributes to their drainage. Occasionally the vein draining segment III ends separately in the confluence of the left and middle hepatic veins. These variations in the venous drainage are of significance in terms of split liver transplantation and live donor liver transplantation. (Susan,2008)

Minor veins

Segment I veins drain directly into the inferior vena cava and vary in number from one to five. Since it has an independent drainage

from the rest of the liver in patients with Budd–Chiari syndrome, where all the major hepatic veins are blocked, segment I often continues to drain effectively and undergoes compensatory hypertrophy. Rarely there is an accessory right middle or inferior hepatic vein. When they are present they are of surgical importance especially if they are of more than 5 mm in diameter; they drain segments V and VI independently of the three major veins and therefore any tumour involving the three major veins can be safely resected as long as venous drainage from the accessory veins is ensured. In live donor and split liver transplantation these veins must be individually anastomosed to the recipient inferior vena cava to ensure adequate venous drainage. (Susan,2008)

Transjugularintraparenchymalporto-systemic shunt (TIPS) procedure for portal hypertension

In extreme cases of chronic portal hypertension, large calibre anastomoses between portal and systemic circulations may be formed within the liver parenchyma using a balloon catheter, introduced via the internal jugular vein and under radiological control, to puncture across and rupture through a thinned strip of liver parenchyma between hepatic veins and dilated portal branches. (Susan,2008)

Lymphatics

Lymph from the liver has abundant protein content. Lymphatic drainage from the liver is wide and may pass to nodes above and below the diaphragm. Obstruction of the hepatic venous drainage

increases the flow of lymph in the thoracic duct. Hepatic collecting vessels are divided into superficial and deep systems.

Superficial hepatic vessels

The superficial vessels run in subserosal areolar tissue over the whole surface of the liver and drain in four directions. Lymph vessels from the majority of the posterior surface, the surface of the caudate lobe, and the posterior part of the inferior surface of the right lobe, accompany the inferior vena cava and drain into pericaval nodes. Vessels in the coronary and right triangular ligaments may directly enter the thoracic duct without any intervening node. Vessels from the majority of the inferior surface, anterior surface and most of the superior surface all converge on the porta hepatis to drain into the hepatic nodes. A few lymph vessels from the posterior surface of the lateral end of the left lobe pass towards the oesophageal opening to drain into the para-cardiac nodes. One or two lymph trunks from the right surface and right end of the superior surface accompany the inferior phrenic artery across the right crus to drain into the coeliac nodes. (Susan, 2008)

Deep hepatic vessels

The great majority of the liver parenchyma is drained by lymphatic vessels within the substance of the liver. Fine lymphatic vessels merge to form larger vessels. Some run superiorly through the parenchyma to form the ascending trunks which accompany the hepatic veins and pass through the caval opening in the diaphragm to drain into nodes around the end of the

inferior vena cava. Vessels from the lower portion of the liver form descending trunks which emerge from the porta hepatis and drain into the hepatic nodes. (Susan,2008)

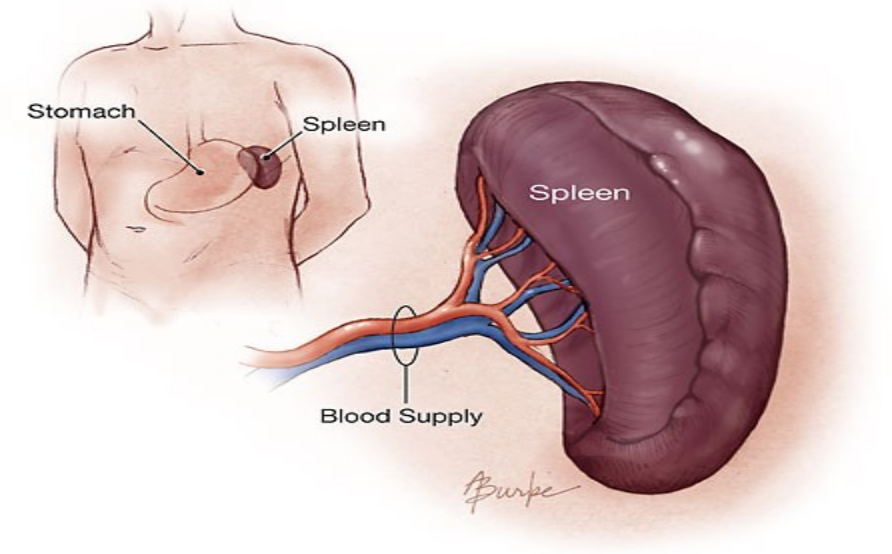
2.2 Spleen:

The spleen consists of a large encapsulated mass of vascular and lymphoid tissue situated in the upper left quadrant of the abdominal cavity between the fundus of the stomach and the diaphragm. Its shape varies from a slightly curved wedge to a ‘domed' tetrahedron. The shape is mostly determined by its relations to neighbouring structures during development. The superolateral aspect is shaped by the left dome of the diaphragm with the inferomedial aspect being influenced mostly by the neighbouring splenic flexure of the colon, the left kidney and stomach. Its long axis lies approximately in the plane of the tenth rib. Its posterior border is approximately 4 cm from the mid-dorsal line at the level of the tenth thoracic vertebral spine. Its anterior border usually reaches the mid-axillary line.

The size and weight of the spleen vary with age and sex. It can also vary slightly in the same individual under different conditions. In the adult it is usually 12 cm long, 7 cm broad, and 3–4 cm wide. It is comparatively largest in the young child, and although its weight increases during puberty, by adulthood it is relatively smaller in comparison to the neighbouring organs. It tends to diminish in size and weight in senescence. Its average adult weight is about 150 g, although the normal range is wide, between 80 g and 300 g, in part reflecting the amount of blood it

contains. The normal-sized adult spleen fits comfortably in a cupped hand; the spleen has to be at least three times its normal size before it can be palpated. (Susan,2008)

Additional collections of fully functional splenic tissue may exist near the spleen, especially within the gastrosplenic ligament and greater omentum. These accessory spleens, or splenunculi, are usually isolated but can be connected to the spleen by thin bands of similar tissue. They may be numerous and widely scattered in the abdomen. The spleen may retain its fetal lobulated form or show deep notches on its diaphragmatic surface and inferior border in addition to those usually present on the superior border(Susan,2008)



Figure(2-3) the spleenhttp://michigansurgery.com

Splenomegaly

Splenic enlargement may accompany any massive immune response and occurs in many other systemic inflammatory and degenerative conditions. In splenomegaly, the anterior border, anterior diaphragmatic surface and notched superior border may become clearly palpable below the left costal margin. The notches are often exaggerated and may be clearly palpable, and the transverse colon and splenic flexure are displaced downward. (Susan,2008)

2.2.1 Vascular Supply and Lymphatic Drainage

Splenic artery

The spleen is supplied exclusively from the splenic artery This is the largest branch of the coeliac axis and its course is among the most tortuous in the body. From its origin the artery runs a little way inferiorly, then turns rapidly to the left to run initially horizontally above the level of the neck of the pancreas, before ascending as it passes more laterally. It is less steeply inclined than the body and tail of the pancreas and so comes to lie posterior to the superior border of the gland. It lies in multiple loops or even coils which appear above the superior border of the pancreas and descend to lie behind the gland. The splenic artery lies anterior to the left kidney and left suprarenal gland and runs in the splenorenal ligament posterior to the tail of the pancreas. It divides into two or three main branches before entering the hilum of the spleen. As these branches enter the hilum they divide

further into four or five segmental arteries that each supply a segment of the splenic tissue. There is relatively little arterial collateral circulation between the segments, which means that occlusion of a segmental vessel often leads to infarction of part of the spleen. There is, however, considerable venous collateral circulation between the segments, making segmental resection of the spleen practically impossible. The splenic artery gives off various branches to the pancreas in its course and gives off short gastric arteries to the stomach just prior to dividing or from its terminal branches. (Susan,2008)

Splenic vein

The splenic vein is formed within the splenorenal ligament, close to the tip of the tail of the pancreas, by five or six tributaries that emerge from the hilum of the spleen. The tributaries are thin walled and often spread over several centimetres because the hilum is long and thin . This must be remembered during surgical removal of the spleen because the venous tributaries must be divided close to the hilum to avoid injury to the pancreatic tail. They should be ligated in several groups to prevent the risk of avulsion of the veins from the splenic hilum and consequent profuse bleeding before the resection is complete

The splenic vein runs in the splenorenal ligament below the splenic artery and posterior to the tail of the pancreas. It descends to the right, and crosses the posterior abdominal wall inferior to the splenic artery and posterior to the body of the pancreas, receiving numerous short tributaries from the gland as

it does so. It crosses anterior to the left kidney and renal hilum and is separated from the left sympathetic trunk and left crus of the diaphragm by the left renal vessels, and from the abdominal aorta by the superior mesenteric artery and left renal vein. It ends behind the neck of the pancreas, where it joins the superior mesenteric vein to form the portal vein. The short gastric and left gastro-epiploic veins drain into the splenic vein through the folds of the gastrosplenic ligament near its origin. (Susan,2008)

Lymphatics

Lymphatic vessels drain along the splenic trabeculae and pass out of the hilum into lymphatic vessels that accompany the splenic artery and vein. They run posterior to the pancreas, close to the splenic artery, and drain into nodes at the hilum and along the splenic artery and into the coeliac nodes. (Susan,2008).

2.3 Physiology of the Liver

2.3.1 Digestion

The liver plays an active role in the process of digestion through the production of bile. Bile is a mixture of water, bile salts, cholesterol, and the pigment bilirubin. Hepatocytes in the liver produce bile, which then passes through the bile ducts to be stored in the gallbladder. When food containing fats reaches the duodenum, the cells of the duodenum release the hormone cholecystokinin to stimulate the gallbladder to release bile. Bile travels through the bile ducts and is released into the duodenum where it emulsifies large masses of fat. The emulsification of fats by bile turns the large clumps of fat into smaller pieces that have more surface area and are therefore easier for the body to digest.

Bilirubin present in bile is a product of the liver's digestion of worn out red blood cells. Kupffer cells in the liver catch and destroy old, worn out red blood cells and pass their components on to hepatocytes. Hepatocytes metabolize hemoglobin, the red oxygen-carrying pigment of red blood cells, into the components heme and globin. Globin protein is further broken down and used as an energy source for the body. The iron-containing heme group cannot be recycled by the body and is converted into the pigment bilirubin and added to bile to be excreted from the body. Bilirubin gives bile its distinctive greenish color. Intestinal bacteria further convert bilirubin into the brown pigment stercobilin, which gives feces their brown color.

2.3.2 Metabolism

The hepatocytes of the liver are tasked with many of the important metabolic jobs that support the cells of the body. Because all of the blood leaving the digestive system passes through the hepatic portal vein, the liver is responsible for metabolizing carbohydrate, lipids, and proteins into biologically useful materials.

Our digestive system breaks down carbohydrates into the monosaccharide glucose, which cells use as a primary energy source. Blood entering the liver through the hepatic portal vein is extremely rich in glucose from digested food. Hepatocytes absorb much of this glucose and store it as the macromolecule glycogen, a branched polysaccharide that allows the hepatocytes to pack away large amounts of glucose and quickly release glucose between meals. The absorption and release of glucose by the hepatocytes helps to maintain homeostasis and protects the rest of the body from dangerous spikes and drops in the blood glucose level.

