Chapter One

1-1 Introduction

Schistosomiasis (bilharziasis or Katayama fever) was firstly described by Dr Theodor bilharz a German pathologist in (1852 -1862) where he was working in kasr-el-Aini hospital in Cairo and it is caused by infection with parasitic blood flukes known as *schistosomes* (by trematodes from the genus schistosoma). in 1915 Robert Lieper demonstrated the complete life cycle in the snail host .The infection found among soldiers in Napoleons army in Egypt. Renault, A. J 1908. The first of the existence of the disease in the Sudan was reported by Balfour in 1904 who found 17% of the children in Khartoum primary school suffering from urinary schistosomiasis. (National program of the schistosomiasis prevention and control of disease (Algazera, 2003). There are five species of *schistosoma (haematobium, mansoni, japonicum, mekongi, intercalatum)* and there are three major species of *schistosoma (haematobium, mansoni, japonicum)* that produce infection in humans. and tend to occur in restricted geographic patterns; for example, *Schistosoma mansoni* is more prevalent in Africa, the Middle East, South America and the Caribbean. In the endemic areas, the infection is usually acquired in childhood and the chronic complications including intestinal, hepatic, urinary neurologic and pulmonary, are more common (Gryseels *et al*. 2006 & Lucey and Maguire 1993).

Schistosoma haematobium causes urinary schistosomiasis while the remain cause hepatosplenic and intestinal schistosomiasis. Urinary schistosomiasis is a chronic parasitic infection of circulatory system, which affects the bladder and subsequently the urinary tract system of man

and it is a common tropical disease, second only to malaria among parasitic disease in Sudan, which poses serious health hazard in much Africa and the Middle East countries.

More than 207 million people, 85% of who live in Africa, are infected with Schistosomiasis (WHO 2010) and an estimated 700 million people are at risk of infection in 76 countries where the disease is considered endemic, as their agricultural work, domestic chores, and recreational activities expose them to infested water (World Health Organization 2010) . *Schistosoma haematobium* is endemic in 54 countries mainly in Africa as geographic distribution(fiqure 2-3-1-13 and table 2-3-1-1) and the parasite is found in areas of natural or man –made fresh water bodies ,and human acquires infection through skin penetration by the infective cercariae . Globally, 200,000 deaths are attributed to Schistosomiasis annually (Chistulo et al. 2004). Transmission is interrupted in some countries (World Health Organization 2010) *Schistosoma haematobium* is transmitted by cercariae penetrating the skin when bathing , washing clothes , fishing , engaging in agricultural or other activity involving contact with contaminated water or recreation .Transmission is differ from areas to areas . High prevalence in central States of country because of the construction of irrigation schemes for development. The population live in Kordofan area at risk of intense seasonal transmission , especially during and after the rainy season .The area which are endemic for schistosoma are characterized by present factors of reservoir of human infection , snail intermediate host ,socioeconomic conditions (pollution). . Children and adults are most affected than elder due to their social activity and contact with water reservoir.).

At present, Schistosomiasis control programs are targeted at morbidity reduction in the populations.Diagnosis is still based on parasitology and serology, and ultrasound has proven to

be an important means to evaluate the extent of the lesions of the urinary tract, (Gigase 1992 and Garba et al. 2009) and lesions in the other internal organs (Corachan 2002).

Several studies have demonstrated that ultrasound is useful in the detection of morbidity induced by Schistosomiasis on an individual basis and at the community level (Leder 2009 and Sturrock et al. 2001).

Schistosomiasis remained an important public health problem in sub-Saharan Africa (WHO) The aim of this study was to evaluate the ultrasound findings among Sudanese who were positive Schistosomiasis Infection in Shikan region, North Kordofan State ,Sudan. The schistosomiasis causes considerable mortality and morbidity (Ukoll, 1992). Morphologically the characteristic shape of male is shorter and stouter and female is longer and slender (Monica 1992).

Life cycle, *Schistosoma haematobium* has an indirect life cycle with pathophsiology. Immunopathology It responds to eggs in liver causing hypersensitivity and immune response is necessary to prevent damage to hepatocytes. Schistosomiasis can be divided into three phases:- migratry phase lasting from penetration to maturity, acute phase which occurs when schistosoma begin producing eggs, chronic phase which occurs in endemic area. Diagnosis is still based on the parasitology and serology and radiology investigation and mainly ultrasound was proven to be an important means to evaluate the extent of the lesions of the urinary tract (Gigase 1992 and Garba et al. 2009) and lesions in the other internal organs (Corachan 2002) intensively used for scanning abdominal, pelvic organ diseases and reliable results in urinary bladder and properly in sign and complication of *Schistosoma haematobium*. The most common complication of GI Schistosomiasis is periportal fibrosis, This leads to portal hypertension, this was noticed ultrasonographically as there were changes in the spleen, splenic vein and portal vein and lives

size .Our panic is that the infection Among persons with *S mansoni*, *S japonicum*, and, possibly, *S mekongi*, may develop hepatosplenic disease as mentioned in the literature. (Lapa al. 2009).

The adult worms live mainly in the venous plexus of the urinary bladder and the morbidity is caused by egg deposition in and around the urinary tract, causing inflammation and lesions. *Schistosoma haematobium*-related pathology is found mainly in the urinary bladder, the ureters and kidneys (Ekwunife 2009)/ Most of pathological effects of *Schistosoma haematobium* in bladder result in thickening of bladder wall, obstructive uropathy and ulceration in lumen of the ureters and bladder which lead to bladder lesions and renal failure, but ultrasound is limited in brain and lungs when involved with *Schistosoma haematobium* due to absorption and reflection at interface respectively.

Control and prevention of Schistosomiasis control by early detection of urinary bilharziasis in school children by urine examination for bilharzias ova is strongly recommended to prevent morbidity and complications of urinary bilharziasis. In people living near water sources, early detection should be extended to the whole population regardless of age, treatment of infected individual, eradication of intermediate host, minimizing the contact between patients and water sources and vaccination and the control based on chemotherapy (Croft, and Brooker, 2003). Treatment a single dose of praziquantel 40 mg/kg is the first choice .The standard does is one 600 mg tablet per 15 kg. It is better if all the drugs can be taken at one administration, but sometimes it has to be divided into 2 or 3 at intervals of 4 to 6 hours. It allows a one –does therapy, but is expensive. Praziquantel is effective against all species of schistosomiasis and Metrifonate is also used for treatment. The patient should follow up for 2 to 6 months.

1-2 Problem of the study

In recent years (2011-2013) the statistics showed that there is an increasing incidence of *Schistosoma haematobium* according to the last surveys in north kordofan state. Generally urinary schistosomasis were investigating using laboratory test. These laboratory tests do not reveal the impact of bilharziasis on the renal system or the internal structure; therefore ultrasound scanning can give clear picture about impact of bilharziasis on the internal structure and the morphological complication. This study well documents the appearance and the textural changes occur due to bilharziasis infection.

1-3 Objectives

General Objective:

The general objective of this study was to study the ultrasound outcome in diagnosis of patient infected by bilharziasis in order to show the impact of bilharziasis and ultrasound appearance and to evaluate the ultrasound findings among Sudanese who were positive Schistosomiasis Infection in Shikan region, North Kordofan State -Sudan.

Specific objectives:

- To measure the bladder wall thickness, liver size, spleen size, portal vein and splenic vein.
- To find the significant difference between the organs measurements in patient infected by bilharziasis and the normal measurement.
- To find the effect of bilharziasis infection on the pre and postmicturition
- To find the relationship between liver sizes, portal vein also the spleen, splenic vein and age.
- To document the prevalence ultrasound findings in the patient with bilharziasis.

1-4 Significance of the study:

This study will provide rich information about bilharziasis infection using ultrasound as a means of investigation, therefore it will document for the appearance of bilharziasis and the possible effect on the renal system and other abdominal organs.

1-5 Overview of the study:

This study falls into five chapters with chapter one is an introduction which includes general Introduction, problem of the study, general and Specific objectives of the study, significance of the study and overview of the study Chapter two which includes a brief introduction about the urinary system anatomy, physiology , pathology, methods of diagnosis of *Schistosoma haematobium* , Ultrasound appearance of urinary tracts and scholarly literature review about bilharziasis infection . In the same essence chapter three detailed about the material and method including selection and description of participants, scanning protocols , statistical analyses and method of data collection . Chapter four portrayed the result of the study using frequency tables and figures and scatter plots for relationship, finally chapter five introduce discussion of data, conclusion, recommendation, references, appendix(1) and appendix(2).

Chapter Two
Background and literature review

2-1 Urinary system anatomy

The urinary system consists of the kidneys, ureters, urinary bladder, and urethra. The kidneys filter the blood to remove wastes and produce urine. The ureters, urinary bladder, and urethra together form the urinary tract, which acts as a plumbing system to drain urine from the kidneys, store it, and then release it during urination. Besides filtering and eliminating wastes from the body, the urinary system also maintains the homeostasis of water, ions, pH, blood pressure, calcium.

Kidneys:

Location of the Kidneys**:-**

There are two kidneys which lie retroperitoneally in the lumbar area. The right kidney is lower than the left due to displacement by the liver .Connective tissue anchors the kidneys to surrounding structures and helps maintain their normal position .Each kidney is bean shaped and measures approximately 11cm x 6cm x 3cm and weighs120 – 170 grams. The kidneys are enclosed by a fibrous capsule and the parenchyma consists of a cortex and a medulla. Within the medulla approximately 8 – 18 triangular structures called renal pyramids are found, and at the base of these pyramids renal papillae are directed towards the centre of the kidney. Together the cortex and the renal pyramids constitute the parenchyma of the kidney and structurally the parenchyma of each kidney consists of approximately 1 million nephrons which are the

functional units of the kidney. Also the kidneys are located posterior to the peritoneum and touch the muscles of the back and surrounded by a layer of adipose that holds them in place and protects them from physical damage. The kidneys filter metabolic wastes, excess ions, and chemicals from the blood to form urine (Richard 2008).

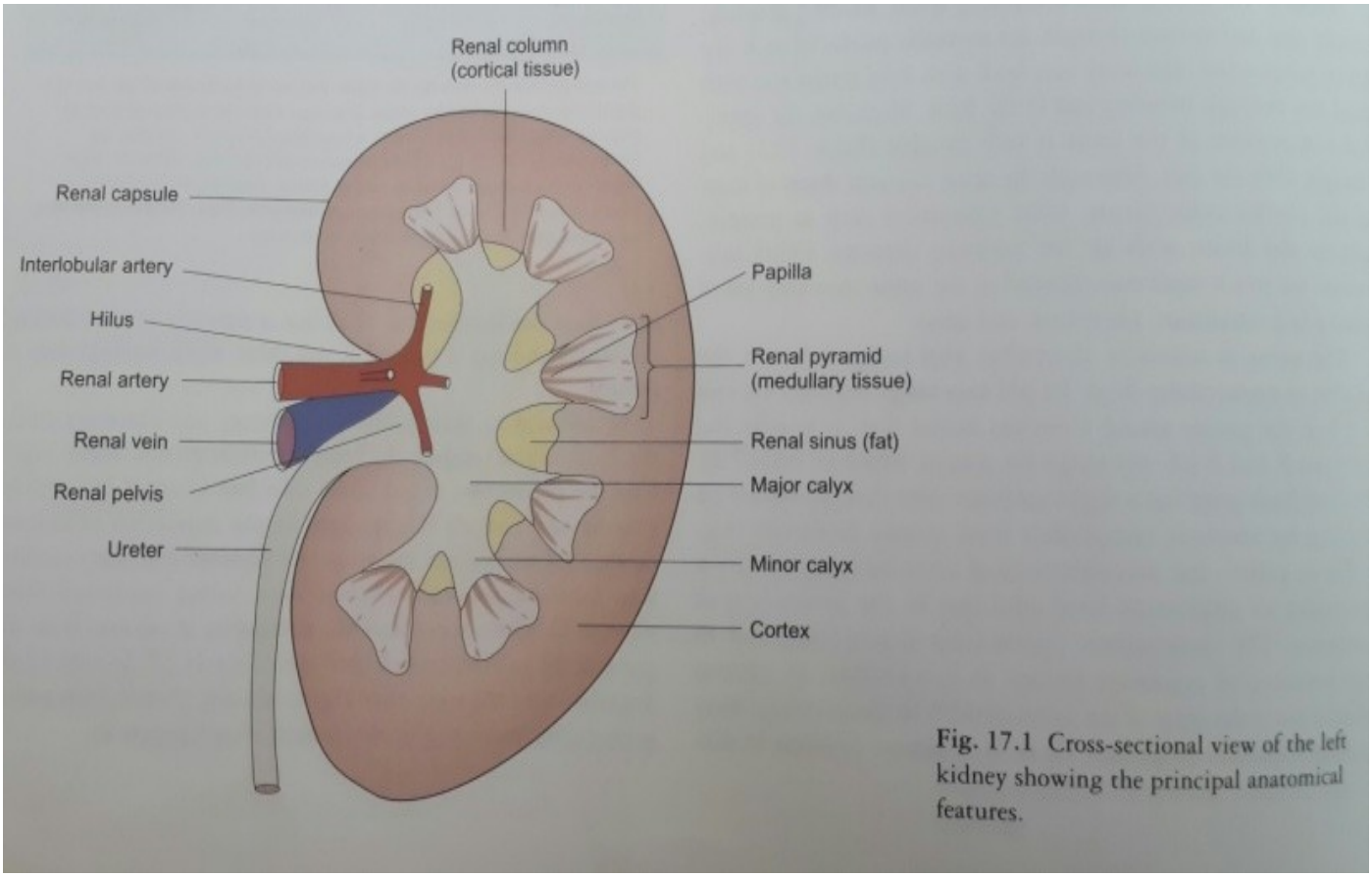


Fig. 17.1 Cross-sectional view of the left kidney showing the principal anatomical features.

Figure (2-1) shows internal structure of the kidney in addition to the blood and nerve supply (Richard 2008).