Fatty acids in the blood passing through the liver are absorbed by hepatocytes and metabolized to produce energy in the form of ATP. Glycerol, another lipid component, is converted into glucose by hepatocytes through the process of gluconeogenesis. Hepatocytes can also produce lipids like cholesterol, phospholipids, and lipoproteins that are used by other cells throughout the body. Much of the cholesterol produced by hepatocytes gets excreted from the body as a component of bile.

Dietary proteins are broken down into their component amino acids by the digestive system before being passed on to the hepatic portal vein. Amino acids entering the liver require metabolic processing before they can be used as an energy source. Hepatocytes first remove the amine groups of the amino acids and convert them into ammonia and eventually urea. Urea is less toxic than ammonia and can be excreted in urine as a waste product of digestion. The remaining parts of the amino acids can be broken down into ATP or converted into new glucose molecules through the process of gluconeogenesis.

2.3.3 Detoxification

As blood from the digestive organs passes through the hepatic portal circulation, the hepatocytes of the liver monitor the contents of the blood and remove many potentially toxic substances before they can reach the rest of the body. Enzymes in hepatocytes metabolize many of these toxins such as alcohol and drugs into their inactive metabolites. And in order to keep hormone levels within homeostatic limits, the liver also metabolizes and removes from circulation hormones produced by the body’s own glands.

2.3.4 Storage

The liver provides storage of many essential nutrients, vitamins, and minerals obtained from blood passing through the hepatic portal system. Glucose is transported into hepatocytes under the influence of the hormone insulin and stored as the polysaccharide glycogen. Hepatocytes also absorb and store fatty acids from

digested triglycerides. The storage of these nutrients allows the liver to maintain the homeostasis of blood glucose. Our liver also stores vitamins and minerals - such as vitamins A, D, E, K, and B12, and the minerals iron and copper - in order to provide a constant supply of these essential substances to the tissues of the body.

2.3.5 Production

The liver is responsible for the production of several vital protein components of blood plasma: prothrombin, fibrinogen, and albumins. Prothrombin and fibrinogen proteins are coagulation factors involved in the formation of blood clots. Albumins are proteins that maintain the isotonic environment of the blood so that cells of the body do not gain or lose water in the presence of body fluids.

2.3.6 Immunity

The liver functions as an organ of the immune system through the function of the Kupffer cells that line the sinusoids. Kupffer cells are a type of fixed macrophage that form part of the mononuclear phagocyte system along with macrophages in the spleen and lymph nodes. Kupffer cells play an important role by capturing and digesting bacteria, fungi, parasites, worn-out blood cells, and cellular debris. The large volume of blood passing through the hepatic portal system and the liver allows Kupffer cells to clean large volumes of blood very quickly

2.4Pathology

2.4.1 Schistosomiasis

Schistosomiasis, also known as bilharzia or “snail fever”, is a parasitic disease carried by fresh water snails infected with one of the five varieties of the parasite Schistosoma. Found predominantly in tropical and sub-tropical climates, schistosomiasis infects 240 million people in as many as 78 countries, with a vast majority of the burden occuring in Africa. Schistosomiasis ranks second only to malaria as the most common parasitic disease

Transmission

Parasites penetrate the skin during contact with freshwater containing contaminated snails. The larvae migrate to the blood vessels where they mate and produce eggs. Some eggs travel to the bladder or intestines and are passed into the urine or stool. Others remain trapped in the body and cause damage to internal organs.

Epidemiology

Schistosomiasis is prevalent in tropical and subtropical areas, especially in poor communities without access to safe drinking water and adequate sanitation. It is estimated that at least 90% of those requiring treatment for schistosomiasis live in Africa.

There are two major forms of schistosomiasis – intestinal and urogenital – caused by five main species of blood fluketable (2.2) (WHO 2016)

Table(2-2): Parasite species and geographical distribution of schistosomiasis

	Species	Geographical distribution
Intestinal schistosomiasis	Schistosoma mansoni	Africa, the Middle East, the Caribbean, Brazil, Venezuela and Suriname
	Schistosoma japonicum	China, Indonesia, the Philippines
	Schistosoma mekongi	Several districts of Cambodia and the Lao People's Democratic Republic
	Schistosoma guineensis and related S. intercalatum	Rain forest areas of central Africa
Urogenital schistosomiasis	Schistosoma haematobium	Africa, the Middle East, Corsica (France)

Schistosomiasis mostly affects poor and rural communities, particularly agricultural and fishing populations. Women doing domestic chores in infested water, such as washing clothes, are also at risk. Inadequate hygiene and contact with infected water make children especially vulnerable to infection (WHO 2016)

Signs and Symptoms:

There are several syndromes, not all of which are evident in all infected persons. The last (chronic) stage varies according to species, i.e., S. japonica, S. mansoni, and S. mekongi primarily affect liver and intestines; while S. haematobium primarily affects the urinary tract. In general, patients with chronic schistosomiasis tend to present in developed countries with lethargy, colicky abdominal pain, mucoid/bloody diarrhea, or dysuria and hematuria.

Initial symptoms may be a pruritic, papular rash that may be caused by schistosome species noted above or by other non-pathogenic parasites. This rash is most likely to occur in persons who do not live in endemic areas.

Acute schistosomiasis (Katayama fever - named after an area of Japan in which schistosomiasis no longer occurs) occurs in primary infection 1-2 months after exposure to heavy cercariae loads. Acute schistosomiasis is common in S. japonicum and S. mansoni infection. Symptoms may include fever of several weeks duration (especially with S. japonicum/Asian), headache, urticaria, cough, hepatosplenomegaly, lymphadenopathy, diarrhea, and eosinophilia. Hematuria and dysuria are common in S. haematobium. These symptoms tend to gradually diminish over several months, but may intensify as more eggs are deposited.

Chronic hepatosplenic schistosomiasis is a consequence of eggs retained in tissue and prolonged infection - usually of > 10 years duration. The eggs provoke a delayed hypersensitive granulomatous reaction with the granuloma occupying >200

times the volume of the egg. The liver may be large or small and firm with nodularity. Fibrosis may cause portal hypertension, splenomegaly, or esophageal or gastric varices. Hematemesis and splenomegaly are common presenting symptoms, with normal liver function. In endemic areas, periportal fibrosis is common and is usually not detectable on physical exam. Periportal fibrosis and portal hypertension is associated with glomerulonephritis (proteinuria, renal failure) and pulmonary hypertension. Granulomatous tissue in the bowel results in bloody diarrhea.

Chronic genitourinary schistosomiasis is associated with chronic S. haematobium infection. Granulomas in the bladder mucosa result from repeated masses of eggs laid by female worms residing in the bladder. Hematuria and dysuria are common from the acute through chronic stages. Obstructive uropathy develops from granulomas blocking ureteral orifices and ureteral dilation may also occur with the end results of hydronephrosis and uremia. Bladder cancer rates are increased in endemic areas.

Salmonella infection concurrent with schistosomiasis is common and is resistant to treatment unless the schistosomiasis is also treated.

2.5Sonographic Appearance of normal liver and spleen

2.5.1 The liver

Is a homogeneous, mid-grey organ on ultrasound. It has the same, or slightly increased echogenicity when compared to the cortex of the right kidney.

The size of the liver is difficult to quantify, as there is such a large variation in shape between normal subjects and direct measurements are notoriouslyinaccurate. Size is therefore usually assessedsubjectively. Look particularly at the inferior margin of the right lobe which should come to a point anterior to the lower pole of the right kidney.(Jane A. Bates 2004).

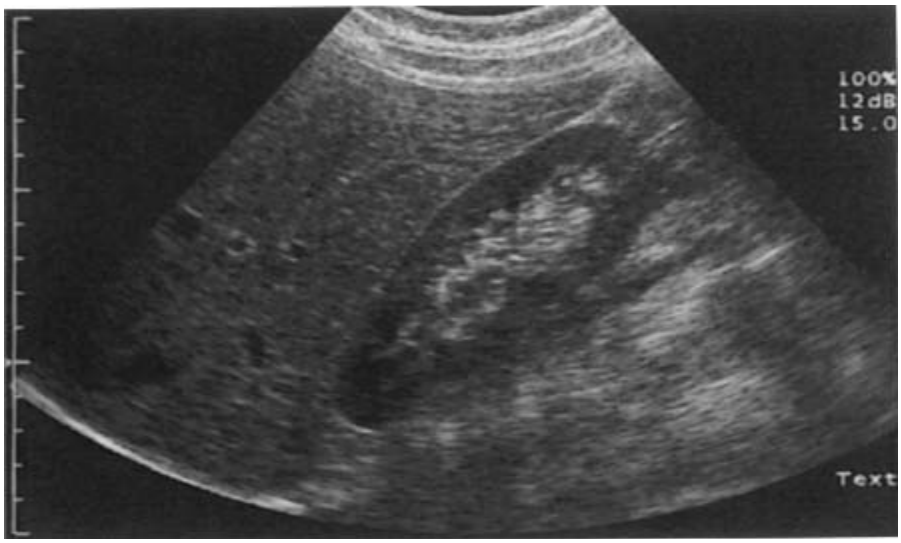


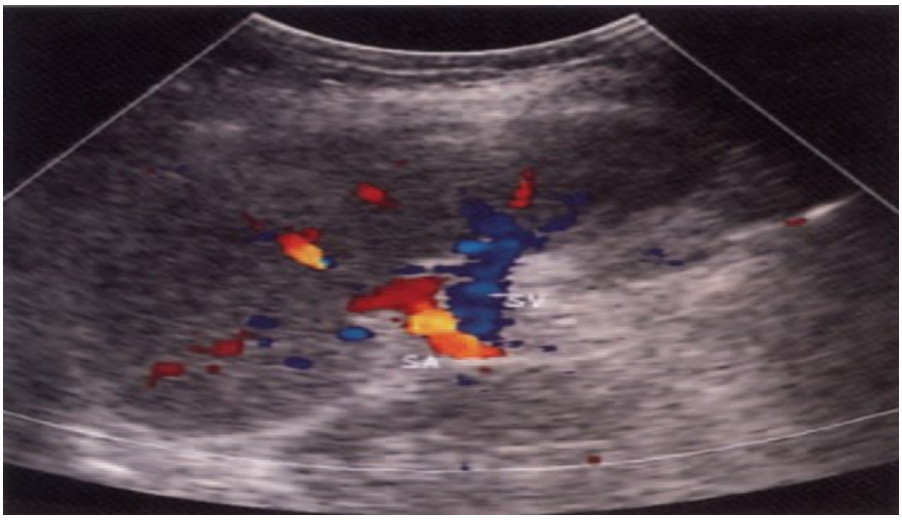
Figure 2.4 Longitudinal section (LS) through the rightlobe of the liver. The renal cortex is slightly lessechogenic than the liver parenchyma. .(Jane A. Bates 2004).

2.5.2 The spleen

The normal spleen has a fine, homogeneous texture, with smooth margins and a pointed inferior edge. It has similar echogenicity to

the liver but may be slightly hypo- or hyperechoic in some subjects. Sound attenuation through the spleen is less than that through the liver, requiring the operatorto ‘flatten’ the time gain compensation controls in order to maintain an even level of echoes throughout the organ.

The main splenic artery and vein and their branches may be demonstrated at the splenic hilum ..(Jane A. Bates 2004).