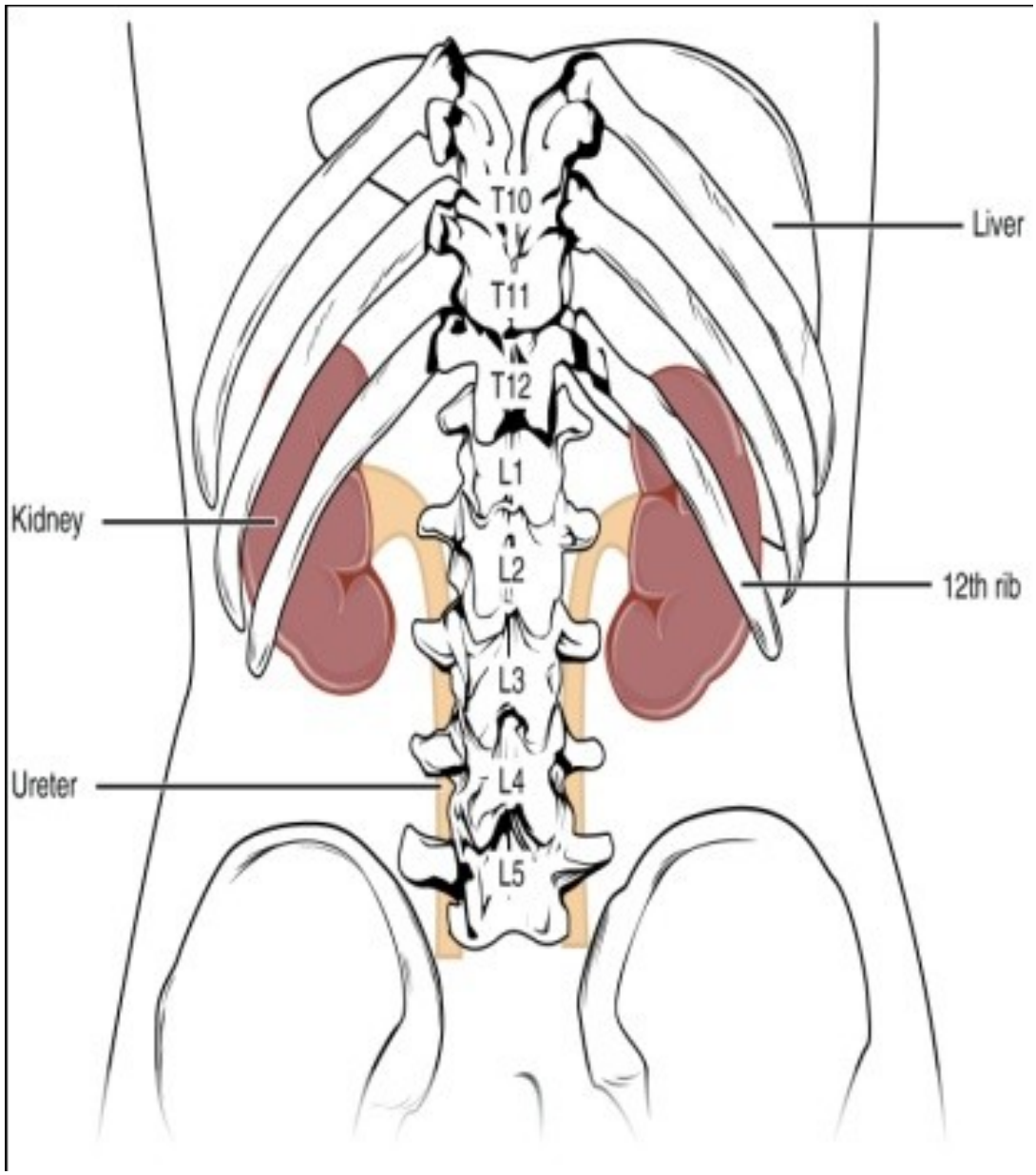
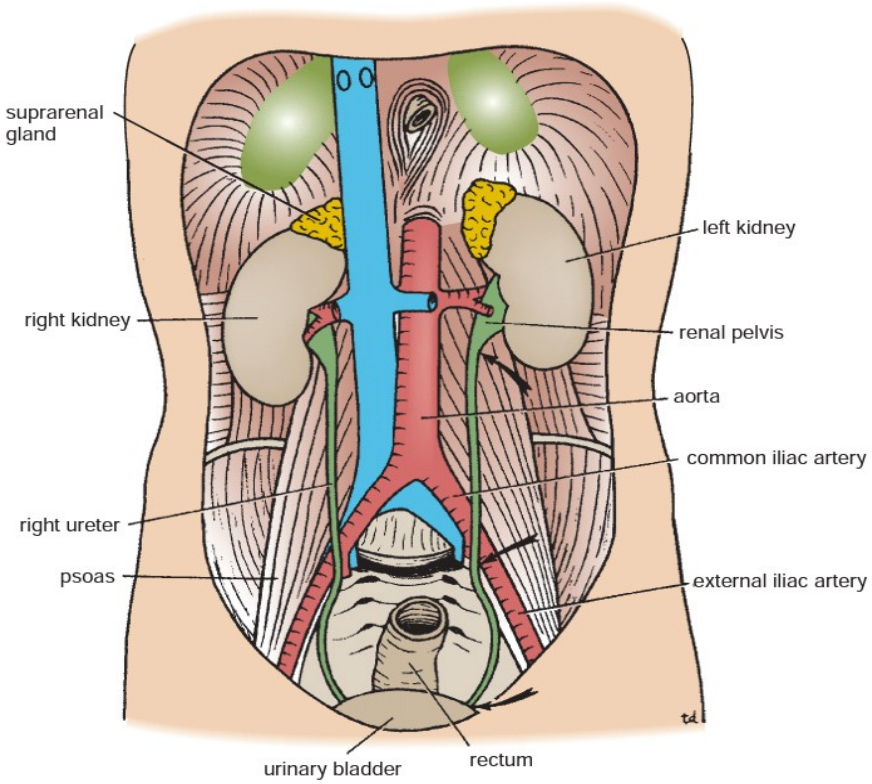


Figure (2-2) shows anatomical position of the kidney in prone position (Richard 2008).



Figure(2-3) demonstrates the anatomy of the kidney in relative to its neighboring structure Richard S.Snell,M.R.C.S(2008) **.**

Renal Blood Supply. The kidneys receive their blood supply from the renal arteries which branch to the left and right from the abdominal aorta. This blood supply to the kidney is equal to 21%of cardiac output and 99% of this cardiac output returns to the general body circulation via the renal vein (and drain into IVC). The remaining1% undergoes further processing in the nephron resulting in urine.

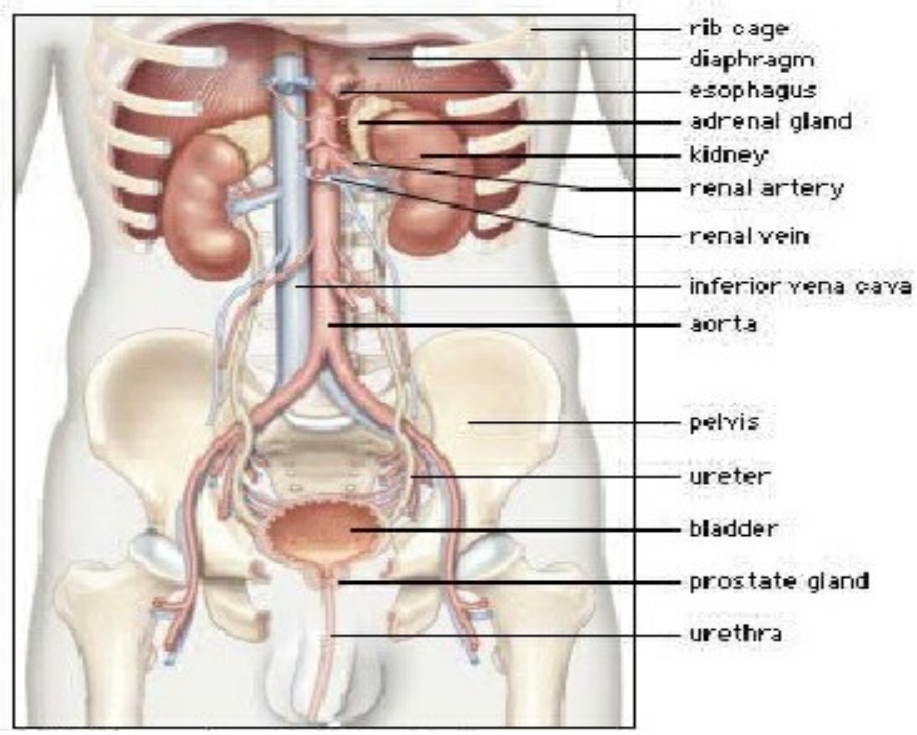


Figure (2-4) demonstrates the blood supply of the kidneys, ureters and bladder (google images).

Ureters. The ureters are a pair of tubes that carry urine from the kidneys to the urinary bladder. The ureters are about 10 to 12 inches long and run on the left and right sides of the body parallel to the vertebral column. Gravity and peristalsis of smooth muscle tissue in the walls of the ureters move urine toward the urinary bladder. The ends of the ureters extend slightly into the urinary bladder and are sealed at the point of entry to the bladder by the ureterovesical valves. These valves prevent urine from flowing back towards the kidneys**. (Tim).**

Urinary Bladder

Location and description: The urinary bladder is a sac-like hollow organ used for storage of urine and urinary bladder is situated behind the pubic bones, the muscular coat of the bladder is composed of smooth muscle known as detrusor muscle .The empty bladder is pyramidal , having and apex interiorly , a base posteriorly , and a superior and two infer lateral surfaces , it also have a neck lies inferiorly and rest on the upper surface of the prostate (Richard 2008).

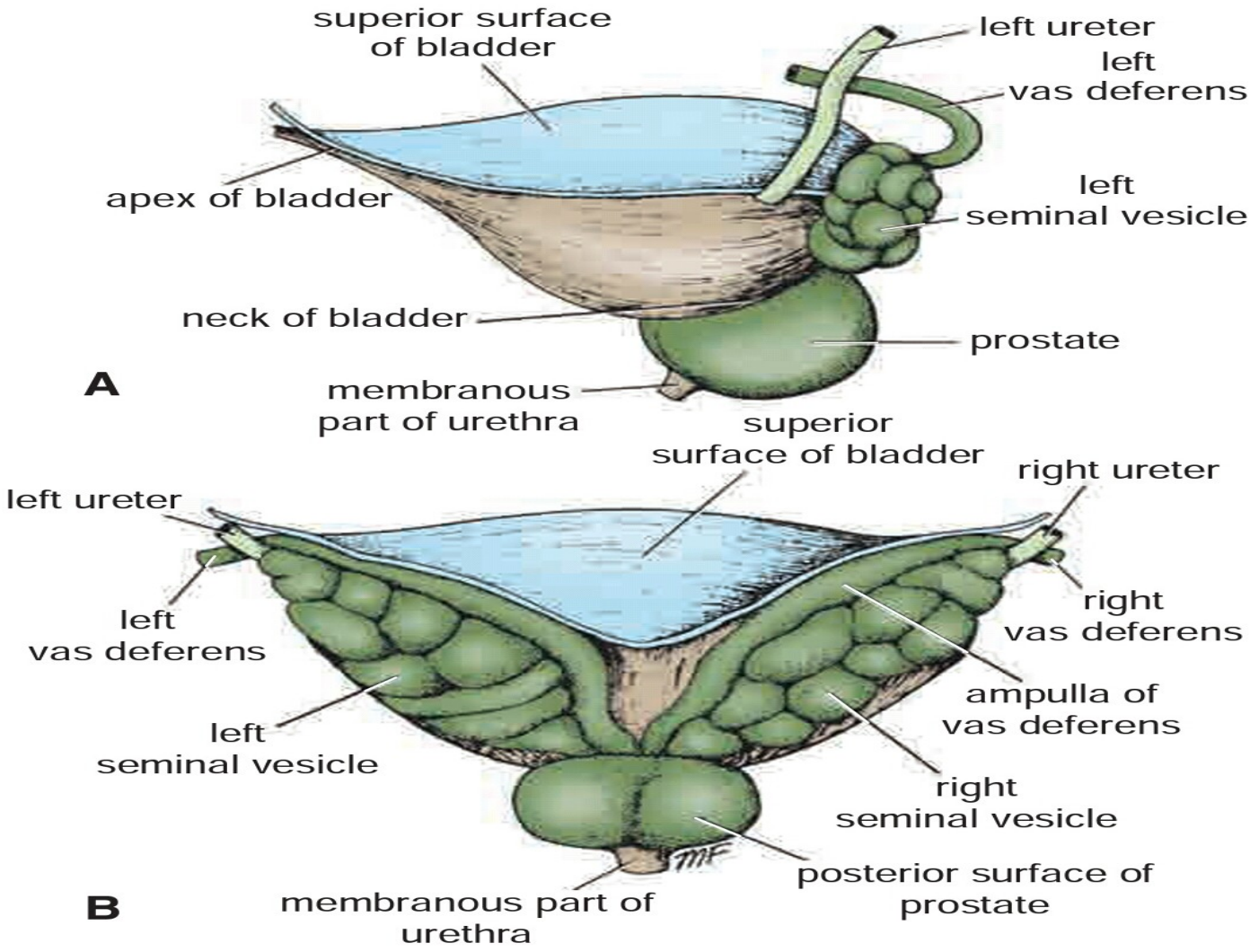


Figure (2-5) shows structures of male urinary bladder Richard S.Snell,M.R.C.S(2008)

Figure (2-6) shows structures of male urinary bladder Richard S.Snell,M.R.C.S(2008)

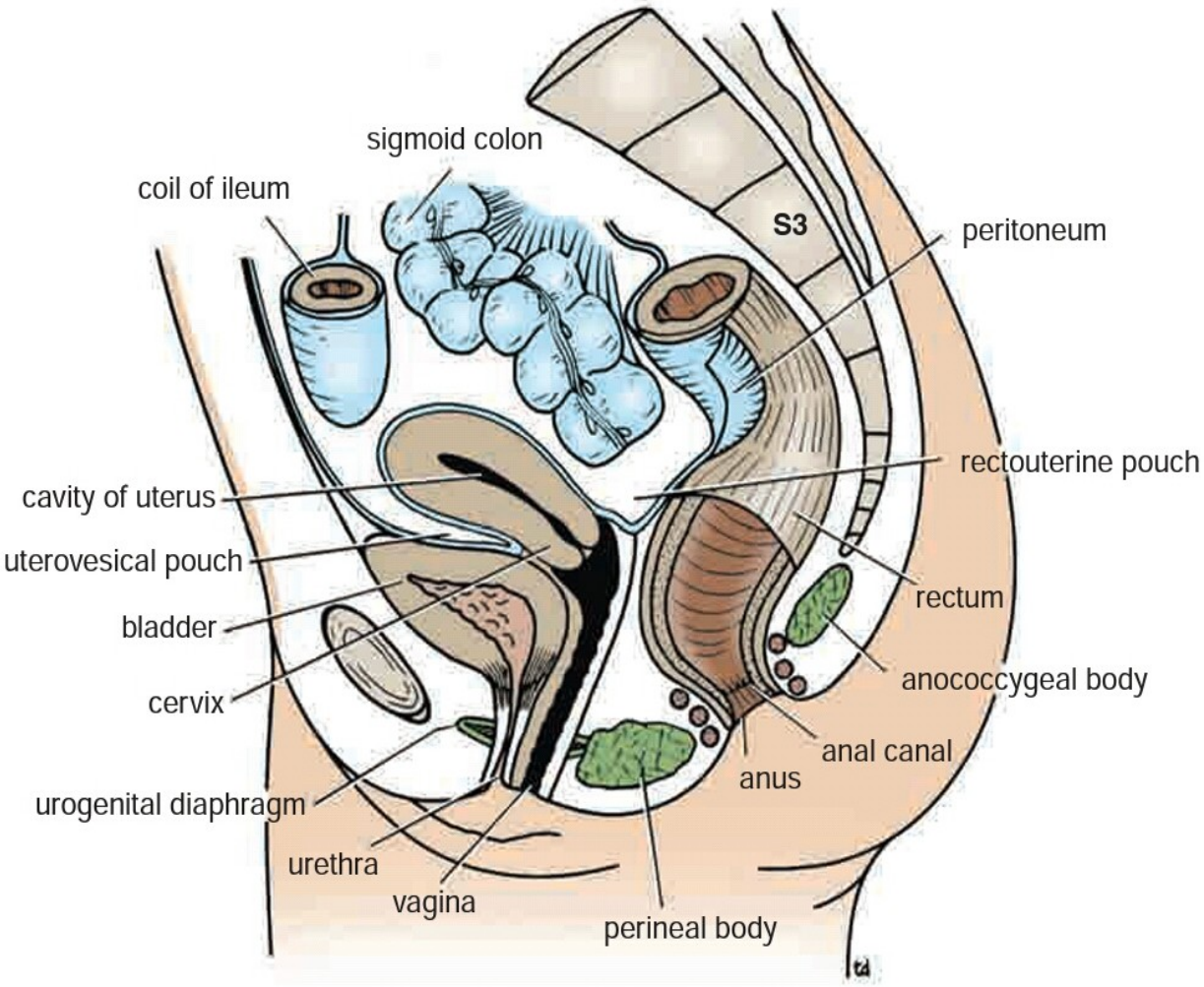


Figure (2-7) shows female bladder structure in relation to the other anatomical organ

Richard S.Snell,M.R.C.S(2008)

Blood supply:- The blood supply of urinary bladder is superior and inferior vesicle arteries, branches of the internal iliac arteries and the veins from the vesicle venous plexus which drains into the internal iliac vein. Internal and external iliac node, the inferior hypo gastric plexuses, the sympathetic nerves inhibit

contraction of the detrusor muscle of the bladder wall and stimulate contraction of the sphincter vesicle, and the parasympathetic nerves stimulate contraction of the muscle and relax the sphincter.

2-2 Physiology Of Urinary System

2-2-1 Introducation of the kidney function :-

The kidney play a major role in control of the constancy of the internal environment .The blood in the kidney is filtered by glomerulari ,so that all the blood constituents except blood cells and blood plasma proteins, go into the micro tubular system ,here modification of filter takes place the useful substance of the most filter water are quickly reabsorbed back into the blood .The unwanted substance that escape filtration are actively secreted into the tubular lumen (tubular secretion) .The final concentration of electrolytes and other constituents of urine is adjusted according to the requirement of the regulation of the extracelluar fluid composition .Glomerular filtration , tubular reabsorption and tubular secretion are rightly described as renal mechanisms that allow the kidney to under take its haemostatic function .Several hormones (especially ADH and Aldosterone) act on the kidney to enable it to adjust the final composition of urine in response to changes in the internal environment (Sukkar et al 2003).

2-2-2 Function of the kidney:

Glomerular Filtration:

Inside each kidney are around a millions tiny structures called nephrons. The nephron is the functional unit of the kidney that filters blood to produce urine , the main function of the glomeruli is filtration.

This is the first of renal mechanism that enable the kidney to carry out its function . It passive physical process (no require energy)

Mechanism of glomerular filtration depend on:

Glomerular capillary pressure (hydrostatic pressure 60mmHg) ,Intracapsular pressure (Bowman's capsule 18mmHg) and Plasma protein osmotic pressure (osmotic pressure 25mmHg) .

Net filtration pressure = 60-(18+25) = 17mmHg .

Glomerular filtration rate (GFR) :-

Is total volume of plasma per unit time leaving the capillaries and entering the Bowman,s capsule (GFR is approximetely 180L/day or 120ml/minute .(normal filtration rate in a 70Kilogram man).