.**Figure(2-5)Left coronal view of the normal spleen demonstrating the main splenic artery and vein at the hilum..(Jane A. Bates 2004).**

2.6 The Previous Studies:

Abdomohammedabdallah march (2011) evaluatedthe use of ultrasound in Evaluation of Caudate and Right Hepatic Lobes Ratio in patient with Schistosomamansoni.

Caudate and Right lobe ratio is used to assess the liver ,usually in setting of cirrhosis ,caused by chronic liver disease, in which there is atrophy of the right lobe with hypertrophy of the caudate lobe. In this study this ratio was done to patients infection with schistosomamansoni using ultrasound to assess the relationship between caudate-right lobe hepatic lobe ratio and liver size change, liver cirrhosis and complications in schistosomiasis patient .It was carried on 50 adults patient of known cases of schistosomiasis in Alfao area and 20 adults volunteers from the same area as control group during septemper 2010 to March 2011,all were surveyed by ultrasound using portable Toshiba scanner with 3.5 MHz probe.

Abdominal scanning was performed for all, measurement done for liver, caudate lobe right lobe portal vein wall thickness portal vein caliper and spleen size following the international guideline, measurement ,scanning and protocol .The study showed that the male affected more than female with incidence of 62%,38% respectively . It also showed that the most affected patient were farmer worker with high incidence 64%. The study noticed the most affected patient were those in the age ranging between (31to50) years with incidence 58%.The study concluded that C/R lobe ratio has proportional

relation to the portal vein wall thickness, the portal vein caliper and the spleen size and has reversal relation to the liver size. The C/R lobe ratio in coarse liver more than 0.64 and in complication more than 0.7.

Mustafa Gafar Musa march(2004) used of ultrasound to evaluate the complications of Schistosomamansoni in Khartoum teaching hospital survey 100 patiens known of schistosomamansoni, 45%were noted with pipe steam peri portal fibrosis, 55%have diffuse periportal fibrosis, 30% with mild portal hypertension, 13% had moderate portal hypertension ,21% had marked portal hypertension,26% had ascites while 74% noted with out ascites ,11% no splenomegally, 89% noted with splenomegally, 74% with normal liver size ,

18% with hepatomegally , and 8% with shrinkage liver .

(Vivek Kumar Sah et al, 2015) found that Schistosomiasis is one of the major affects 200 million people, resulting in the loss of 1.53 million disability-adjusted life years (DALY). The disease presents in wide spectrum including both acute and chronic forms, affecting multiple target organs. The schistosomal infection is mainly diagnosed by demonstrating evidence of infestation by parasitological, serological or molecular methods using samples such as stool, urine, blood or other body fluids and tissue specimens. However, these test methods have their own limitations in evaluating severity of morbidity. The role of diagnostic imaging modalities such as ultrasonography, CT

scan and MR scan is crucial not only to diagnose the disease but also to evaluate the severity of the disease process and its complications in target organs. The clinical and imaging features of the disease can mimic other infectious as well as noninfectious disease. Thus, it is essential to be familiar for radiologists and physicians with the imaging features of schistosomiasis, so as to make accurate and timely diagnosis and thereby, reducing the morbidity and mortality of this disease. Ultrasound is considered as primary modality of choice as it is able to pick characteristic hepatosplenic and urinary lesions. Typical ultrasonographic findings of hepatosplenic schistosomiasis include periportal fibrosis, hypertrophy of the left liver lobe, atrophy of right liver lobe, splenomegaly, and ascites. CT and MR scan are valuable not only for hepatosplenic and urogenital schistosomiasis, but also for secondary and ectopic lesions such as those in CNS and lungs, which are difficult to be assessed by ultrasonography. Periportal fibrosis, map-like calcification of liver parenchyma, nodular enhancement of the cerebral mass are some typical imaging findings of schistosomiasis (Vivek Kumar Sah et al, 2015).

(Tamer Elbaz, Gamal Esmat 2012)aimedof the studySchistosomiasis is an endemic disease in Egypt caused by the trematode Schistosoma which has different species. Hepatic schistosomiasis represents the best known form of chronic disease with a wide range of clinical manifestations. The pathogenesis of schistosomiasis is related to the host

cellular immune response. This leads to granuloma formation and neo angiogenesis with subsequent periportal fibrosis manifested as portal hypertension, splenomegaly and esophageal varices. Intestinal schistosomiasis is another well identified form of chronic schistosomal affection. Egg deposition and granuloma formation eventually leads to acute then chronic schistosomal colitis and is commonly associated with polyp formation. It frequently presents as abdominal pain, diarrhea, tenesmus and anal pain. Definite diagnosis of schistosomiasis disease depends on microscopy and egg identification. Marked progress regarding serologic diagnosis occurred with development of recent PCR techniques that can confirm schistosomal affection at any stage. Many antischistosomal drugs have been described for treatment, praziquantel being the most safe and efficient drug. Still ongoing studies try to develop effective vaccines with identification of many target antigens. Preventive programs are highly needed to control the disease morbidity and to break the cycle of transmission (Tamer Elbaz, Gamal Esmat 2012)

Chapter Three

Material and methods

This was prospective study which done for known cases of schistosomiasis , the study was carried out at IBN SENA hospital.

3-1 Samples

The data collected by using 50 sample of patients with bilharsiasiscame to ultrasound department for scanning , at period from March up to June 2016 .

3-2 Examination technique

The patient is coming fasting at least 8 hours , to reduce bowel gas .

Patient lie in supine position , left lateral decubitus. By applying gel to the curve linear array transducer with frequency 3.5 MHz scan done in longitudinal and transverse – oblique planes transducer is placed in subcostal location and scanning is performed with the performed in deep inspiration in order to lower the liver .

Measure the internal (inner to inner) diameter of the portal vein at the entry point of the portal vein into the liver.

patient be scanned in the lateral decubitus (left side up) position and that the left tenth or eleventh intercostal spaces be used as access to the spleen. You will be scanning in the left coronal plane and should be able to achieve a long axis scan and by turning the transducer ninety degrees, a short axis scan.

You will be scanning in the left coronal plane and should be able to achieve a long axis scan and by turning the transducer ninety degrees, a short axis scan to show spleen.

Measure the internal (inner to inner) diameter of the portal vein at the entry point of the portal vein into the liver.

3-3 Equipment

Ultrasound scanner:
Honda -

HS 2000 -

Portable -

Curvilinear -

MHz 3.5 -

Personal computer
Data collection sheet

3-4 Data collection

The data will be collected by clinical data sheets and ultrasound images

3-5 Measurements

The study of population was assessed with

Patient age -

Gender -

Occupation -

Incidence of ascites -

Incidence of PPF -

Incidence of PHTN -

Liver size -

Spleen size -

Incidence of UTI -

3-6 The method of data analysis used

After collecting , the data sheets were symbolized ,classified and analyzed by using SPSS and excel.

The complex tables and figures were used in the analysis and carried out the relationship between variables.