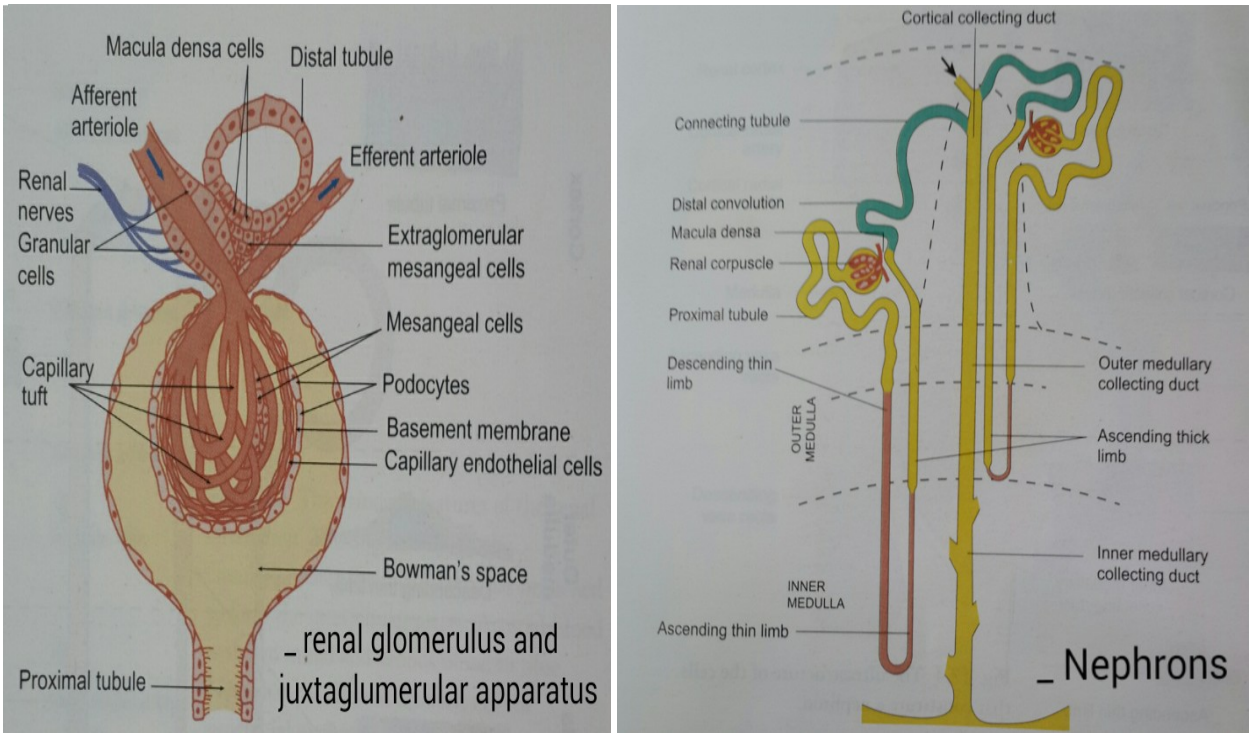


Figure (2-8) shows the structure of the functional unit of the kidney (nephron)

Reabsortion of Glomerular filtration:-

All the filtred substances such as glucose, protein and most of water, sodium and irons are reabsorbed by renal tubules through passive or active energy.

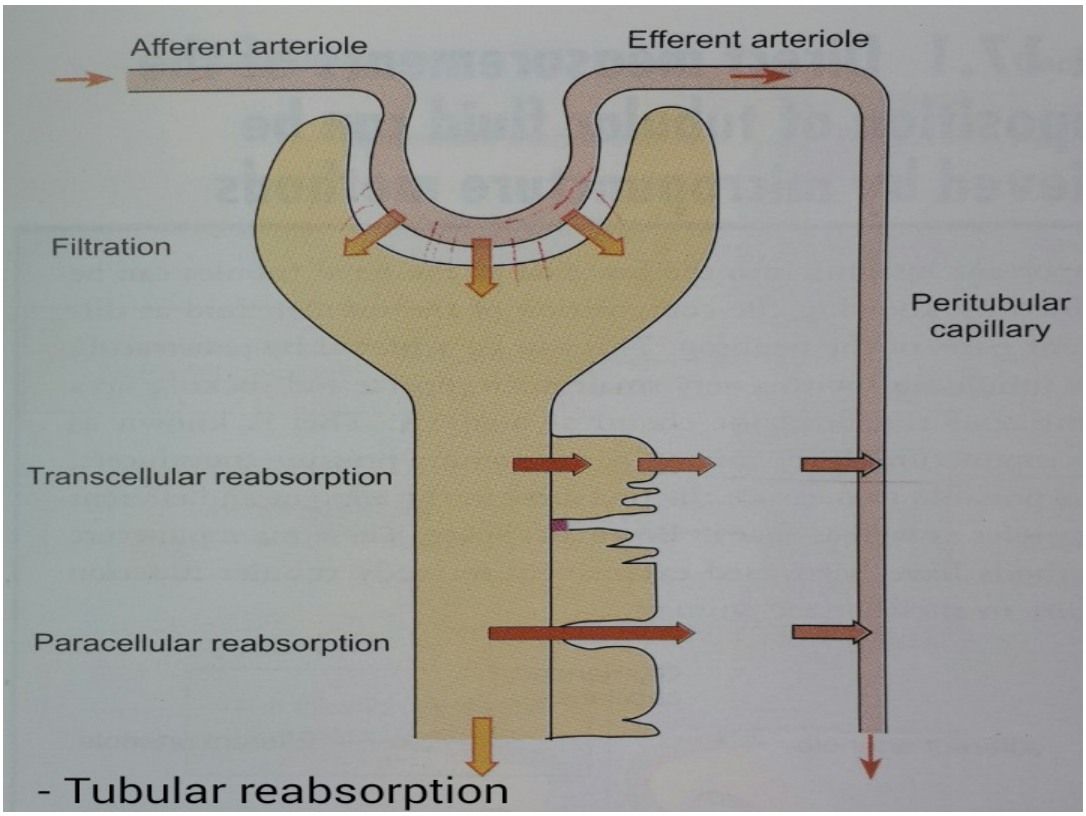


Figure (2-9) shows the tubular reabsorption mechanism Gillian & Christopher 2004

Tubular secretion :-

The most important substance secreted by the renal tubule are K+ , H+ ,organic anions and cations and also important for eliminating un wanted metabolic product and drugs .

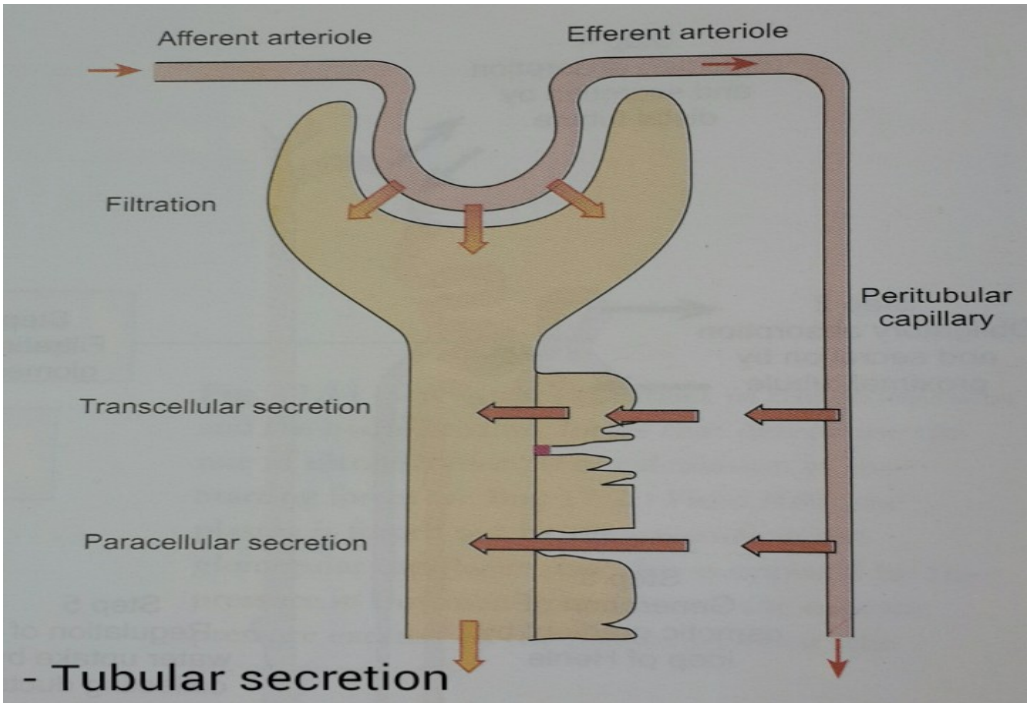


Figure (2-10) shows the tubular secretion mechanism Gillian & Christopher 2004

Endocrine function of the kidney :-

- Rennin production , is produced by juxtraglomerular cells in response to avariety of stimuli e.g. renal ischemia .
- Synthesis of Erythropoietin that produced by peritubular cells in renal cortex and medulla in respone to hypoxia and anemia .
- Activation of vitamin D3 (1,25- dihydroxycholicalciferol).

Prostaglandins(PGE2 ,PGA2 ,PGI2) are released in response to the renal ischaemia (Philippa and Sukkar 2003).

Maintenance of body Homeostasis:

The kidneys maintain the homeostasis of several important internal conditions by controlling the excretion of substances out of the body :

***Ions*.** The kidney can control the excretion of potassium, sodium, calcium, magnesium, phosphate, and chloride ions into urine. In cases where these ions reach a higher than normal concentration, the kidneys can increase their excretion out of the body to return them to a normal level. Conversely, the kidneys can conserve these ions when they are present in lower than normal levels by allowing the ions to be reabsorbed into the blood during filtration

PH. The kidneys monitor and regulate the levels of hydrogen ions (H+) and bicarbonate ions in the blood to control blood pH. H+ ions are produced as a natural by product of the metabolism of dietary proteins and accumulate in the blood over time.The kidneys also conserve bicarbonate ions, which act as important pH buffers in the blood .

Osmolality The kidneys maintain the body's osmotic balance by controlling the amount of water that is filtered out of the blood and excreted into urine

Blood Pressure. The kidneys monitor the body's blood pressure to help maintain homeostasis. When blood pressure is elevated, the kidneys can help to reduce blood pressure by reducing the volume of blood in the body. The kidneys are able to reduce blood volume by reducing the reabsorption of water into the blood and producing watery, dilute urine. When blood pressure becomes too low, the kidneys can produce the enzyme rennin to constrict blood vessels and produce concentrated urine (Tim) .

2-2-3 Function of the urinary bladder:-

Micturition Is a reflex action , controlled by higher center in the brain , the reflex is initiated when the volume of urine reaches about 300 ml ; stretch receptors in the bladder wall are stimulated and transmit impulses to the central nervous system , and the individual has a conscious desire to micturate. Urination is the process of releasing urine from the urinary bladder through the urethra and out of the body. The process of urination begins when the muscles of the urethral sphincters relax, allowing urine to pass through the urethra. At the same time that the sphincters relax, the smooth muscle in the walls of the urinary bladder contract to expel urine from the bladder. (Sukkar2003 and Gillian & Christopher 2004)

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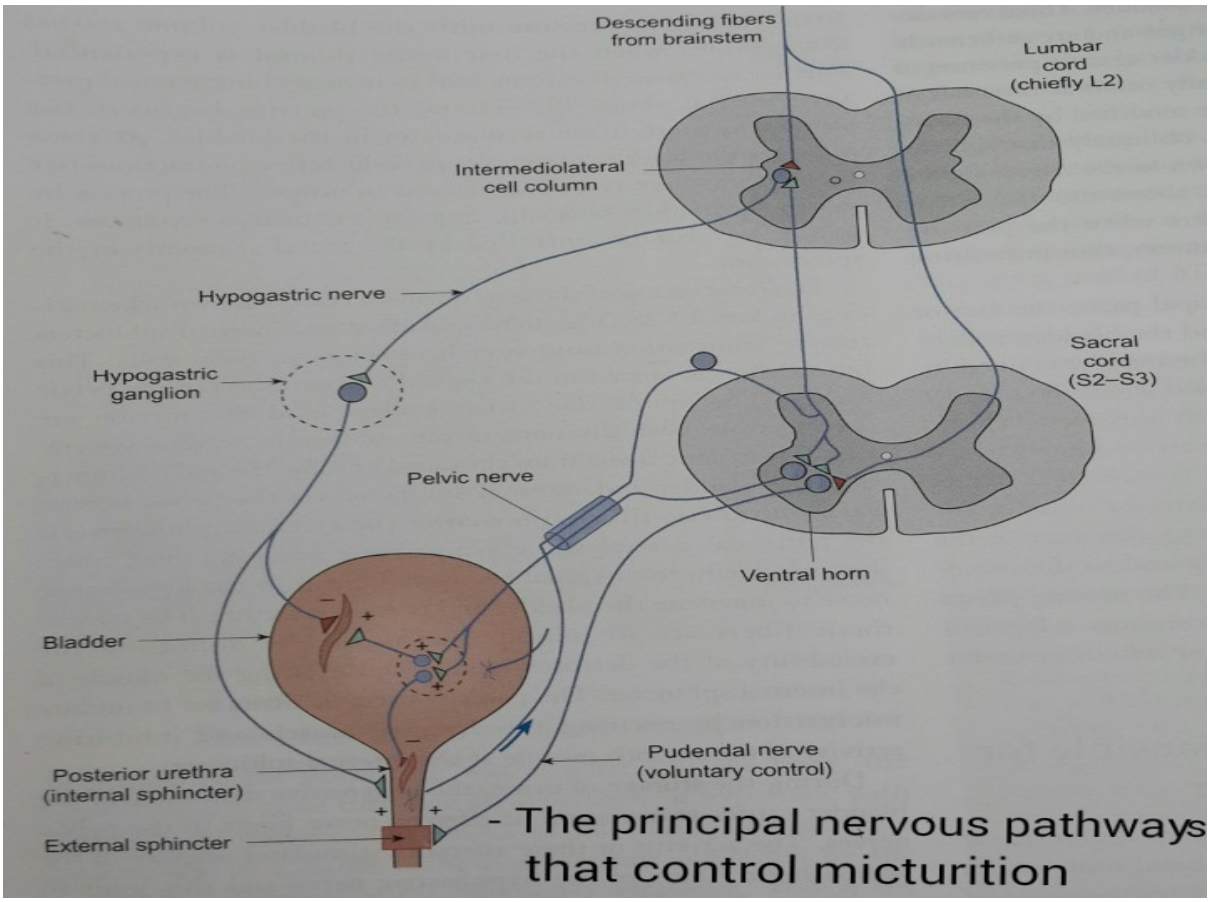


Figure (2-11) shows the principal nervous pathway that control micturition Gillian & Christopher 2004

2-3 Pathology

2-3-1 Epidemiology:

Bilharziasis is wide spread parasitic infection of man and is endemic in more than 70 countries in different parts in the world**. WHO 2006** which carried by water and thus. WHO reported the disease is major health problems in the world with high prevalence infection of man and is second only to malaria in socioeconomic and public health importance in tropical and subtropical countries. WHO 2007. In 2013 WHO revealed that the number of people treated for the disease in 2011 was 28.1 million. High rate of bilharziasis infection occur near fresh water bodies, agricultural developments and environmental changes linked to water resources, population movement and population growth have led to the spread of the disease to previously low on non-endemic areas. In Sudan Bilharziasis prevalence in area of irrigated agricultural schemes. affects all provinces(Geziara, Kordofan, ALrahad) except Red sea states. Children in particular, with high infection levels, indiscriminate habit of excretion and predilection for playing in water are very important in propagating the disease (Jordan, and Webber, 1982) . High incidence of infection are increase by high intensity eggs in children which predominant in age 7-20 years, but eggs decline intensity in older age due to immunity reflection or less duration of contact with water .So that the disease is more common in children and adult (Ross and Wilson 2002). Urinary schistosomiasis caused by schistosoma haematobium affects 54 countries in Africa and eastern Mediterranean and intestinal schistosoma caused by schistosoma japoncium occurs in 52 countries most of countries in Africa .According to WHO the distribution of schistosomiasis has been eradicated from Japan and transmission has been stopped in Tunisia and very low in Saudi Arabia (Ross and Wilson 2002).

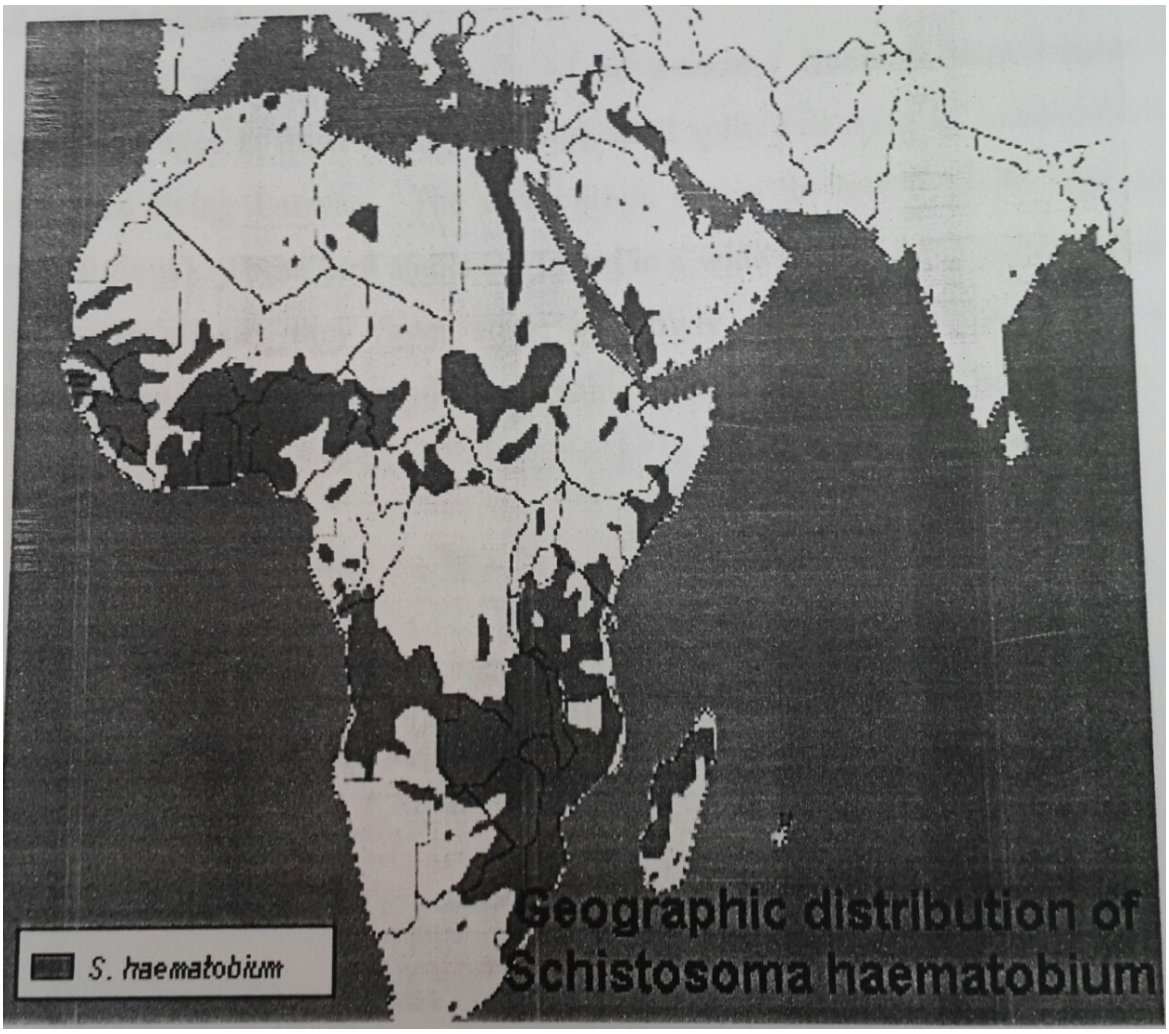


Figure (2-12) shows Schistosoma Epidemiology (Geographical distribution)

Table (2-1) shows Geographical distribution according to types of snail :-

S.haematobium	Africa , Middle East ,	the intermediate host is the fresh water snail of the genus bulinus
S.mansoni	Africa , Middle East , South America	the intermediate host is the snail of the genus Biomphalaria
S. intercalatum	Central Africa ,	Bulinus species act as intermediate host.
S . japonicum	Southeast Asia and Far East	The intermediate host is the snail of Onchomalonia species.
S. mekongi	Mekong basin ,	It is relative to Schistosoma japoncium

2-3-2 Life cycle of schistosomiasis:-

Schistosoma haematobium has an indirect life cycle. Aperson becomes infected by contact with water containing cercaria. The cercaria becomes attached to the skin an able to penetrated unbroken skin. If ingested cercaria can penetrate mucous membrane (WHO 2006).

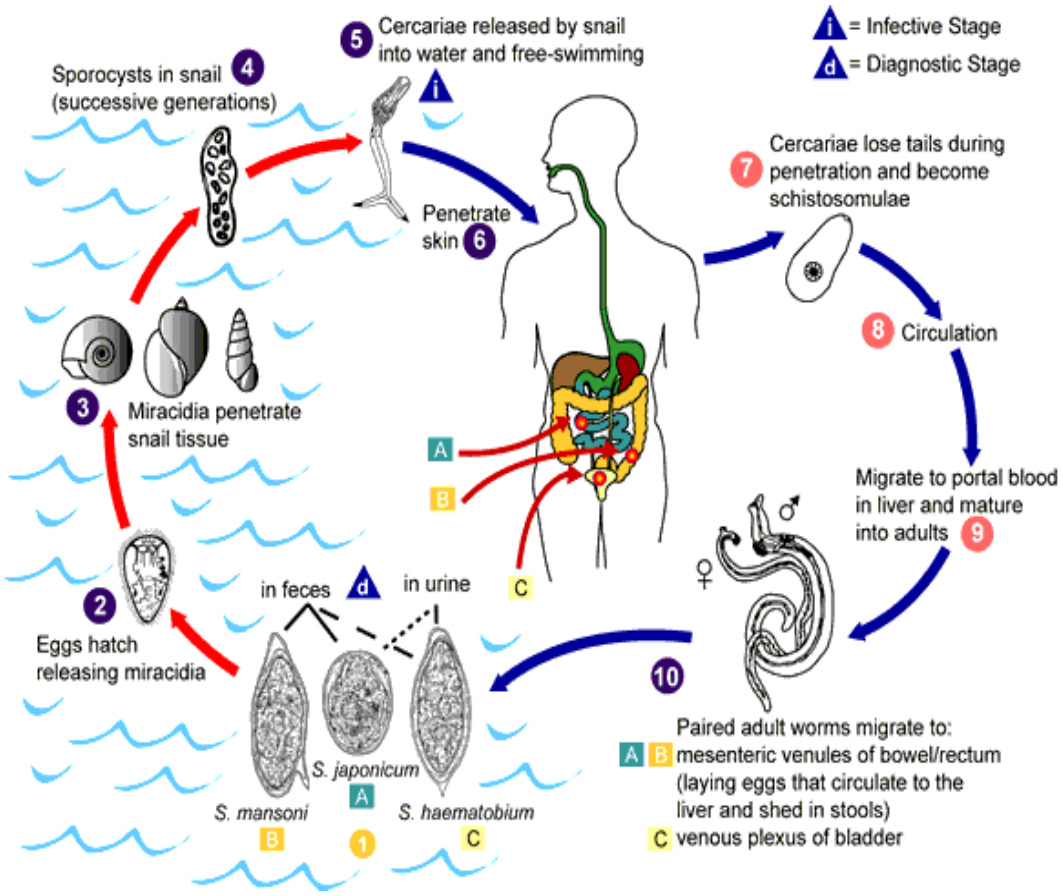


Figure (2-13) demonstrates the life cycle of Schistosomiasis (google images)

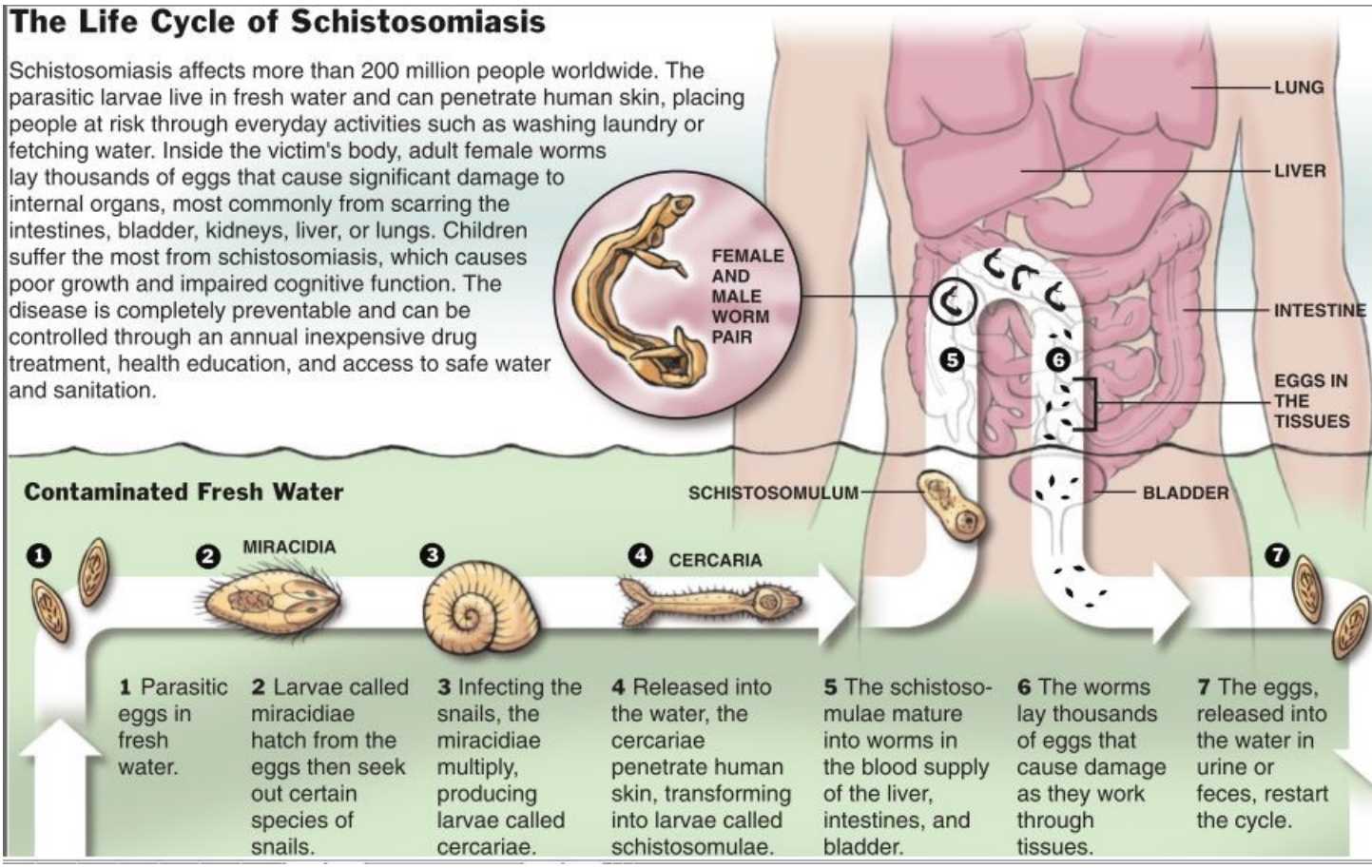


Figure (2-14) demonstrates the life cycle of Schistosomiasis (google images)

2-3-3 Pathophysiology of schistosoma infection:

The path physiology of infection is associated with life cycle of the parasites as following.

1-Cercariae penetrate the skin and produce an allergic dermatitis at the site of entry.

2-Schistosomula are tailless cercariae that are transported through blood to the heart or lungs, infection cause cough, fever, eosinophilia may be.

3- Adult worm do not multiply inside the human body, in the venous blood, adult male and female mate, and the female lays eggs 4-6 weeks after cercarial penetration.

4- Eggs they cause Katayama fever and schistosomiasis.

2-3-4 Katayama fever:

The katayama fever valley in Japan was an area that was hyperendemic for schistosoma japonicum and observed among immigrants in this valley and became known as katayama fever. This syndrome as well as cercarial dermatitis ,was first described in 1848 by the Japanese doctor Yoshinao Fujii .The disease is caused by primary infection with schistosomes and violent reaction to products released from eggs. Acute schistosomiasis (Katayama fever) is a systemic hypersensitivity reaction against the migrating schistosomulae, Bottieau, J. et al 2006. It occurs 4-8 weeks after initial infection .The disease starts suddenly with fever, fatigue, myalgia, malaise, cough, wheezing ,urticaria and marked eosinophilia and patchy infiltrates in chest radiography. Most patients recover spontaneously after 2-10 weeks, but some develop persistent into lymph node enlargement and hepatosplenomegly . Katayama fever is less frequent and milder in schistosoma haematobium infections.

2-3-5 Mortality and morbidity:

Acute schistosomiasis which detected by ultrasound (bladder wall thickening) with eosinophilia if not treated properly it results in severe morbidity or death. Chronic schistosomiasis with symptom or symptomless will lead to more complication as gastrointestinal schistosomiasis, the complication is result in Symmer periportal fibrosis, pipestem appearance, sky astar appearance, collateral circulation with oesophageal varices and hemorrhage, which to lead portal hypertension , Liver parenchyma disease occurs when associated with hepatitis, cirrhosis and ascites is a late sign. Urinary tract schistosomiasis complication results in interstitial diseases (pyelonephritis), renal failure due to obstructive uropathy and later bladder lesions (Ca),

Pulmonary eosinophilia the disease observed radio logically in lung shadow and accompanied by a blood eosinophilia and resolving pneumonia, hydatid disease, Hodg Kins disease, Central nervous system schistosomiasis the result in cerebral haemarrhoge by CT or MRI so ultrasound is limited to CVS .An d transverse myelitis results in spinal schistosomiasis.

2-3-6 Schistosomaiasis Pathology of Urinary tract (Mainly Urinary Bladder):-

Pathology depends on the stage of infection, number of eggs in the body which associated with symptom and symptomless. The likelihood of symptom increase with an increasing in the degree of infection, and complicated and results from the host's immune reaction against the deposited eggs is responsible for most pathology. Adult worms induce pathological changes, and the eggs are thus the major pathogenetic agent.(Monica Cheesbrough, (1992); District laboratory practice in tropical countries, Vol. -1-, U. of Cambridge, Great Britain-321-341) . The most serious lesions arise from cell - mediated immune granulomata and immune complex reaction surrounding eggs that have been trapped in the tissues in the bowel and bladder, or in the liver and lungs. The granuloma formation around schistosoma eggs is of the delayed type hypersensitivity reaction. (Warren 1997).

The adult worms live mainly in the venous plexus of the urinary bladder and the morbidity is caused by egg deposition in and around the urinary tract, causing inflammation and lesions. Schistosoma haematobium-related pathology is found mainly in the urinary bladder, the ureters and kidneys (Ekwunife 2009).

Pathologies of the Schistosoma.haematobium causes acute painful cystitis (infection) results in fibrosis, ,thickening of bladder wall either locally or generalized due to reaction to present of eggs ,and called acute cystitis if not treated properly will lead to severe and chronic cystitis ,and

chronic cystitis (infection) may lead to polyps and progressive into squamous cell carcinoma of bladder. In chronic severe infection ,the urinary bladder wall become so fibroses and calcified that it does not empty properly and bacteria bladder infection persist .So that bladder reduce capacity Other bladder lesions including polyps and calcification due to pathological change are detect ultrasonographically. The renal pelvicalyceal system (PCS) and the lower ureteric end (LUE) were prominent seen as well as Obstructive uropathy, hydroureter, hydronephrosis and calcify ureter. Lower obstruction uropathy may arise from granuloms formation around eggs laid in lower ureter (ulceration, calcify) and may cause hydro-ureter ,hydronephrosis (David et al 2008). When infection involvement of urinary tracts this could lead to stone formation ,interstitial diseases (pyelonephritis) ,and renal failure via process of obstructive uropathy through long hydronephrosis or masses

2-3-7 After severe, chronic infection the following serious problem can occur:-

Reduced bladder capacity, Increased incidence of bladder carcinoma, Lesions of the female genitalia with cervical erosions, papillomatous lesions, sterility, increased risk of ectopic pregnancy, Lesions of the male genitalia (localisation in the ducts spermaticus, Irreversible obstruction of the urinary tract with hydro –ureter and hydronebhrosis, Vesicle stone and renal stone can form, recurrent bacterial urinary infection are frequent, including salmonella, Nephritic syndrome can occur as well as hypertension, Chronic glomerulonpehritis can be caused by Schistosoma mansoni and Finally chronic renal insufficiency may ensue (kidney damage may occur). In Africa urinary Bilharziasis is also reported as impairing growth and development of children.