Chapter four

Result

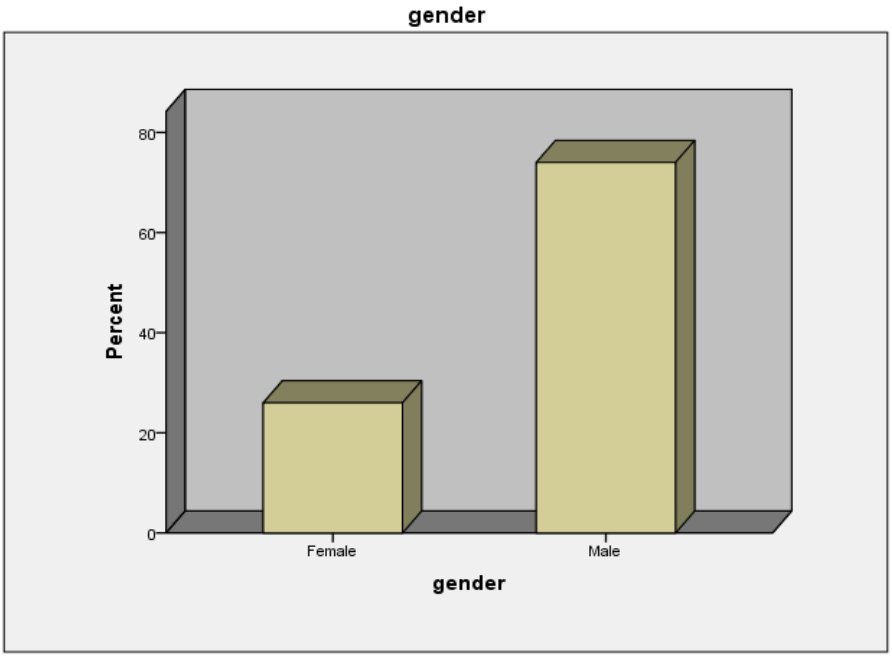


Figure 4.1 Gender distribution

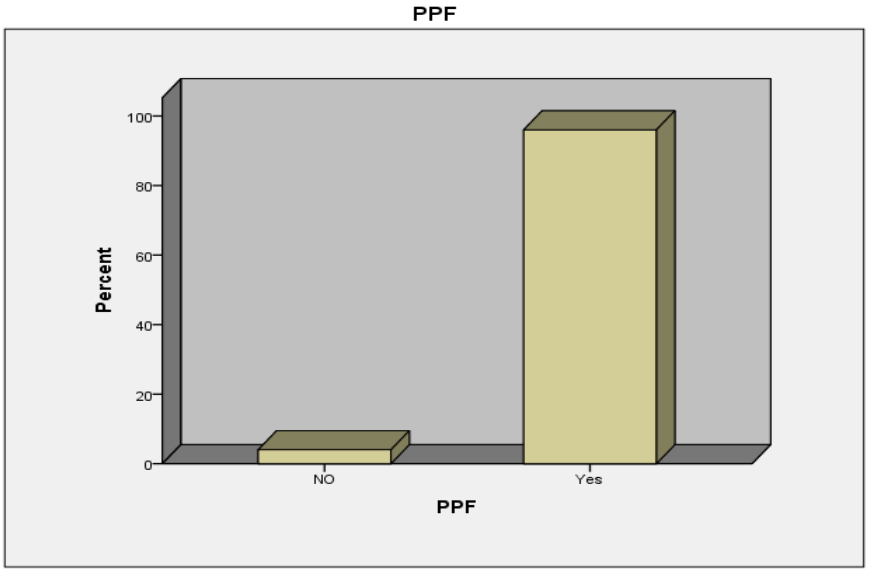


Figure 4.2 Theincidence of periportal fibrosis

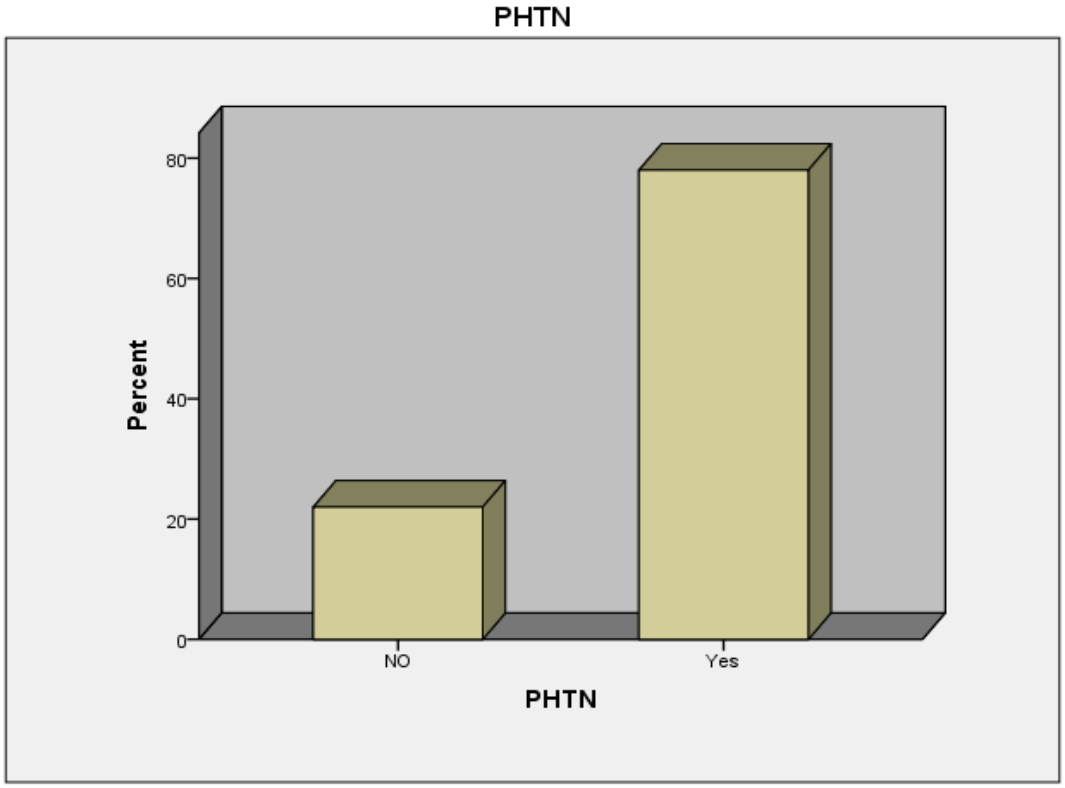


Figure 4.3 Theincidence of portal hypertension

Table (4.1) Cross tabulation demonstrate the relationship between patients age and size of the liver in case under study

Age Vs liver size		Liver size			Total
		normal	small	enlarged	
age	10-19	1	0	0	1
	20-29	2	1	1	4
	30-39	6	3	1	10
	40-49	9	2	1	12
	50-59	6	4	1	11
	60-69	2	0	1	3
	70-79	2	4	2	8
	80-89	0	1	0	1
Total		28	15	7	50
Correlation is significant at p<0.05 (p=0.712)					

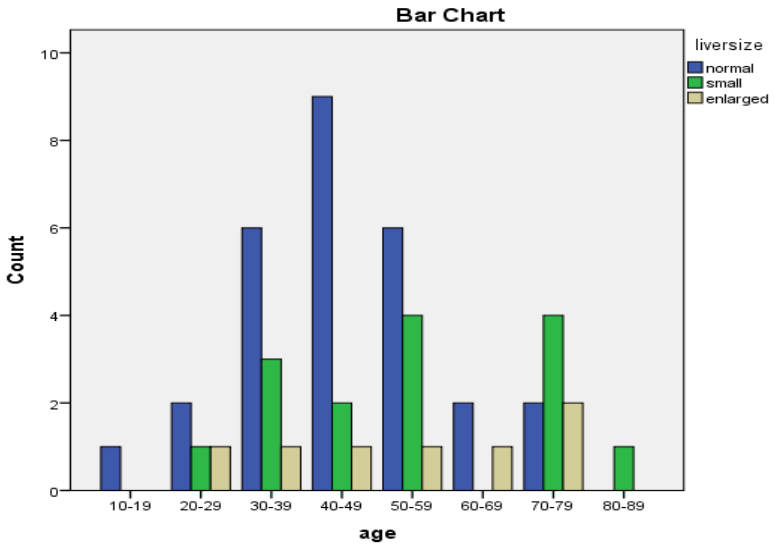


Figure (4.4) Showed the effect of patient age on the liver size in patient with bilharziasis

Table (4.2) Cross tabulation showed the relationship between the patient age and presents and absents of PPF

age * PPF	PPF		Total
	Yes	No	

age	10-19	1	0	1
	20-29	3	1	4
	30-39	9	1	10
	40-49	12	0	12
	50-59	11	0	11
	60-69	3	0	3
	70-79	8	0	8
	80-89	1	0	1
Total		48	2	50

Correlation is significant at $p<0.05$ ($p=0.426$)

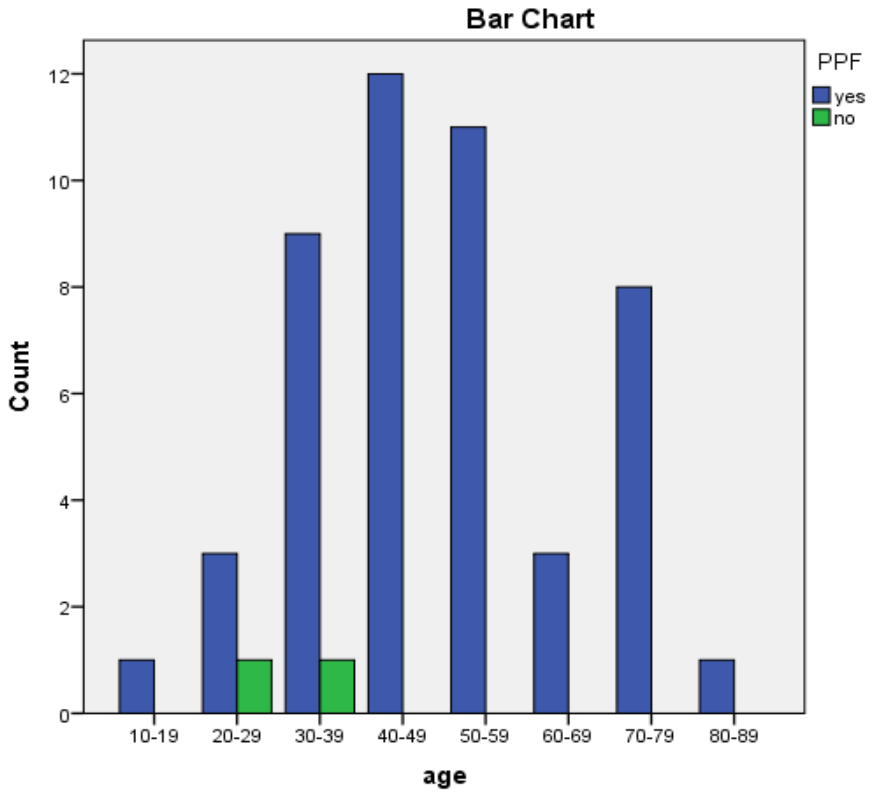


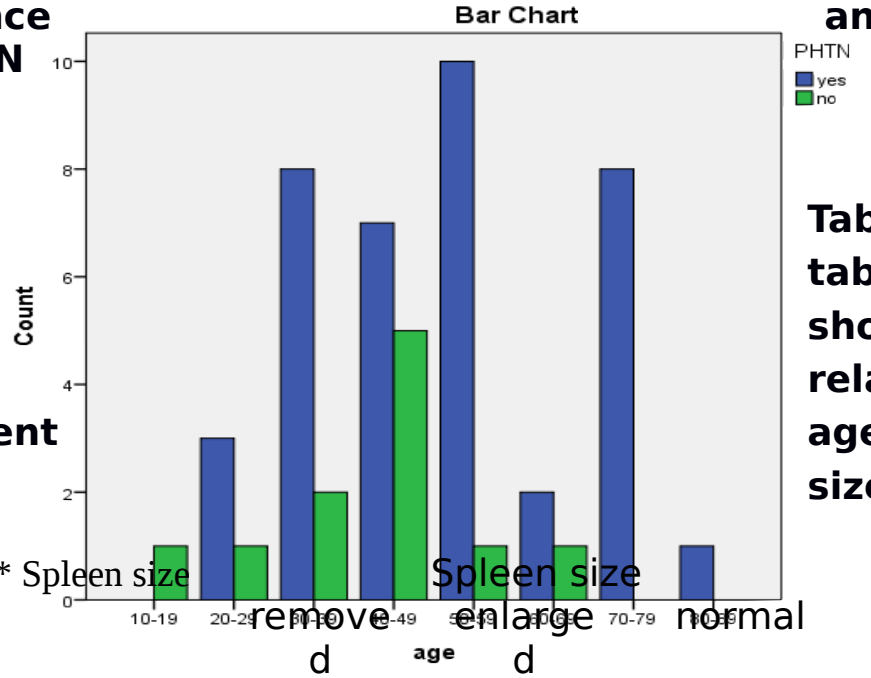
Figure (4.5) Showed the relationship between the patient age and presents and absents of PPF

Table (4.3) Cross tabulation showed the relationship of patient age and presence and absents of PHTN

age * PHTN		PHTN		Total
		Yes	No	
Age	10-19	0	1	1
	20-29	3	1	4
	30-39	8	2	10
	40-49	7	5	12
	50-59	10	1	11
	60-69	2	1	3
	70-79	8	0	8
	80-89	1	0	1
Total		39	11	50

Correlation is significant at p<0.05 (p=0.182)

Figure(4.6) Showed the relationship of patient age and presence and absents of PHTN



Cross tabulation showed the relationship of patient age and spleen size

Table(4.4)

age * Spleen size		Spleen size			Total
		removed	enlarged	normal	
age	10-19	0	1	0	1
	20-29	0	4	0	4
	30-39	1	8	1	10
	40-49	0	12	0	12
	50-59	0	11	0	11
	60-69	0	3	0	3
	70-79	1	7	0	8
	80-89	0	1	0	1
Total		2	47	1	50

Correlation is significant at p<0.05 (p=0.0.89)

Table (4.5) Showed the relationship of patient age and presence or absents of ascites

age * ascites		ascites		Total
		Yes	no	
ag	10-19	0	1	1

e	20-29	2	2	4
	30-39	2	8	10
	40-49	4	8	12
	50-59	5	6	11
	60-69	1	2	3
	70-79	6	2	8
	80-89	1	0	1
Total		21	29	50
Correlation is significant at p<0.05 (p=0.0.308)				