2-3-8 Schistosomiasis of Intestinal lesions:

The most common complication of GI Schistosomiasis is periportal fibrosis, This leads to portal hypertension,this was noticed ultrasonographically as there were changes in the spleen, splenic vein and portal vein and lives size .Our panic is that the infection Among persons with *S mansoni*, *S japonicum*, and, possibly, *S mekongi*, may develop hepatosplenic disease as mentioned in the literature (Lapa et al. 2009), while Schistosoma(mansoni, japoncium, intercalatum,mekongi)are associated with chronic hepatic and intestinal fibrosis ,hepatosplenomegaly, periportal fibrosis, sky stars appearance, pipestem, and collateral, portal hypertension, cirrhosis, ascites.

Bleeding esophageal varices secondary to portal hypertension are the commonest cause of death in schistosoma mansoni infection. Jordan, p., and Webber, G. ectopic eggs may reach the pulmonary arterioles causing blockage and pulmonary hypertension(pulmonary eosinophilia (Crofton and Douglas's 2003).

In addition to involving the urogenital organs, the eggs may be carried into the inferior mesenteric veins and produce schistosomal appendicitis or involvement of the caecum, colon, and particularly the rectum causing focal damage (Owor and Madda 1977)

2-3-9 Ectopic schistosomiasis localisations:

Eggs or adult worms can cause lesions of the spinal cord ,known as transverse myelitis (principle S.haematobium and S.masoni) ,or of the brain (principle S.japoncium) which result in form of spastic paraparesis and CVA respectively ,when reach the skin can cause popular dermatitis ,but rare and more rare in the vocal chords ,with nodules and hoarseness, Also ectopic

eggs may cause granuloma in the central nervous system causing focal damage (Crewe, and Haddock, 1985).

2-4 Methods of Diagnosis of schistosoma haematobium:-

The diagnosis is established by detection of eggs in the urine, stool or bladder and bowel mucosal biopsy when associated with slight or chronic infection. Schistosoma haematobium eggs predominantly in urine, sometimes in stool, cervix or elsewhere, while Schistosoma (mansoni, intercalatum, japonicum: eggs predominantly in stool, sometimes in urine or elsewhere.

Diagnosis is still based on parasitology and serology which divided into : laboratory test including (urine , Stool, Eosinophiluria, Biopsy, Serology) and Diagnosis Medical imaging (Ultrasound) including Plain X-ray of abdominal to showed calcification in the bladder wall which partially or completely around the organ then extended to the ureters. Retrograde urgram may show nodular filling -defects in the bladder and ureters, hydroureter, hydronephrosis. Intravenous pyelograms (IVP) is useful to show obstruction uropathy and kidney function.

Ultrasound can detected complication occurs by schistosomiasis and the degree of liver involvement, ultrasound is the only possible technique for establishing a non-invasive , sensitive and specific diagnosis of hepatic lesions in hepatointestinal schistosomiasis.Symmers fibrosis caused by schistosomiasis and hepatic cirrhosis can become symptomatic in later life when parasite load has become low. Ultrasound is showed degree of infection (Bladder wall thickening) – hydronephrosis , hydroureter , stone , calcification, lesion ,Symmers periportal fibrosis , sky stars appearance , pipe stem fibrosis , collateral),hepatomegaly(predominantly of the left liver lobe), splenomegaly and ascites

2-5 Ultrasound appearance of urinary tracts

2-5-1 The ultrasound of urinary bladder:

Patient preparation for abdomen and pelvic for 6 hours from food or urine kept at least 2 hours before examination. The patient in supine position during the scan for longitudinal and transverse section through out the urinary bladder, full bladder used for acoustic window to evaluate wall thickening , change of shape and volume before and after micturition .

By ultrasound can detected wall thickness, calcification, fibrosis, formation of polyps and later lesions, and showed distortion shape either oval or rounded this lead to reduce bladder capacity, vesicle stone, calcify ureter diverticulum's and schistosomiasis. As image below.

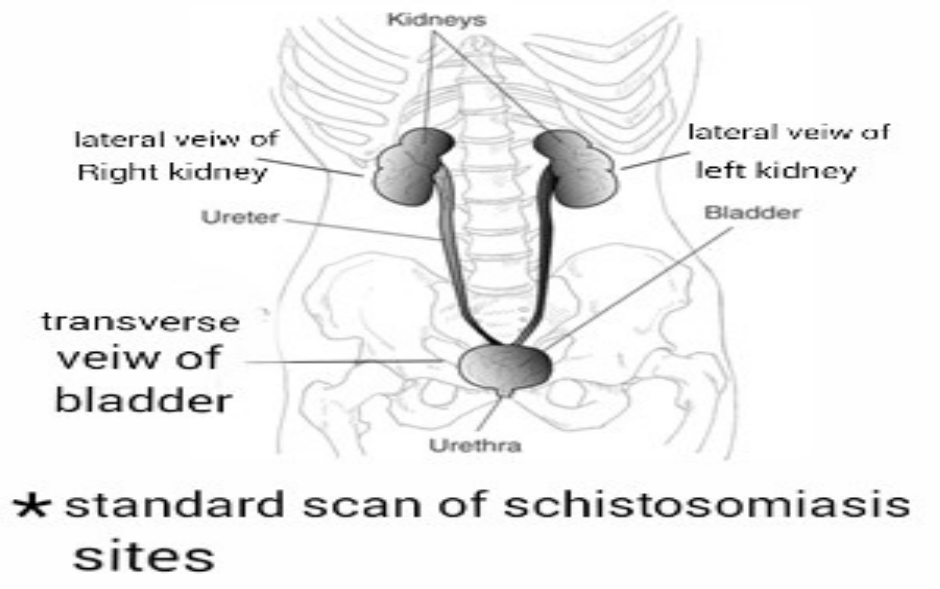


Figure (2-15) shows standard scan of Schistosmiasis sites

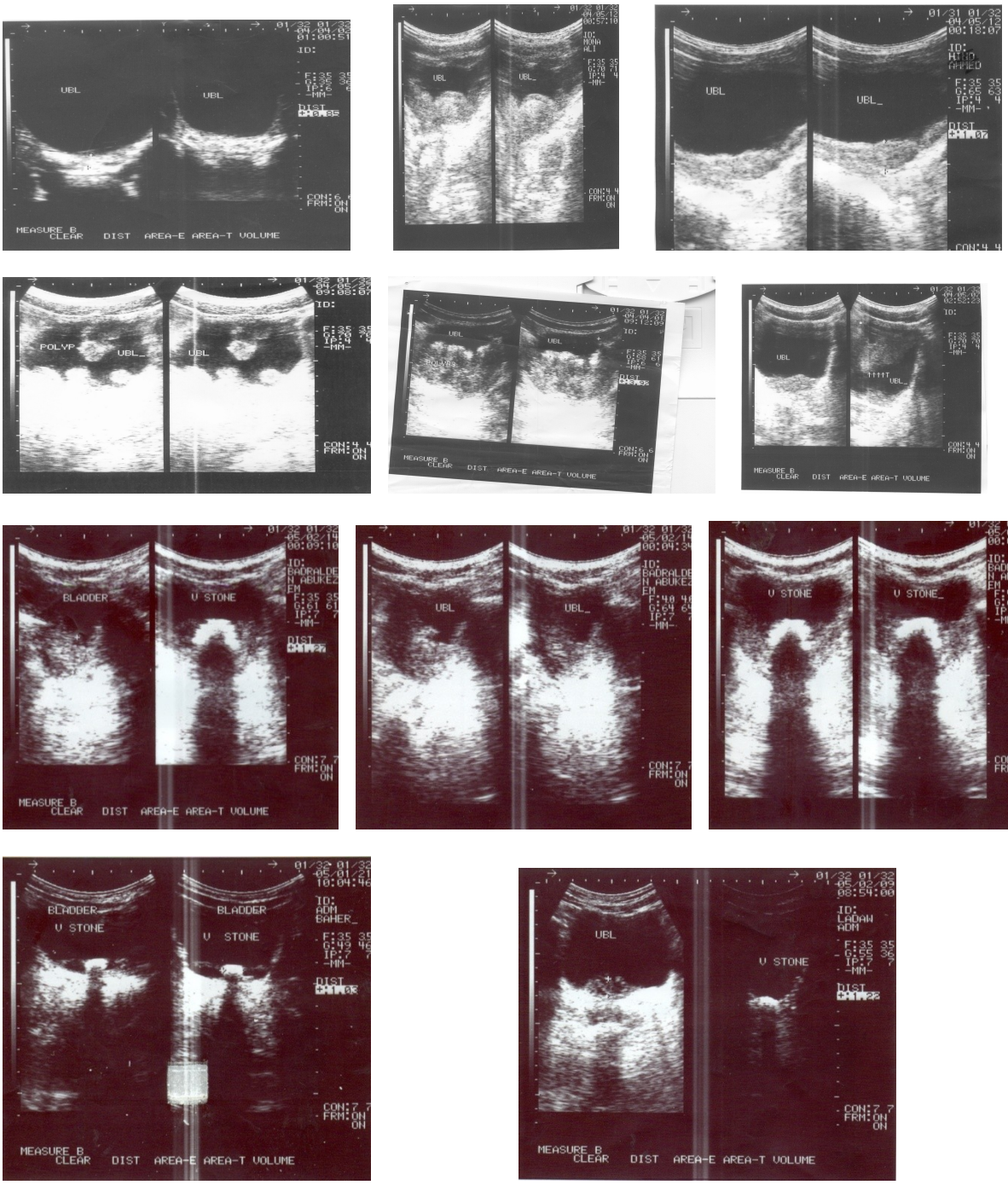


Figure (2-16) shows normal and thick wall, polyp, calcification and V.stone

2-5-2 Ureter:

Usually in well built patient it is possible to see ureteric end. It is about 25 cm long and divided into 3 segment (renal pelvic ureter, abdominal ureter, pelvic ureter).When dilatation in lower third 8cm occur it is possible to see local, dilatation classification, stricture, and reflux upwards in the ureter congenital anomalies (bifid, post caval ,ectopia (cobra shape ,megalla ureter) .as image .

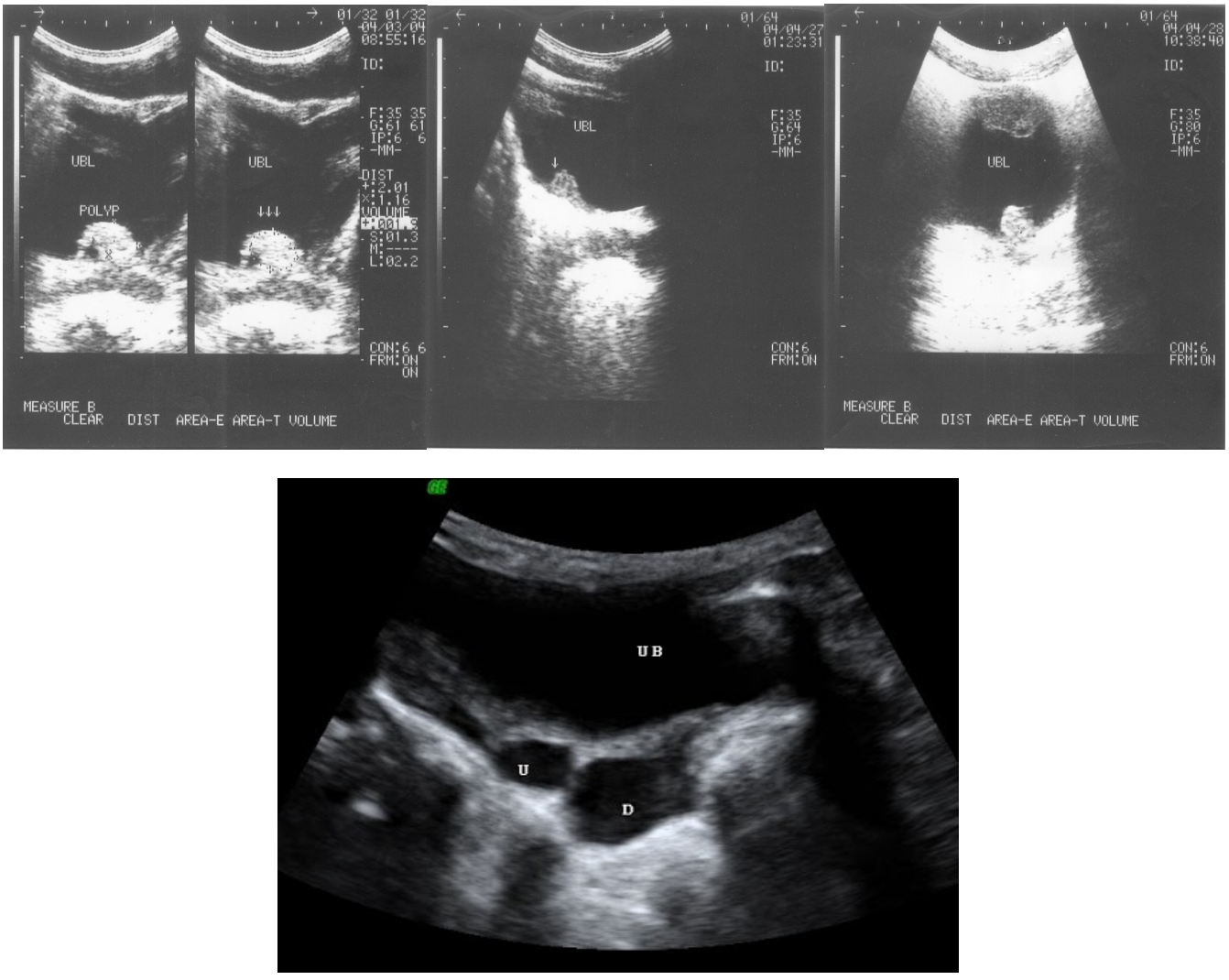


Figure (2-17) shows Calcify right and left ureter, hydro ureter and dilatation

If you want to see the ureter we must look for spine, psoas muscle, aorta, IVC .As below.

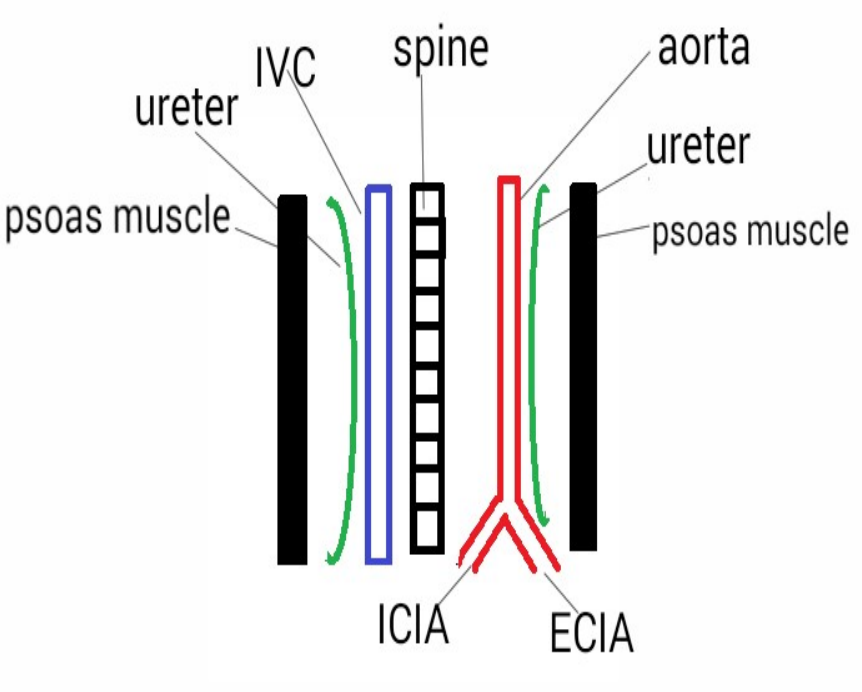


Figure (2-18) shows the ureter and neighboring organs

The ejection of urine must be at RT angle to each other. But when impaired by infection or other causes the ejection is altered, when ureter invaded or obstructed by Bilharziasis zigzag shape and calcification may be seen as below.

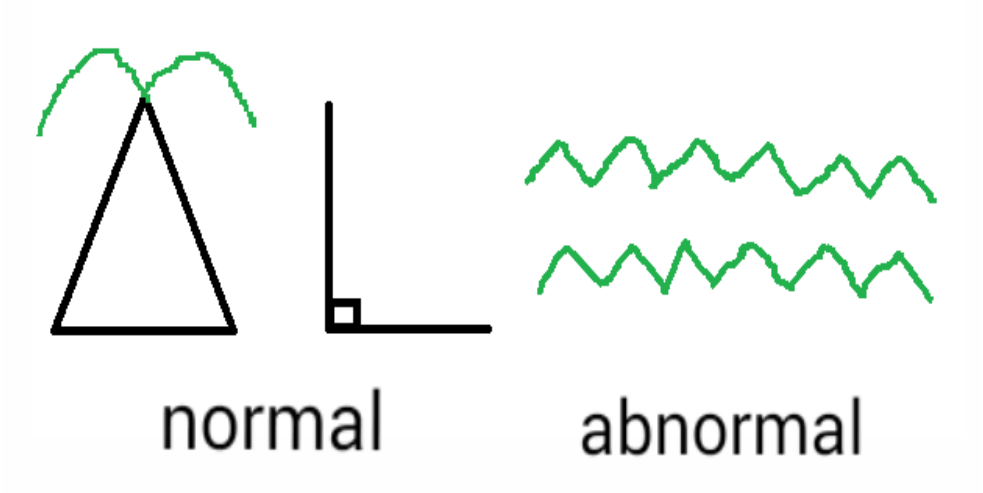


Figure (2-19) shows normal and abnormal ejection of the ureter

2-5-3 Kidney:

The kidney size and texture usually seen by ultrasound with patient supine, left and right oblique , prone position and cross section must done to search for horse shoe kidney .

Examination is done in deep inspiration to pushed kidney away from ribs; give fine detail and longitudinal dimension not alter by movement. Liver and spleen used as acoustic window for right and left kidney. Ultrasound detected kidneys abnormalities (differentiate between cortex and medulla), kidneys anomalies, interstitial disease, present of stone with or without obstruction, renal lesion and an ascending infection as in case of schistosoma haematobium which lead to renal failure.

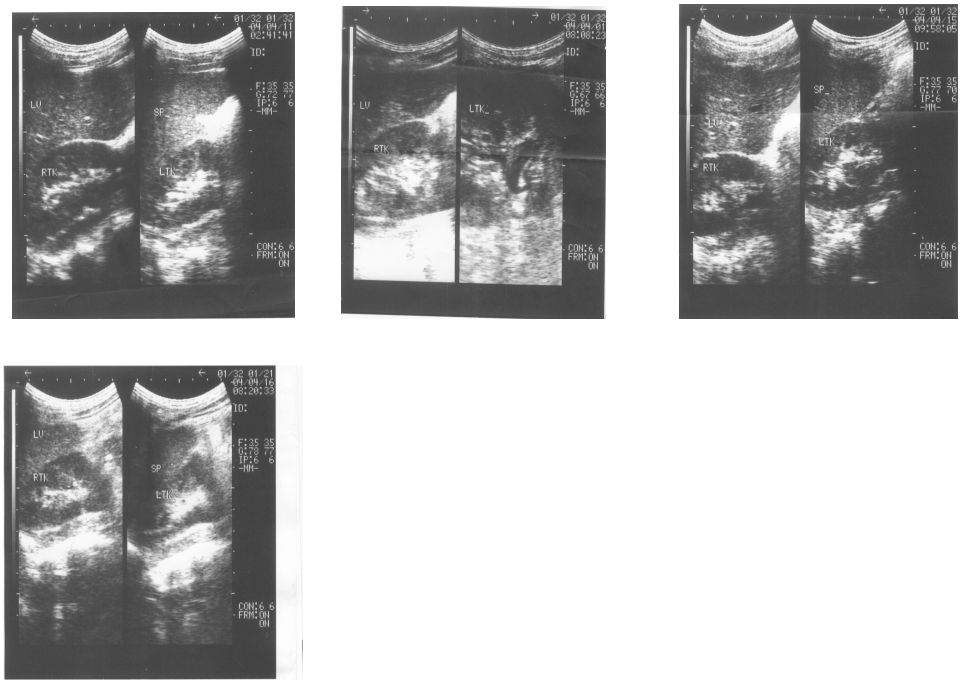
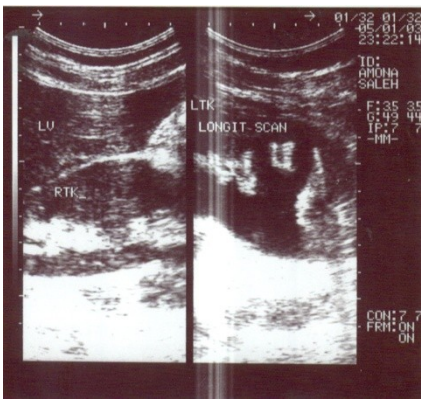


Figure (2-20) shows normal and right kidney and hydronephrosis on the left kidney


LV
RTK
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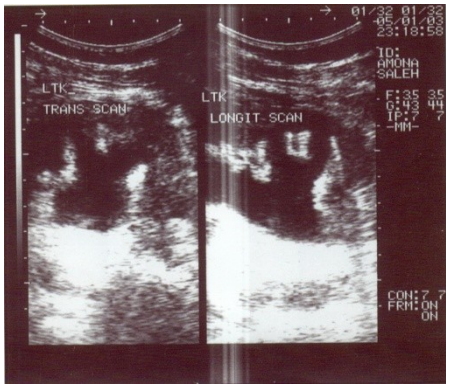
LTK
TRANS SCAN
LTK
LONGIT SCAN
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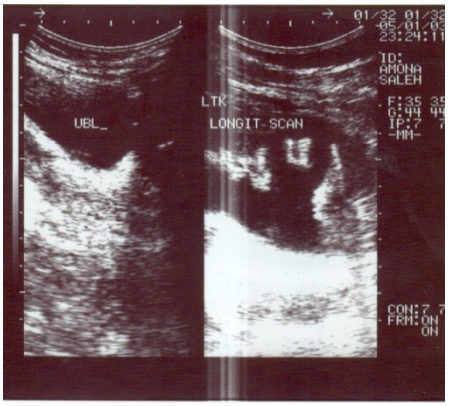
AMONA
SALEH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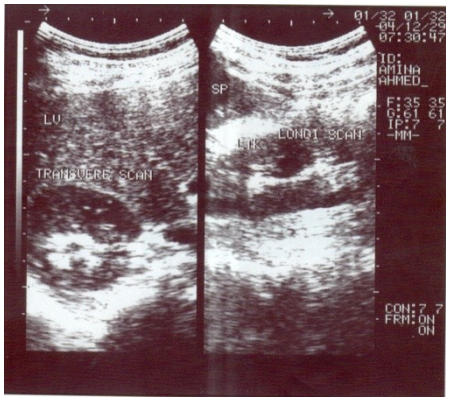
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AHMED

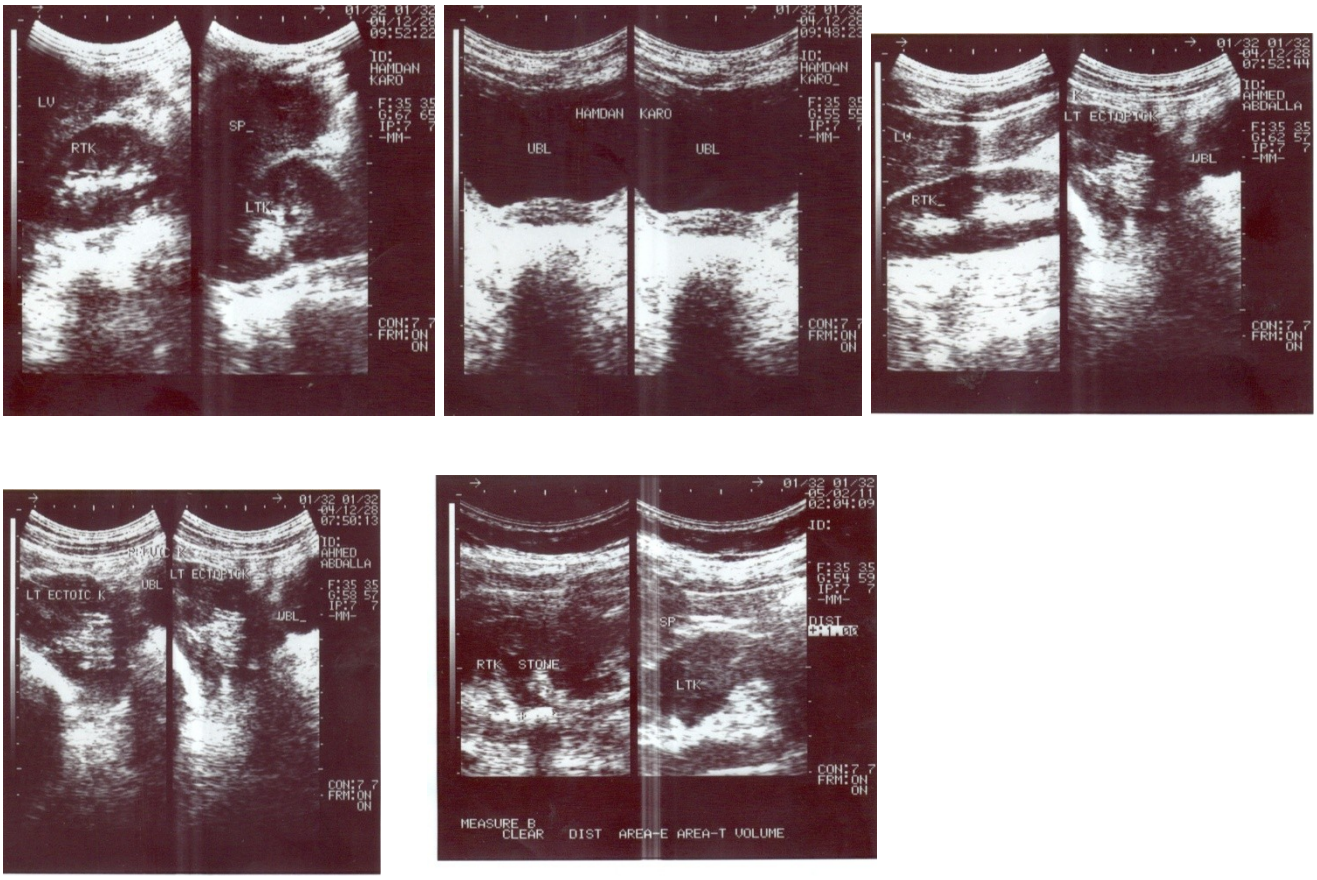


Figure (2-21) shows normal and abnormal of the kidney(hydronephrosis,stone) and ectopic kidney

2-6 previous study

The role of ultrasound in urinary bilharziasis has been extensively studied. There is a rich international literature on the subject. Schistosomiasis in Sudan is found in irrigated areas central province eg :Elgazira ,Sinnar ,White Nile , Kordofan province eg (Alrahad , Umrwaba ,Ubziabad , Alnohod ,Shikan) and Western Sudan ,Darfor province. Schistosoma haematobium and mansoni are prevalent in those areas

which causes of urinary and intestinal schistosomiasis respectively. Mukhtar, (2000) showed that the prevalence of the infection dropped from 53% to 34% and intensity of infection from 31% to 18%, with reduction in hepatomegaly and hepato-splenomegaly, although splenomagaly alone was unchanged after treatment (Mukhtar, 2000).

Manasik (2013) studied screening at school children in Elobied for diagnosis of urinary schistosomiasis cause by schistosoma haematobium four schools were selected which were located at difference site ,the number of students was 400 age (8 -14) years ,Out of this number 25 (6.2 %)were found to harbour eggs in their urine using direct smear and flotation ,the high rate of infection near to source of water (Fula) and higher in males than females. The results indicated that the disease is common in school children.

Bushra (2006) described in his study which is practical and descriptive one in two endemic areas with urinary Schistosomiasis 83 sample study from Kiryiab agricultural scheme (Khartoum state) and 80 from al Rahad area (Kordofan state) and 50 samples as control group. He found that the ultrasound could confidently be used with laboratory investigation for diagnosis of schistosomiasis and ultrasound is a powerful, cheap, non- invasive, non –costive, less time consuming and rather a pleasant tool to demonstrate the structural morbidity caused by schistosoma haematobium. The thickness of the bladder wall should be measured at the posterior wall in area of the trigonum, which is varies from (4-12) mm and divided into acute, intermediate and severe chronic changes (inflammatory). The polyps, fibrosis, classification, stones, masses Ca. The polyps are classified according to their shape as follows: Sessile mass with a stem (stalk-like connection), Thick base (finger -like) extending mass for > 10 mm, Wave-like mass usually < 10 mm with gradual elevation and down running surfaces, Rock-like which is similar to the wave-like but higher and bigger in size as figure below:

The above mentioned masses have a homogeneous texture and thus considered to be simple benign polyploidy masses; masses with irregular shapes and mixed echo texture are delt with Ca bladder and is advised usually.

Ramarakoto (2008) studied the ultrasonographical findings in the urogenital organs in women and men infected by S.haematobium in northern Madagascar. Ultrasonography (US) was applied in this community –based study in northern Madagascar to compare urogenital finding in Schistosoma haematobium-positive individuals (105 women and 116 men) from the high-endemic Sirama Village, with urinary egg negative controls (100 women and 108 men) from the neighboring low-endemic Mataipako village .In addition to examination of the urinary tract, the female genitals were examined by transvaginal US, whereas the male genitals were examined by transrectal and Tran scrotal US. Pathology of the urinary tract was significantly more prevalent among women and men in Sirama. There were no differences in female genital tract between the two study populations, whereas significantly higher proportions of men in Sirama were detected with hyperechogenic and calcified lesions in the seminal vesicles and the prostate. Moreover ,the mean size of the seminal vesicles was significantly larger in Sirama .There were no differences with respect to the external male genitals .Six month after anti-schistosome treatment, no changes were observed in the female genital tract in Sirama, where as Hyperechogenicity of the prostate and the seminal vesicles, in addition to size of the seminal vesicles, declined significantly .This study has provided new insight into genital pathology in S.haematobium-infected men and women .However, the clinical significance of these finding needs further exploration.

Elmadani (2013) addressed ultrasound finding in urinary schistosomiaisis infection school children in the Gezira State Central Sudan to evaluate the Ultrasound finding of urinary

schistosomiaisis in Quran school (Khalwas) children in Gezira State Sudan, we studied all the students from two schools. A total of 103 boys were tested for urinary schistosomiaisis using the urine filtration method. Schistosomiaisis haematobium (S.haematobium) eggs were counted. Ultrasound was performed for all the positive subjects. Seventy-three (71%) subjects were positive for S.haematobium. The mean age was 11.3 +_ 2.9 years. Sixty-six (90.4%) subjects showed urinary tract abnormalities. The finding revealed the following degree of wall thickening: 53.0% mild, 18.2% moderate and 21.2% severe. Urinary bladder polyp(s) were noted in 43.3% (single) and 40.9 %(multiple) of the subject, and calcification of the bladder wall was observed in 7.6% subjects. Ureteric dilatation was noted in 38/73 (52%), while hydronephrosis detected in 19/73 (26.3%). The vast majority of urinary tract Schistosomiaisis lesions were in the urinary bladder. Ultrasound is a useful tool for identifying the morbidity of Schistosoma haematobium in endemic areas.

Kardorff (1994) described the Ultrasonography of ureteric abnormalities induced by Schistosoma haematombium infection before and after praziquantel treatment. While Boisier (2000) described the epidemiological and individual value of ultrasonic diagnosis of morbidity related to schistosomiasis due to Schistosma mansoni and Schistosma haematombium. King (2002) studied the ultrasound monitoring of structural urinary tract disease in Schistosoma haematombium infection. Starhan (2013) concentrated on studying the response of treatment in children and the ultrasonic finding following 14 month after treatment (in the liver and urinary bladder of children). After praziquantel treatment for schistosomiasis, parasitological cure rates of 60%-90% are usual. Does this response to treatment correlate with the improvement in liver and bladder changes seen on ultrasound in children? This study shows that ultrasound is an effective

way to evaluate liver and bladder changes caused by schistosomiasis infection in children and the assess treatment effects after mass treatment programmers.

Bonnard (2011) studied the curve of vesico-urinary ultrasonography in Schistosoma haematobium infection with WHO practical guide: a "simple to learn" examination. Proved that Ultrasound in urinary bilharziasis is not only an effective diagnostic method, but also showed that it is a simple examination that can be conducted in the filed by non-radiologist physicians.

In developing countries, it is difficult to rally a radiologist to conduct field studies. Here, we report how a radiologist taught a clinician to carry out the ultrasound examination as defined by the World Health Organization (WHO) record sheet for Schistosoma haematobium related lesions. In a population infected with Schistosoma haematobium, the learner and teacher performed two ultrasound exams and the results were compared. One hundred thirty-two children were prospectively included, during 8 ultrasonography sessions split over 23 days. After 51 examinations the learner's sensitivity was above 90%. After the fifth session the specificity reached 100% (results remained stable until the end of the study period). This study shows that a clinician can quickly learn how to carry out a simple ultrasound examination to gather the items needed for the follow-up of Schistosoma haematobium related lesions, suggesting that clinicians could implement networks of ultrasound-based surveillance on the field. Odongo et al 2010 to study different techniques detection including ultrasound.Bilharzia induced pathologies and techniques of detection in Uganda: a review. Since its first detection in 1902 schistosomiasis mansoni and later schistosomiasis haematobium in Uganda, morbidity assessment was on physical examination and intensity of eggs excretion. The first field study in Uganda of schistosomiasis pathologies using ultrasound was that conducted in West Nile in Obongi, Rhino Camp and Pundu in 1991 and reviwed in 1992. These armless and none invasive method of

pathologies detection has advantage of repeatability. It showed that after treatment there was reversibility of pathological conditions introduced by the parasites in the hosts. Schistosomiasis mansoni pathologies as detected by the non invasive ultrasound finding compared well with those of the more risky invasive liver biopsy. The detection of pathologies by clinical examination was less sensitive. Pathological lesions due to schistosoma haematobium correlated with abnormalities of the urinary tract and intensity of eggs in urine.