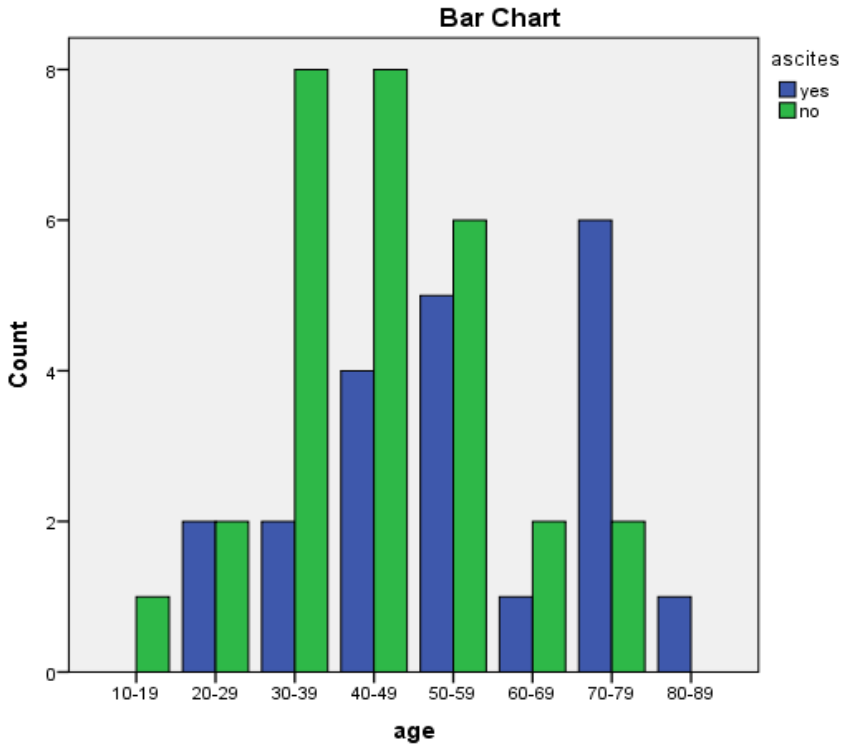


Figure (4.7) Showed the relationship of patient age and incidence of ascites

Table (4.6) Showed the relationship of patient age and incidence of UTI

age * UTI		UTI		Total
		Yes	no	
age	10-19	0	1	1
	20-29	0	4	4
	30-39	1	9	10
	40-49	0	12	12
	50-59	0	11	11
	60-69	0	3	3
	70-79	1	7	8
	80-89	0	1	1
	Total	2	48	50

Correlation is significant at p<0.05 (p=0.805)

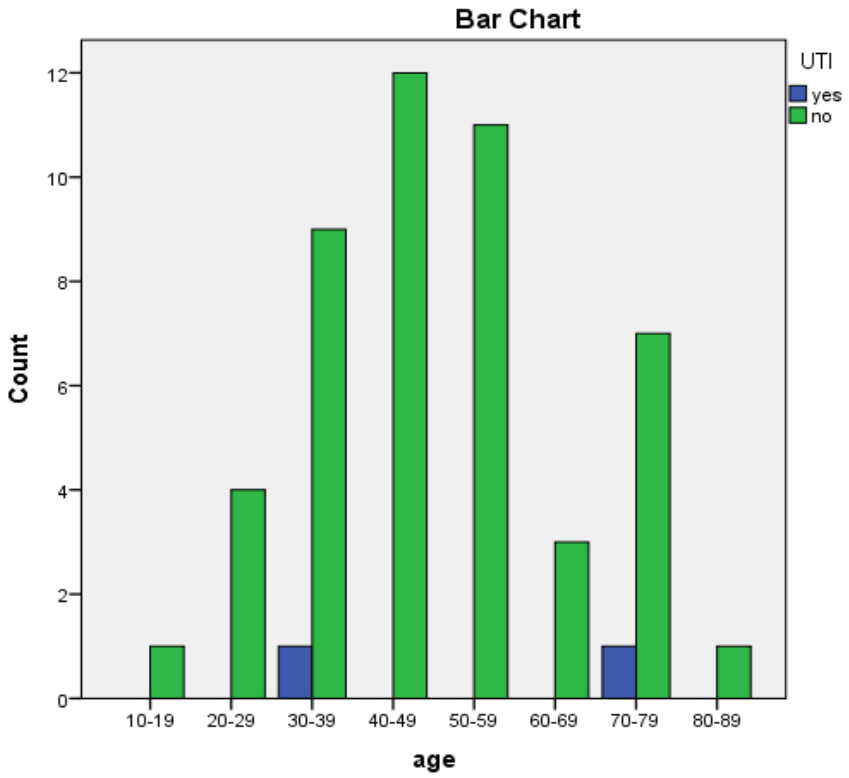


Figure (4.8) Showed the relationship of patient age and incidence of UTI

Table(4.7) Showed the relationship of gender and liver size

gender * liver size		Liver size			Total
		Normal	small	Enlarged	
Gender	Male	21	12	4	37
	Female	7	3	3	13
Total		28	15	7	50

Correlation is significant at p<0.05 (p=0.0.515)

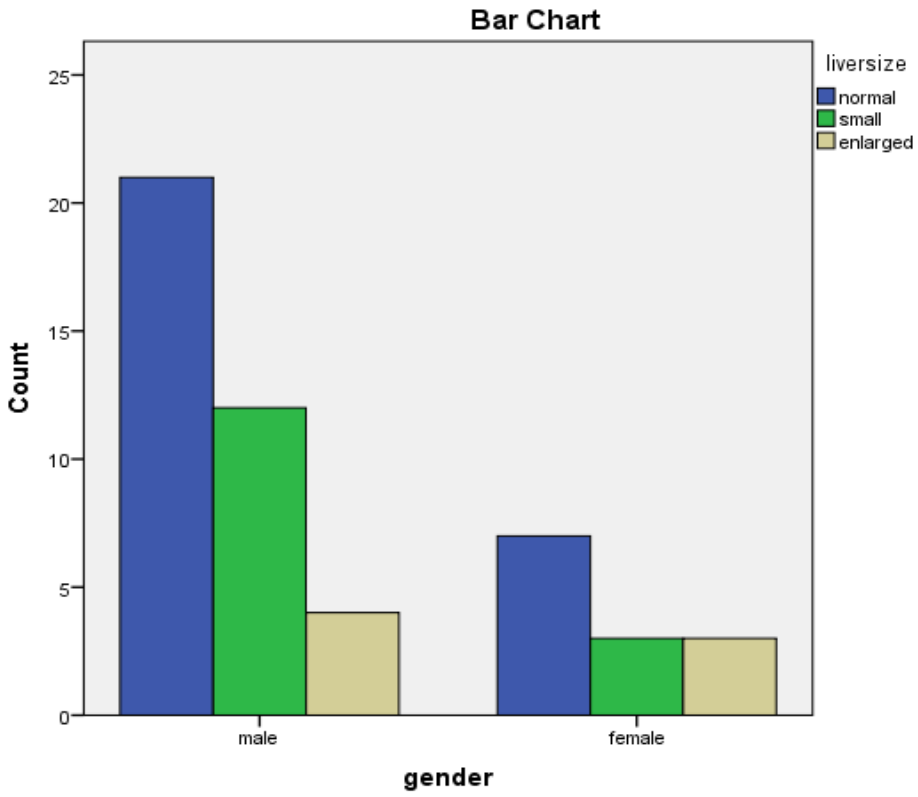


Figure (4.9) Showed the relationship of gender and liver size

Table (4.8) Showed the relationship between patient gender and PPF

gender * PPF		PPF		Total
		Yes	no	
gender	male	35	2	37
	female	13	0	13
Total		48	2	50

Correlation is significant at p<0.05 (p=0.544)

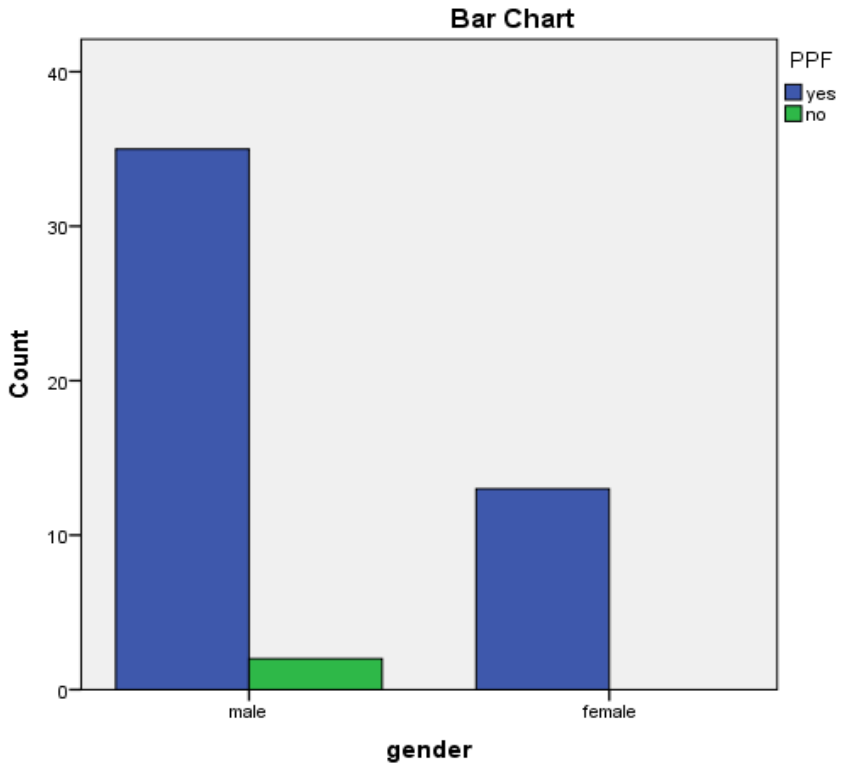


Figure (4.10) Showed the relationship of patient gender and PPF

Table (4.9) Showed the relationship of patient gender and PHTN

gender * PHTN		7 PHTN		Total
		Yes	no	
Gender	male	27	10	37
	female	12	1	13
Total		39	11	50

Correlation is significant at p<0.05 (p=0.0.144)

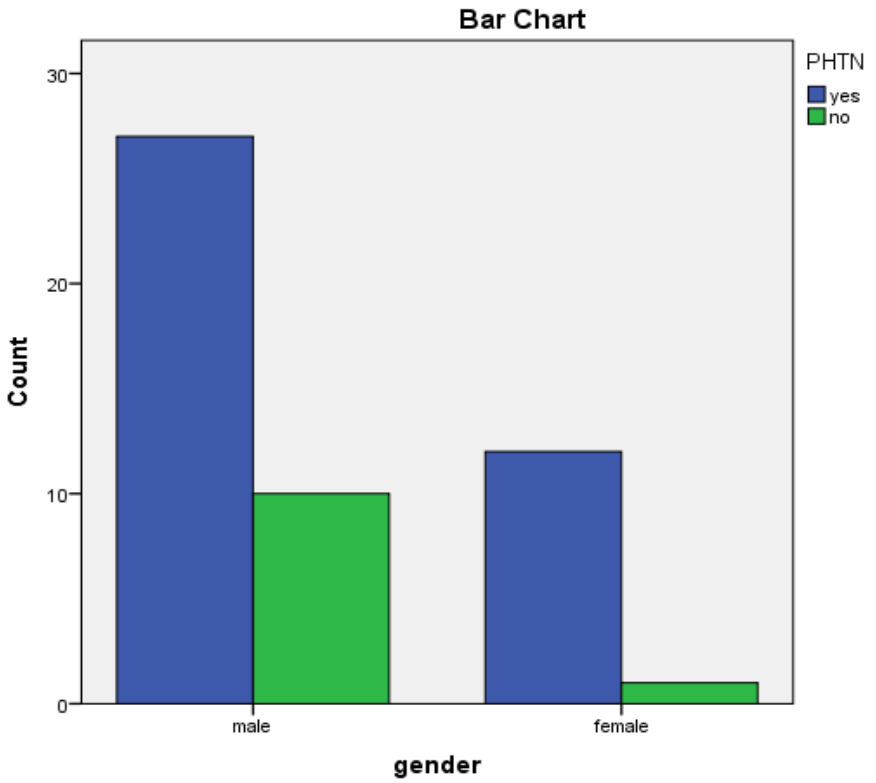


Figure (4.11) Showed the relationship of patient gender and PHTN

Table (4.10) Showed the relationship of patient gender and spleen size

gender * Spleen size		Spleen size			Total
		Removed	enlarged	normal	
Gender	Male	2	34	1	37
	female	0	13	0	13
Total		2	47	1	50

Correlation is significant at p<0.05 (p=0.571)

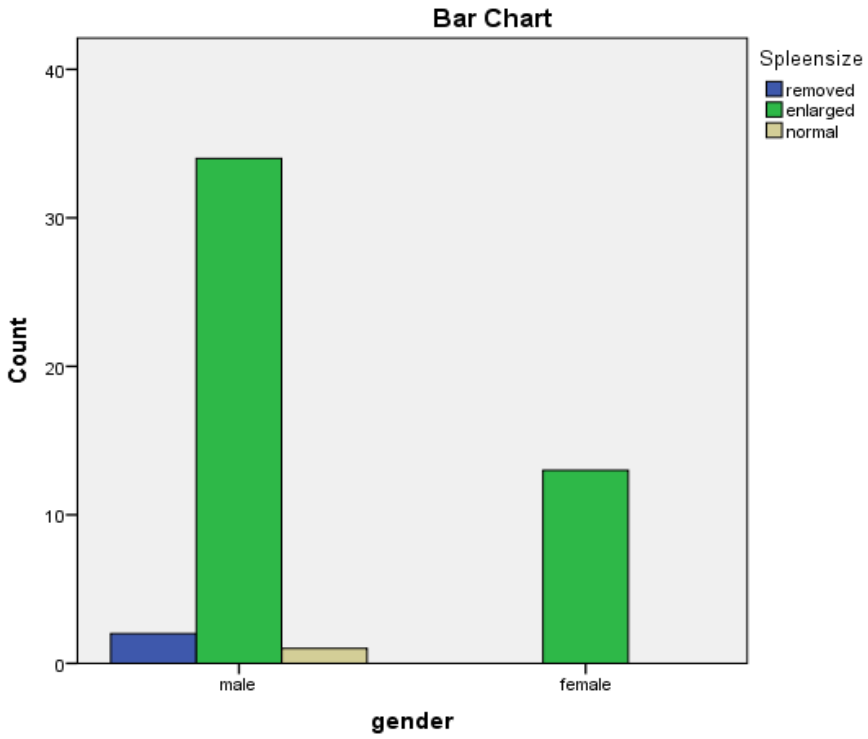


Figure (4.12) Showed the relationship of patient gender and spleen size

Table (4.11) Showed the relationship of patient gender and ascites

gender * ascites		Ascites		Total
		yes	no	
Gender	male	15	22	37
	female	6	7	13
Total		21	29	50

Correlation is significant at p<0.05 (p=0.486)

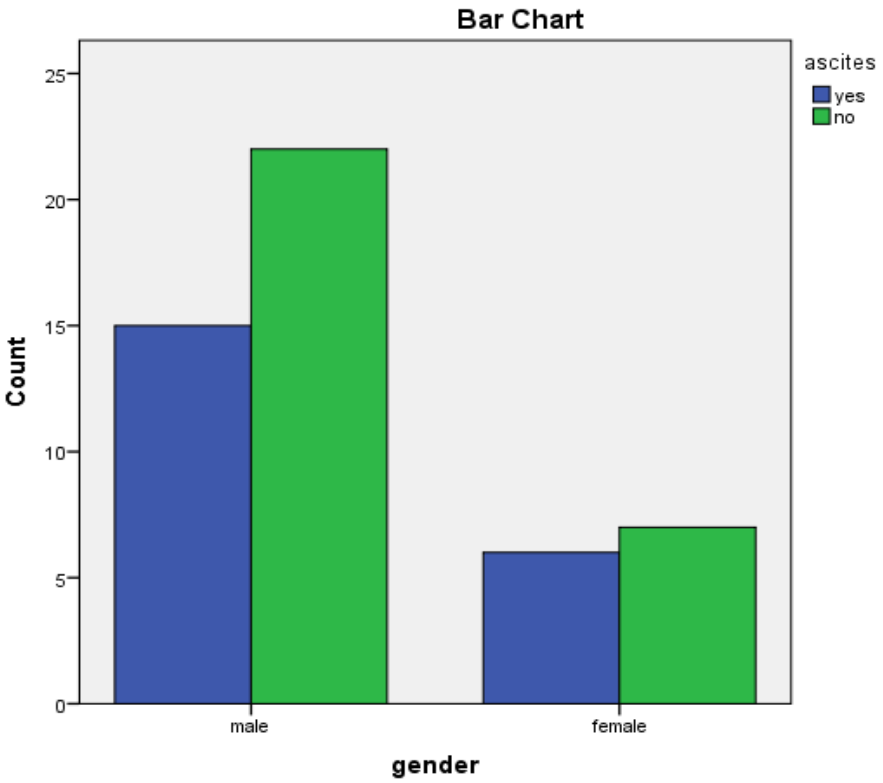


Figure (4.13) Showed the relationship of patient gender and ascites

Table (4.12) Showed the relationship of patient gender and UTI

gender * UTI		UTI		Total
		yes	No	
Gender	Male	1	36	37
	Female	1	12	13
Total		2	48	50

Correlation is significant at p<0.05 (p=0.45)

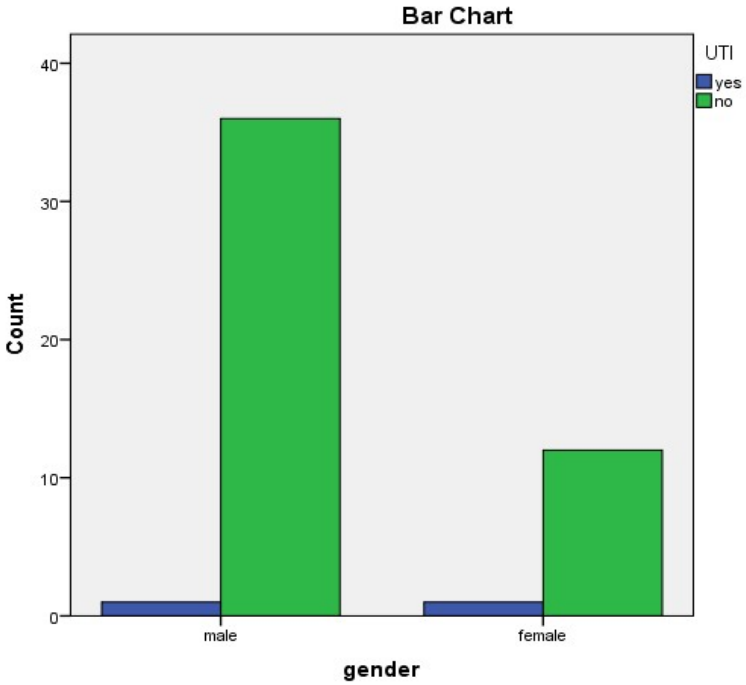


Figure (4.14) Showed the relationship of patient gender and UTI

Table (4.13) Showed the relationship of patient occupation and liver size

occupation * liversize		Liversize			Total
		Normal	Small	Enlarged	
Occupation	GW	4	2	0	6
	farmer	17	9	3	29
	HW	5	4	3	12
	student	2	0	1	3
Total		28	15	7	50

Correlation is significant at p<0.05 (p=0.597)

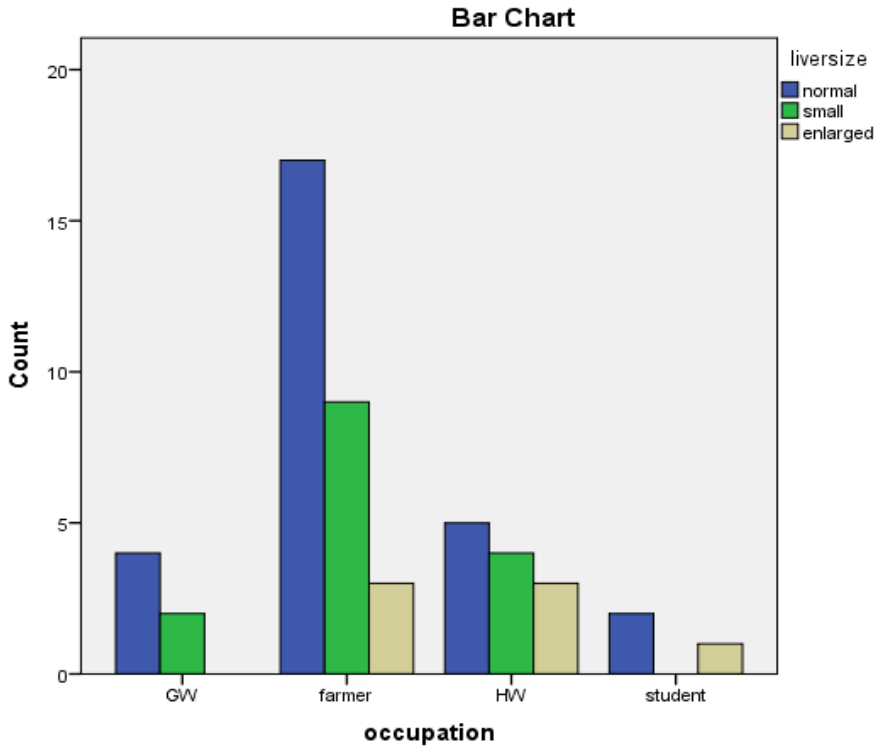


Figure (4.15) Showed the relationship of patient gender and liver size

Table (4.14) Showed the relationship of patient occupation and PPF

occupation * PPF		PPF		Total
		Yes	no	
Occupation	GW	6	0	6
	Farmer	27	2	29
	HW	12	0	12
	Student	3	0	3
Total		48	2	50

Correlation is significant at p<0.05 (p=0.680)

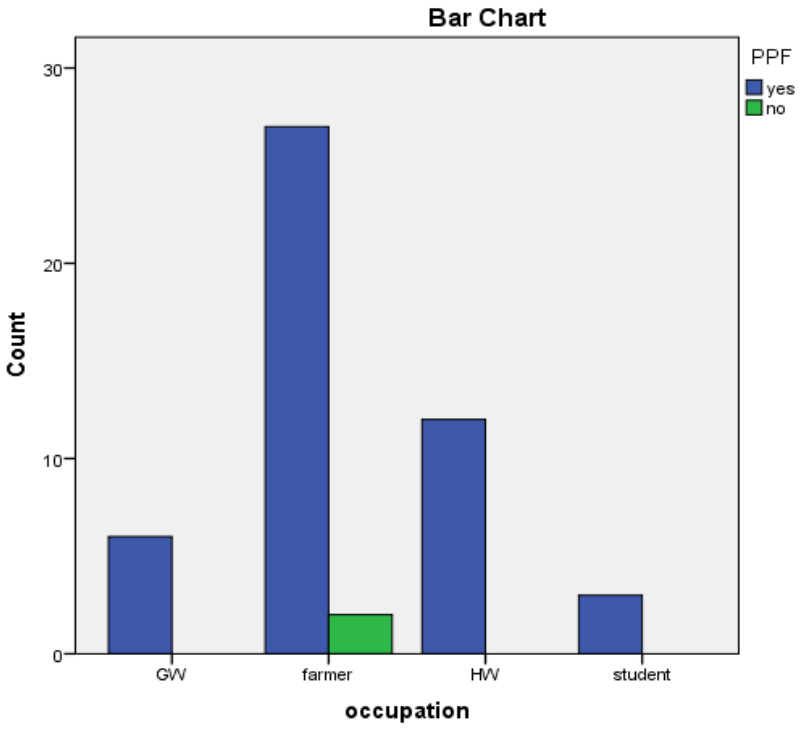


Figure (4.16) Showed the relationship of patient gender and PPF

Table (4.15) Showed the relationship of patient occupation and PHTN

occupation * PHTN		PHTN		Total
		yes	no	
occupation	GW	3	3	6
	Farmer	24	5	29
	HW	11	1	12
	Student	1	2	3
Total		39	11	50