Strikland and Abdelwahab (1993) used portable abdominal ultrasonography has been used to measure community morbidity. From schistosomiasis in schoolchildren and cross-sectional population samples and to assess efficacy of chemotherapy. Periportal fibrosis and hepatosplenomegaly have been common findings, usually associated with each other and with prevalence and intensity of infection as measured by faecal Schistosoma mansoni ova excretion. Similar, less severe, lesions have been noted in subjects infected with schistosoma haematobium. Inhabitants of villages where praziquantel therapy was systematically provided had less periportal fibrosis and hepatosplenomegaly than those living in near by villages where treatment was not available. Community-based screening in schistosoma haematobium endemic areas has shown high prevalence of bladder wall thickening, irregularities, and polyps which were usually more frequent and severe in children and in those excreting most ova. Obstructive uropathy was frequent in most studies. Chemotherapy usually rapidly resolved the bladder wall abnormalities. In some studies hydronephrosis and hydroureter were more persistent. Reversibility of chronic, stable a lesion in adults remains unproven.

Abdelwahab (1992) described schistosoma haematobium infection in Egyptian school children: demonstration of both hepatic and urinary tract morbidity by ultrasongraphy. Parasitological. Clinical and ultrasonographical studies were performed upon 422 schoolchildren aged 12-16

years living in a village in the Fayoum where schistosoma haematobium, but not S. mansoni, was transmitted. Over half of the children gave a history of receiving praziquantel therapy during the preceding 2 years. Symptoms (e.g., haematuria, burning micturition), signs (e.g., hepatomegaly, splenomegaly) and urinary findings (e.g., haematuria, proteinuria) correlated better with the presence and intensity of S. haematobium infection after correcting for this variable. Renal obstructive lesions detected by ultrasound were 2 and 3 times as common in those with moderate and heavy infections as in those with no or light infections, and urinary bladder wall lesions were far more frequent in those with moderate and heavy infections. A mild grade of periportal fibrosis, hepatomegaly and splenomegaly were present in some children in all groups. However, the prevalence of splenomegaly correlated directly with the intensity of infection; liver lesions occurred much more frequently in children with infection or a history of treated infection than in non-infected children denying recent treatment, and no child had hepatomegaly or splenomegaly in the absence of periportal fibrosis.

Van Der et al (2004) studied diagnosis of urinary schistosomiasis in a novel approach to compare bladder pathology measured by ultrasound and three methods for haematuria detection. they aggregated published data from field studies documenting prevalence of Schistosoma haematobium infection and bladder pathology determined by Ultrasonography or haematuria detected by reagent strip, questionnaire, or visual Examination. A mathematical expression was used to describe the associations between prevalence of pathology/morbidity and infection. This allows for indirect Comparison of these methods, which are rarely used simultaneously. All four methods showed a similar, marked association with infection. Surprisingly, ultrasound revealed higher prevalence's of pathology in schools than in communities with the same Prevalence of infection, implying a need for age-related cut-off values. Reagent strip Testing yielded a higher prevalence than questionnaire, which in turn was higher than By visual examination. After correction for

morbidity' due to other causes, a consistent Ratio in prevalence of haematuria of 3:2:1 resulted for the three respective methods. The simple questionnaire approach is not markedly inferior to the other techniques, making it the best option for field use.

Keita (2005) studied the prevalence of schistosomiasis lesions detected by ultrasonography in children in molodo, Mali.To study schistosomiasis infection in school children in Molodo, an irrigated rice growing region of Mali. By determining the prevalence of schistosomiasis and lesions Identified by ultrasonography among children living in this region. This cross sectional study included 346 children aged 7 to 14 years selected at random from five schools in Molodo. We tested for haematuria using urine dipsticks and Searched for Schistosoma haematobium eggs in urine and Schistosoma mansoni eggs in stools. UItrasonography of the liver, spleen and urinary tract was performed. The prevalence's of Schistosoma haematobium and Schistosoma mansoni infection were 72% (range: 66.9-76.6%) and 68.2% (range: 60.9-71.2%) respectively; 55.1% of the children had co-infection. Ultrasonography of the urinary tract revealed an irregular bladder wall as the most frequent abnormality (3.4% of children).Abdominal Ultrasonography demonstrated type B hepatic fibrosis in four children (1.1%), type C in one (0.3%) and type D in one (0.3%). Few schistosomiasis lesions were detected by ultrasonography compared with the Prevalence of Schistosoma haematobium and Schistosoma mansoni infections. This observation is probably related to mass treatment programs conducted during a national anti- schistosomiasis program.

Koukounari (2006) Assessment of ultrasound morbidity indicators of schistosomiasis in the context of a large-scale program illustrated with experiences from Malian children. We assessed morbidity indicators for both Schistosoma haematobium and Schistosoma mansoni infections and evaluated the appropriateness of the World Health Organization (WHO) guidelines for ultrasound in schistosomiasis in the Context of large-scale control interventions. Abdominal and urinary tract Ultrasonography was performed on 2,247 and 2,822 school children, respectively, from 29 randomly selected schools in Mali before the implementation of mass anthelminthic drug administration. Using two-level logistic regression models, we examined associations of

potential factors with the risk of having a positive ultrasound global score (morbidity indicative of Schistosoma haematobium infection), abnormal image pattern scores, dilatation of the portal vein, and/or enlarged liver (morbidity indicative of Schistosoma mansoni infection). The WHO protocol was found useful for detection of Schistosoma haematobium pathology but overestimated the risk of portal vein dilatation and left liver lobe enlargement associated with Schistosoma mansoni infection. We conclude that ultrasonography should be included in large-scale control interventions, where logistics allow, but cautiously.

Ekwunife (2009) screened infected people, ultrasonography screening of urinary schistosomasis infected patients in Agulu community, Anambra state, southeast Nigeria. The pathology of Schistosoma haematobium infection in 60 infected primary school Children in Agulu community, Anambra State, southeast Nigeria, with over 50 ova/10 Ml urine was assessed. The ultrasonographic examination was done using a sector scanner with convex probe. World Health Organization method was used for classification and scoring of lesions. T-test and Coefficient of determination were used in analysis. The pathologic effects due to Schistosoma haematombium identified among the study group included irregularity of the bladder wall (25%), thickening of the bladder wall (10%) and massing of the bladder wall (3.3%). About 4(6.7%) and 1(1.7%) of the patients had the right pelvis and left pelvis of their kidney moderately dilated respectively. Identified bladder wall lesions had 69 scores while kidney dilation had 30 scores. The number of individuals with lesions correlated with intensity of infection. Male pupils (65.2%) had more lesions than females (34.8%). The difference observed in lesion distribution among males and females was found to be significant ($DF= 6$, $p < 0.05$). All bladder and kidney lesions responded favorably to treatment with praziquantel (40 mg/kg-body weight). Health education campaign including showing the community members evidence of damages to the organs (from the

ultrasound pictures) will go a long way in the control and prevention of the disease in this community.

Mahmood and Al-Mendalawi (2013), ultrasound findings in urinary schistosomasis infection in school children in Gezira state central Sudan. How to cite this article: URL: I have two comments on the interesting paper by Elmadani et al 2013, on the ultrasound findings in urinary schistosomiasis infection in school children in Gezira state. Central Sudan. First, the best applications for which an ultrasonographic investigation of schistosomiasis is now considered as mandatory are community-based studies and post-therapeutic follow-up of the populations. However the poor specificity of some images is a major limitation for use in zones of low prevalence. Also, lack of funds, proper equipment or training, particularly in developing countries with endemic schistosomiasis. Are additional limitations. Despite these limitations, results have indicated that urinary tract abnormalities are common (18% over all prevalence) in Schistosoma haematobium transmission areas, with a 2-4% risk of either severe bladder abnormality or advanced ureteral obstruction. Interestingly, the prevalence of 83.6% urinary tract ultrasonographic abnormalities reported by Elmadani et al 2013 is alarmingly high. Did not address the factors contributing to that spike in ultrosonographic abnormalities in their studied cohort. I presume that factors implicated in the evolution of high ultrasonographic urinary pathology might be probably related to a lack of or irregular mass treatment programs conducted during a national anti-schistosomiasis program in Sudan, intensity and duration of exposure, co-infection with other parasite strains, complex immune mechanisms resulting in slow acquisition of immune resistance, patients' aye and genetic and nutritional backgrounds. Therefore, strategic anti-schistosomiasis programs consisting of early detection, proper treatment and regular follow-up as well as comprehensive preventive measures are still in paramount need in Sudan. Second,

apart from the common ultrasonographic findings of urinary bladder wall thickening, calcification, polyp(s), ureteric dilatation and hydronephrosis addressed in Ehmadani et al's study 2013, and various studies worldwide, additional ureteric wall abnormalities in term of strictures and ureterocele-like lesions of the ostium have been reported that tend to disappear after proper treatment with anti-schistosomiasis drugs. Expanding the knowledge of ultrasonographers on the whole spectrum of ultrasonographic findings in schistosomiasis is crucial

Chapter Three
Materials and Methods

3.1 Materials:-

3.1.1 Machine Used:-

The patients were scanned by Fukuda (4100) ultrasound machine fitted with convex probe (3.5) MHz , which is preferable for the assessment of the urinary system ,kidney and abdominal organ . portability of the equipment is small and lightweight as to be portable freely with one hand.

3.1.2 Population of the study

This study conducted in Shikan, North Kordofan State-Sudan at the ultrasound department of Elobied teaching hospital, from March 2014 to October 2015. The patients included in this study were positive Schistosomiasis were collected prospectively by the researcher during ultrasound scanning. This is a descriptive cross-sectional study. The following changes were considered as pathological lesions in the lower urinary tract: bladder wall thicker than 5 mm and presence of bladder polyp(s) or wall nodularity.

3.1.3 Sample size and type

The data of this study collected from 108 patients from both gender include young and adult patient, where all patients with positive Schistosomiasis attend the ultrasound clinic were included conveniently.

3.2 Methods

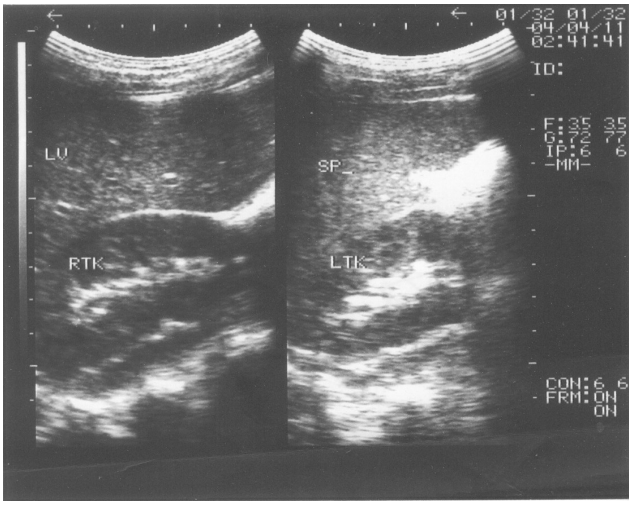
3.2.1 Scanning protocols

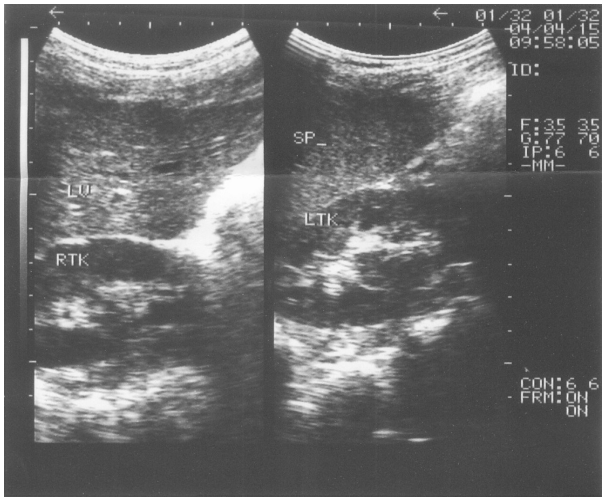
All patients were scanned in supine position where the urinary tract, liver and spleen examinations were achieved sonographically. The patients were asked to drink water prior to the

scan to fill their urinary bladder. Both the lower urinary Tract (bladder) and the upper urinary tract (kidneys and ureters) were evaluated.

3.2.1.1 Renal Scanning Technique

The examination was done with the patient in the supine position. Scans were performed in the Sagittal and transverse planes. Lateral decubitus and lateral oblique positions for the right and left kidney were used. Coronal longitudinal and transverse scans were obtained for evaluating the renal pelvis and proximal ureter. The bladder wall thickness, lower ureters and lesion thickness was measured in (mm) using caliper.





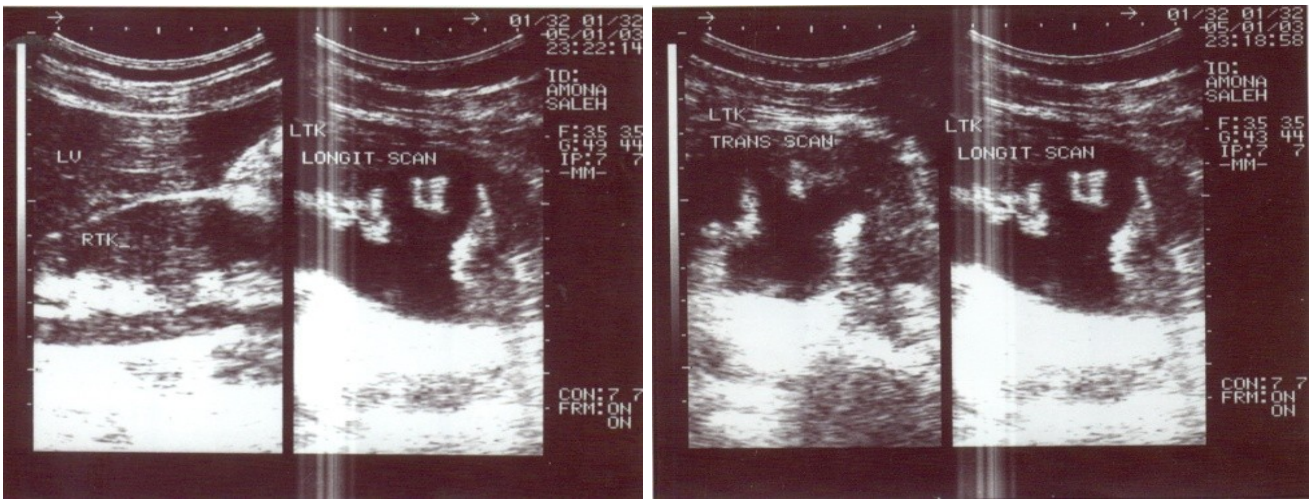
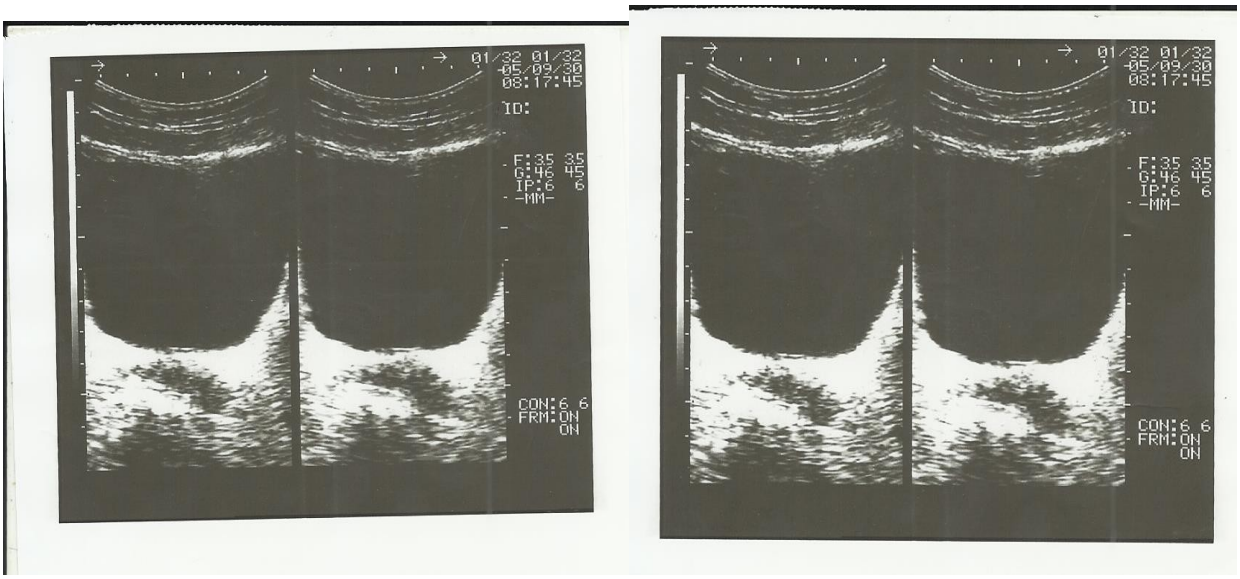