Correlation is significant at p<0.05 (p=0.048)

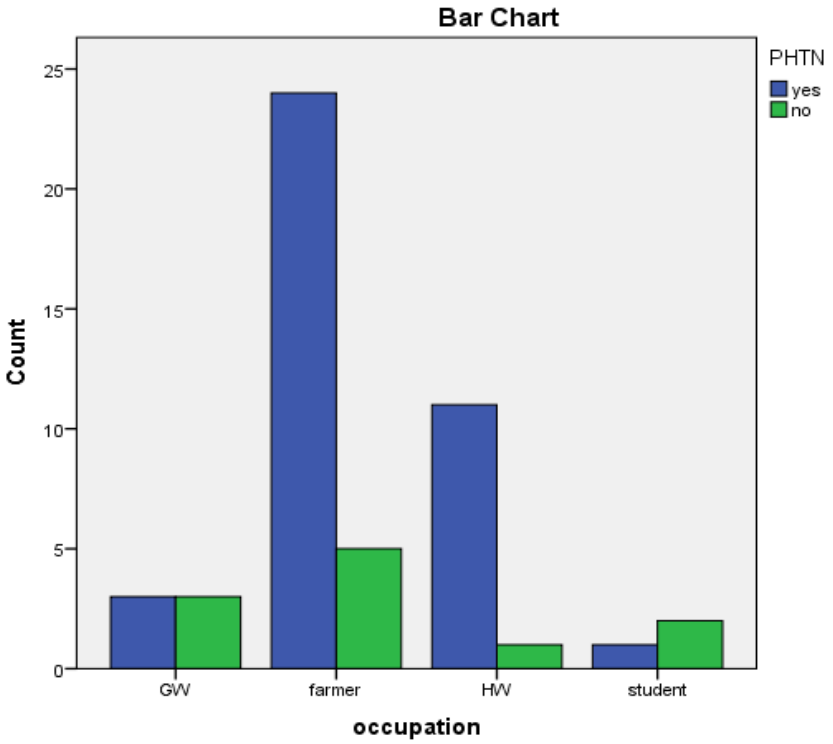


Figure (4.17) Showed the relationship of patient occupation and PHTN

Table (4.16) Showed the relationship of patient occupation and spleen size

occupation * Spleen size		Spleen size			Total
		removed	enlarged	normal	
Occupation	GW	1	5	0	6
	farmer	1	28	0	29
	HW	0	12	0	12
	student	0	2	1	3
Total		2	47	1	50
Correlation is significant at p<0.05 (p=0.004)					

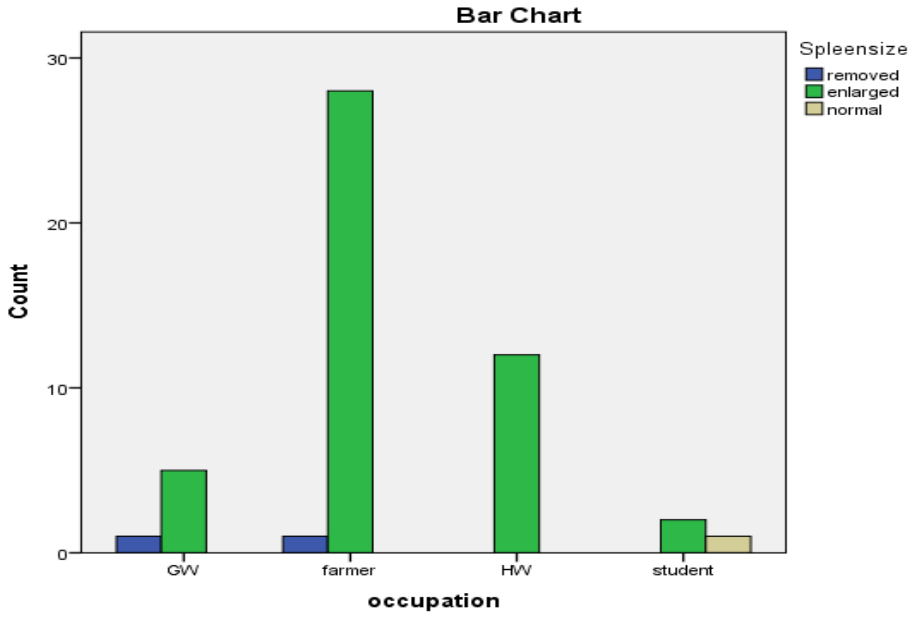


Figure (4.18) Showed the relationship of patient occupation and spleen size

Table (4.17) Showed the relationship of patient occupation and ascites

occupation * ascites		ascites		Total
		yes	No	
occupation	GW	3	3	6
	farmer	12	17	29
	HW	6	6	12
	student	0	3	3
Total		21	29	50

Correlation is significant at p<0.05 (p=0.449)

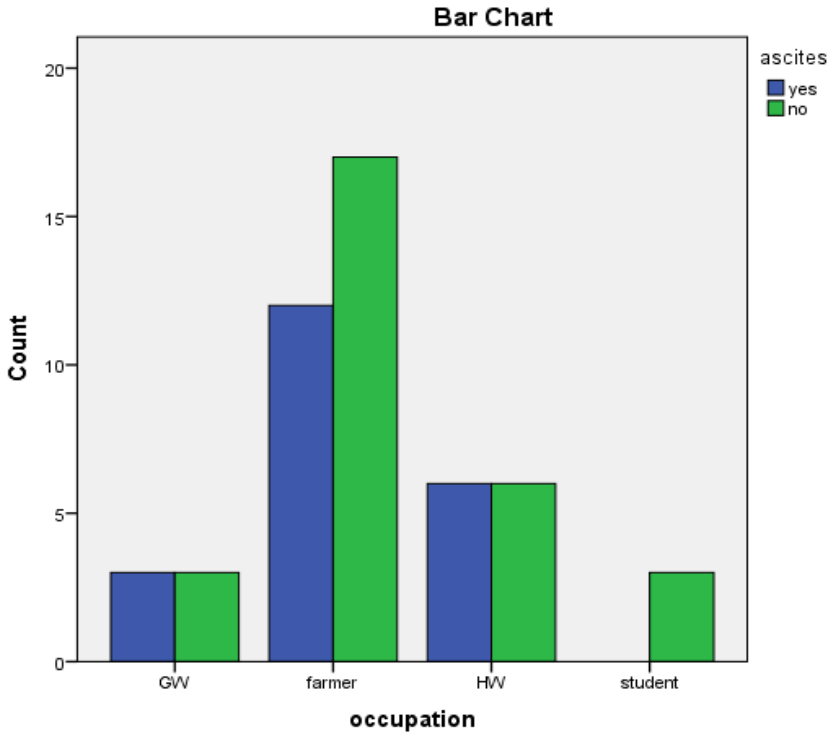


Figure (4.19) Showed the relationship of patient occupation and ascites

Table (4.18) Showed the relationship of patient occupation and UTI

Occupation * UTI		UTI		Total
		yes	no	
occupation	GW	0	6	6
	farmer	1	28	29
	HW	1	11	12
	student	0	3	3
Total		2	48	50

Correlation is significant at p<0.05 (p=0.805)

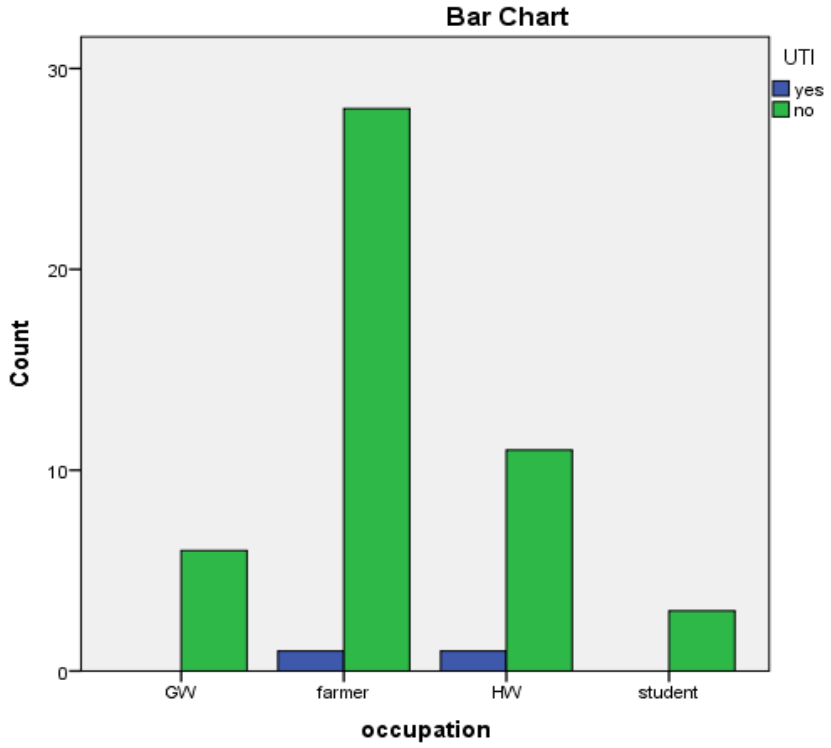


Figure (4.20) Showed the relationship of patient occupation and UTI

Chapter five

Discussion, conclusion and recommendations

5-1 discussion:

The study aimed to assess the complications of schistosomiasis in Sudanese population using ultrasonography. The study conducted in IBN SENA hospital from March to July 2016.

All patients were scanned for abdomen and pelvic ultrasound using 3.5 MHZ , to show liver , spleen portal vein ,kidney and urinary bladder, the variables of this study are age, gender , occupation, liver size ,spleen size , and incidence of (PHTN, PPF, ascites ,UTI) study a correlation between those variables

Population of this study were 50 patients of both gender as : 37 male with percentage (74%) and 13 female with percentage (26%).

This result shows the male are more affected with schistosomiasis than female as in figure (4.1).

Figure (4.2) shows the incidence of periportal fibrosis is high in schistosomiasis patients 96% this result agree with (Mustafa Gafar 2004).

Figure (4.3) shows the incidence of portal hypertension was high in schistosomiasis patients 78% this result agree with (Mustafa Gafar 2004) study

As from table (4.1) which demonstrated the relationship between the age and liver size we found that there is no significant relationship between the age and liver size.

Table (4.2) showed insignificant relationship between patient age and incidence of PPF but it clearly appear that most

affected age ranged between 30 -80 years old , also PHTN had insignificant relationship with patient age this is shown in table (4.3).

The spleen size showed slightly significant relation with patient age as in table (4.4) ,the most affected age group ranged between 30-60.

From table (4.5) which demonstrated the relationship between patient age and incidence of ascites there was a significant relationship with p=(0.0308) from this table we can find that 42% of total sample were affected with ascites while 58% were not .

The incidence of UTI also correlated to patient age as it demonstrated in table (4.6) which showed insignificant relationship.

The relationship between gender and liver size was significant as demonstrated in table(4.7) , which noted that females affected with 46 % and males affected with (43%)

Table (4.8) showed insignificant relationship between gender and incidence of PPF but the incidence of PPF was very high in schistosomiasis patients (96%) of total sample were affected with PPF.

Table (4.9) which demonstrated the relationship between patient gender and incidence of PHTN showed significant relationship with p=(0.0144) ,the females were most affected with PHTN while males affected with (72.9)%

Table (4.10) which demonstrated insignificant relationship between gender and spleen size, 100% of females showed enlarged spleen while 91.9 % of male showed enlarged spleen.

Table (4.11) which demonstrated insignificant relationship between gender and incidence of ascites , 41 % of males showed ascites , 59 % had no ascites while 46 % of females showed ascites and 54 % had no ascites .

Table (4.12) which demonstrated insignificant relationship between gender and UTI incidence.

Table (4.13) which demonstrated insignificant relationship between occupation and liver size. But it was obviously that the farmers are more affected with schistosomiasis 58% of total sample.

Table (4.14) which demonstrated insignificant relationship between occupation and PPF

Table (4.15) which demonstrated significant relationship between occupation and PHTN ,but farmer patients mostly affected (82%) of them affected with PHTN .

Table (4.16) which demonstrated significant relationship between occupation and spleen size . But farmer mostly affected 96% of them showed enlarged spleen .

Table (4.17) which demonstrated insignificant relationship between occupation and ascites.

Table (4.18) which demonstrated insignificant relationship between occupation and UTI.

5-2 Conclusion

The study well demonstrated the medical diagnostic ultrasound is an easy , fast ,safe, accurate and reliablein detecting schistosomiasiscomplications.

Ultrasound findings in patients with bilarzisis were hepatomegaly, shrink liver, splenomegaly, PPF, portal hypertension, ascites and UTI.

It was found that the incidence of schistosomiasis is higher in male than female.

It was found that the incidence of periportal fibrosis in schistosomiasis patients is very high

It was found that the incidence of portal hypertension is high in schistosomiasis.

Schistosomiasis mainly affects the farmers rather than the others.

Most of schistosomiasis patients show changes in liver and spleen size.

5-3 Recommendations

Ultrasound scanning should be used in every patient with suspicion and assessment of schistosomiasis complications.

Further studies should be done to evaluate the ultrasound findings GI tract and Urinary tract in patients with schistosomiasis in epidemic areas .

Avoid using of contaminated water in areas where schistosomiasis is widespread

If anyone develops symptoms that could be the result of schistosomiasis should seek medical advice.

Reduced water contamination by preventing the ingress of practices eggs as well as curtailing the sexual amplification cycle is snail hosts.

Modifying habits and farming practice .

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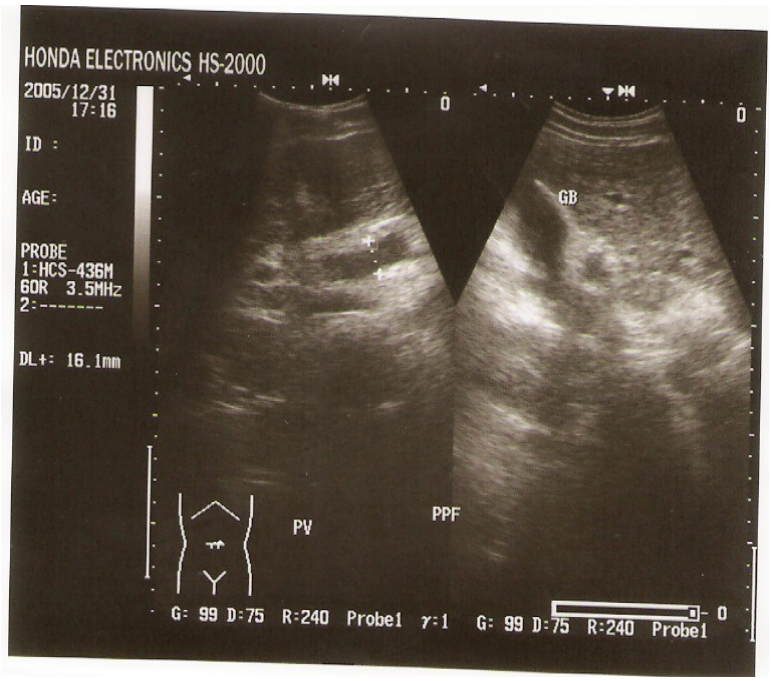
Appendices:



image(1). 38 years old – male with PPF and PHTN.

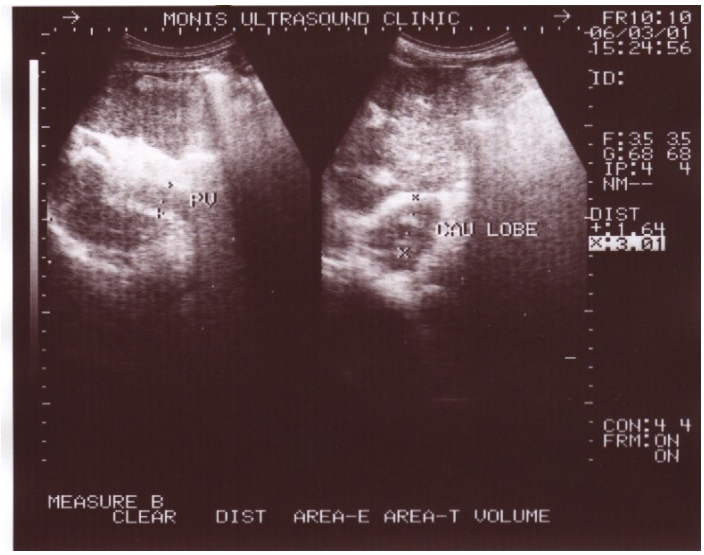


Image (2). U/S image of 37 years old – male with PPF and PHTN.

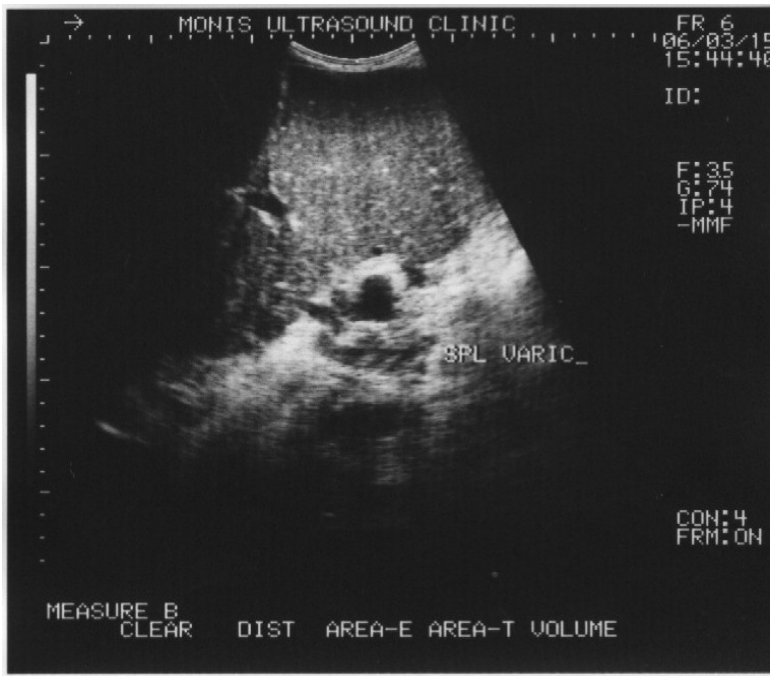


image (3) U/S image of 45 years old – female with marked splenomegaly

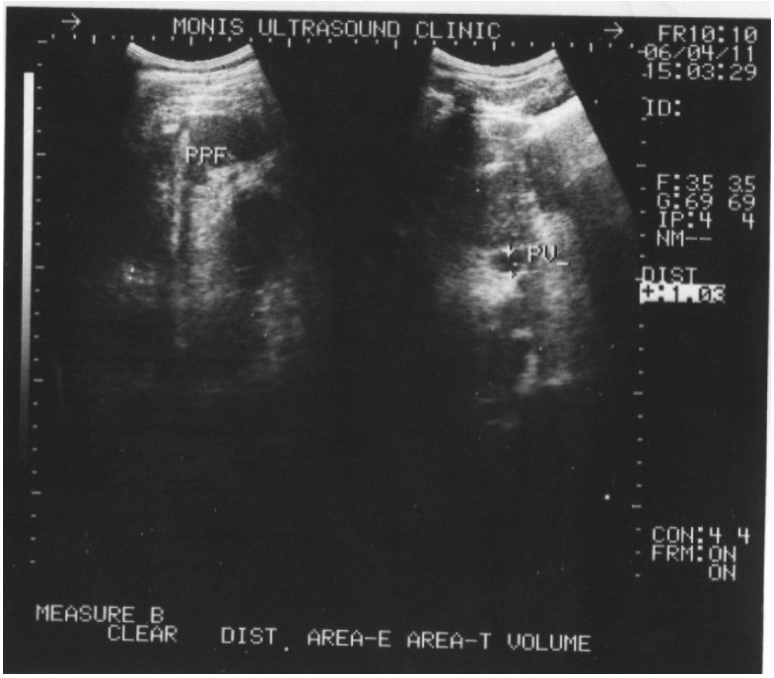


image (4) U/S image of 55 years old – male with PPF

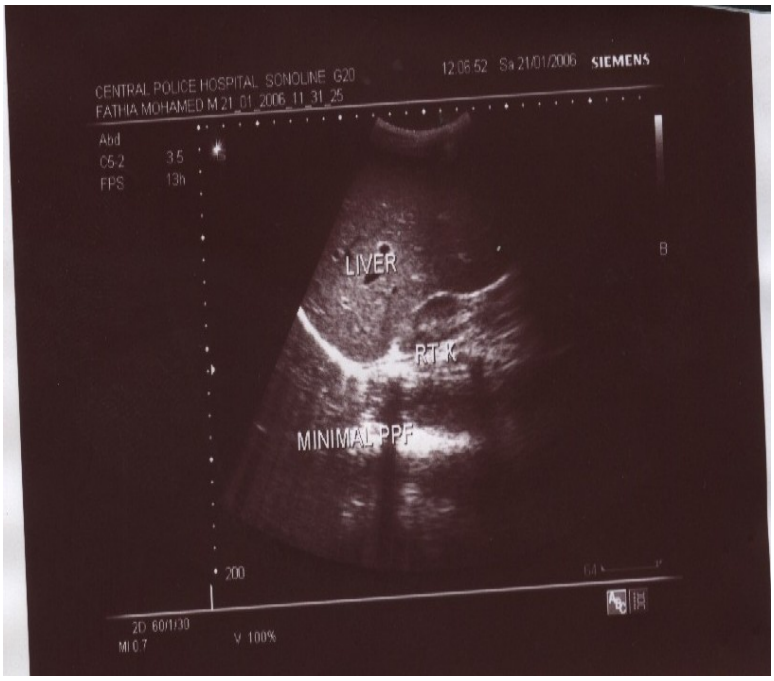


image (5) U/S image 35 years old – male with PPF.