Figure (3-21) Normal and prominence of the pelvicalyceal (PCS)



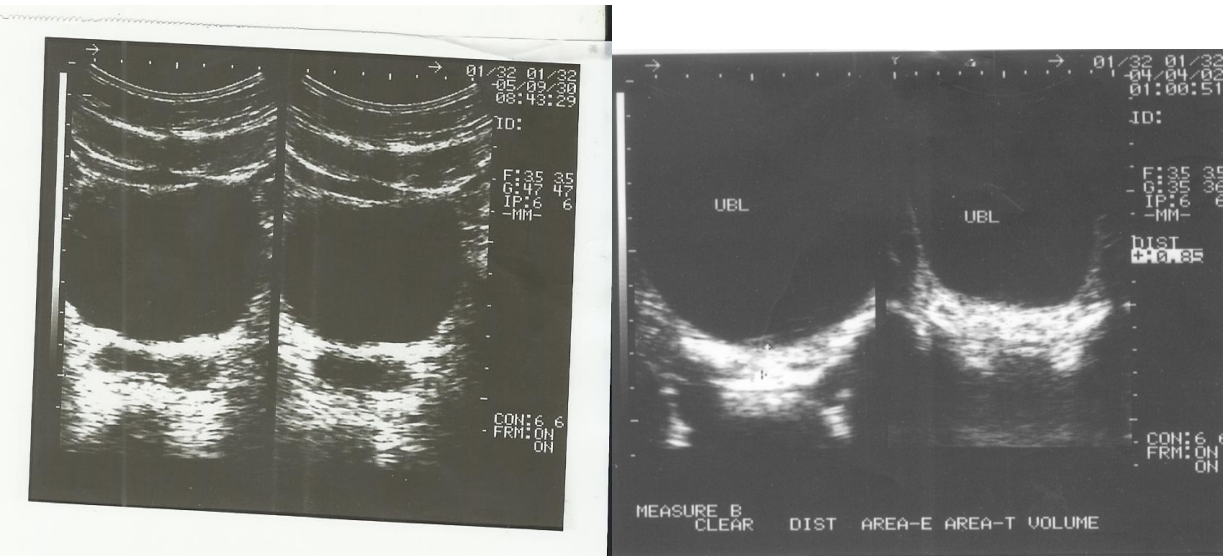
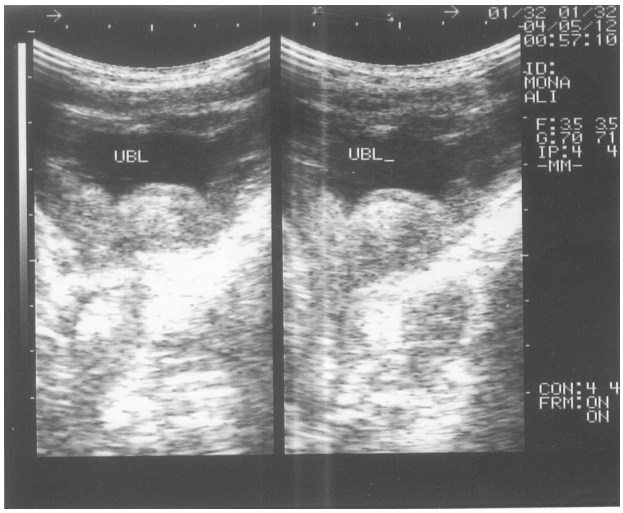
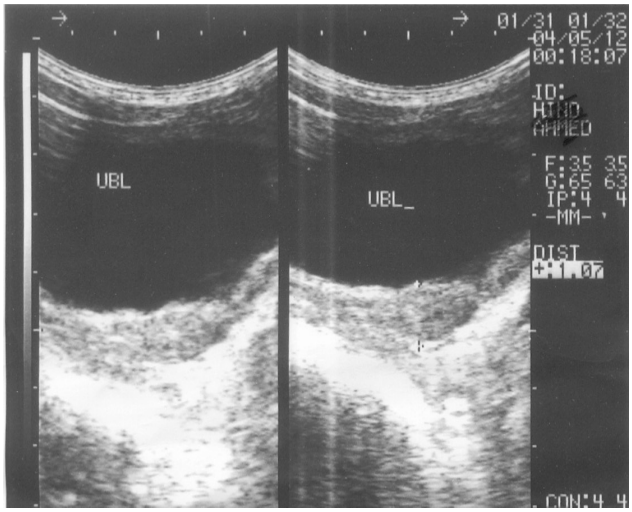


Figure (3-22) shows Normal urinary bladder wall





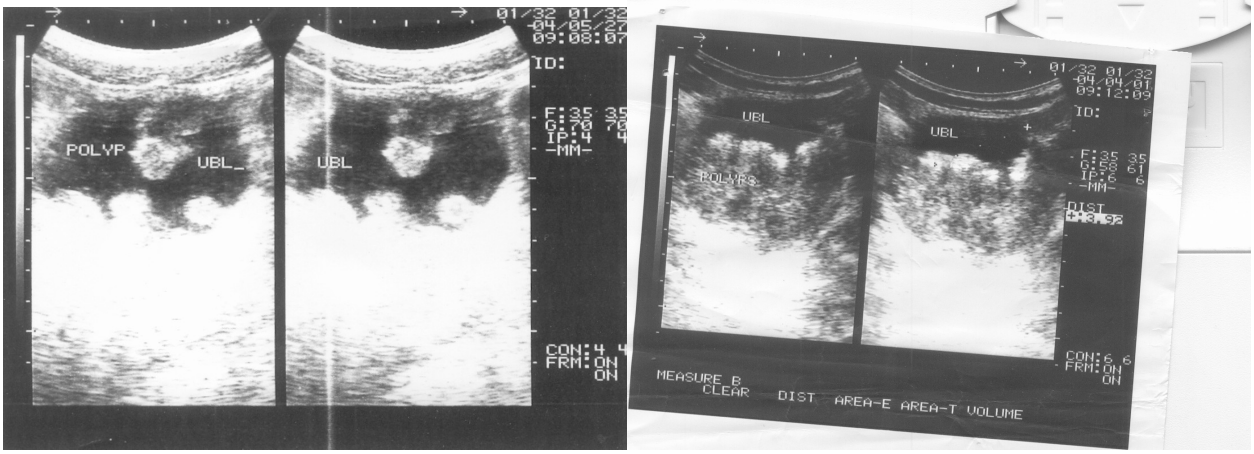
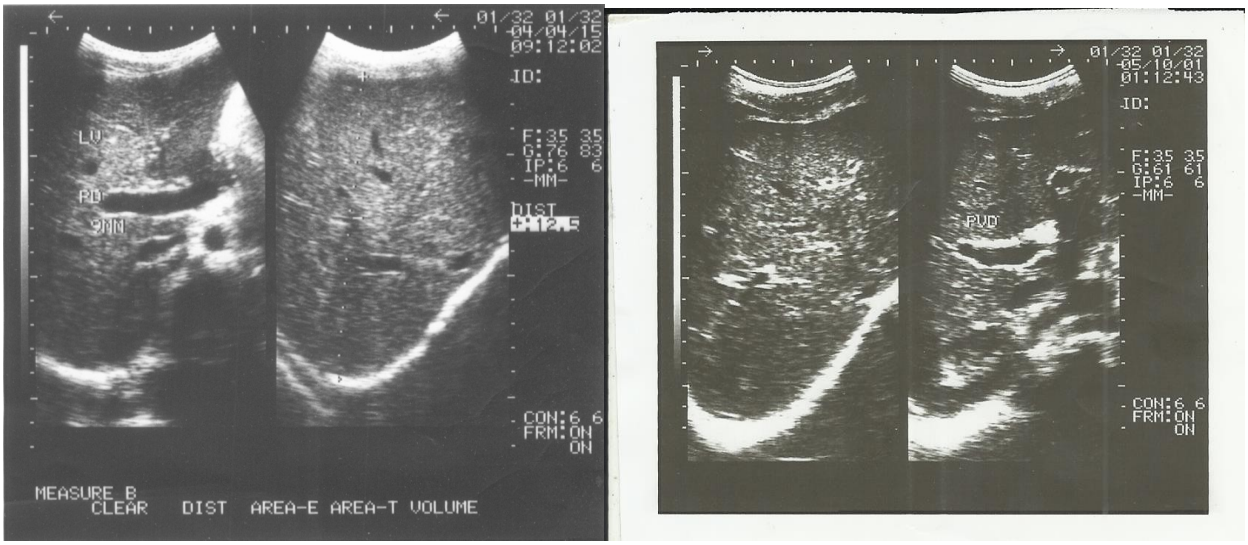


Figure (3-23) Shows Thick bladder wall, Polyps and calcify

3.2.1.2 Liver Scanning Technique

The patients were positioned in supine, left posterior oblique and left lateral decubitus. Scans were done in longitudinal, transverse and transverse-oblique planes. Liver size, portal vein and splenic vein diameters were measured in (mm) using caliper.



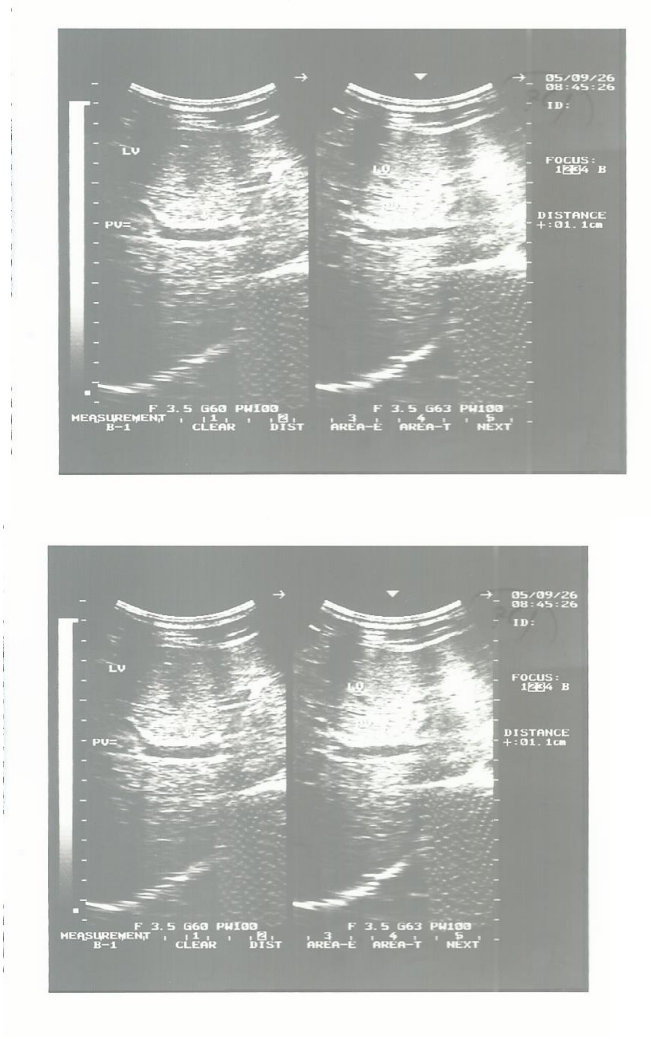
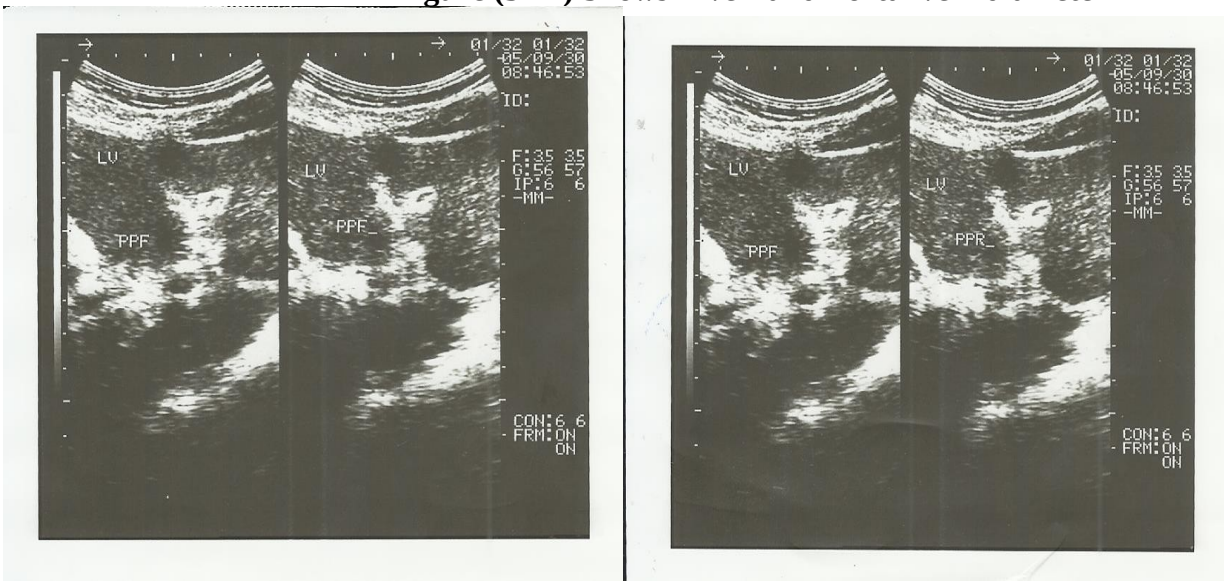


Figure (3-24) Shows Liver and Portal vein diameter



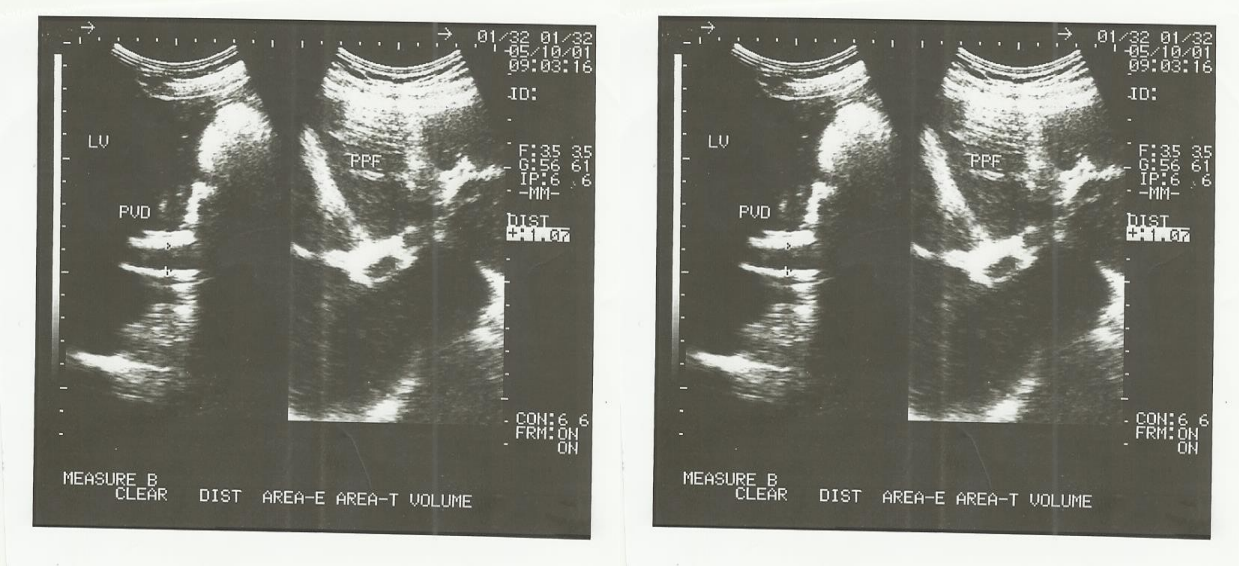


Figure (3-25) Shows Periportal fibrosis

3.2.1.3 Spleen Scanning Technique

The patients were scanned in the right lateral decubitus position .Scanning was done in the left coronal plane to achieve a long axis scan and by turning the transducer ninety degrees, a short axis scan achieved. Spleen size cranio-caudally was measured in (mm) using caliper.

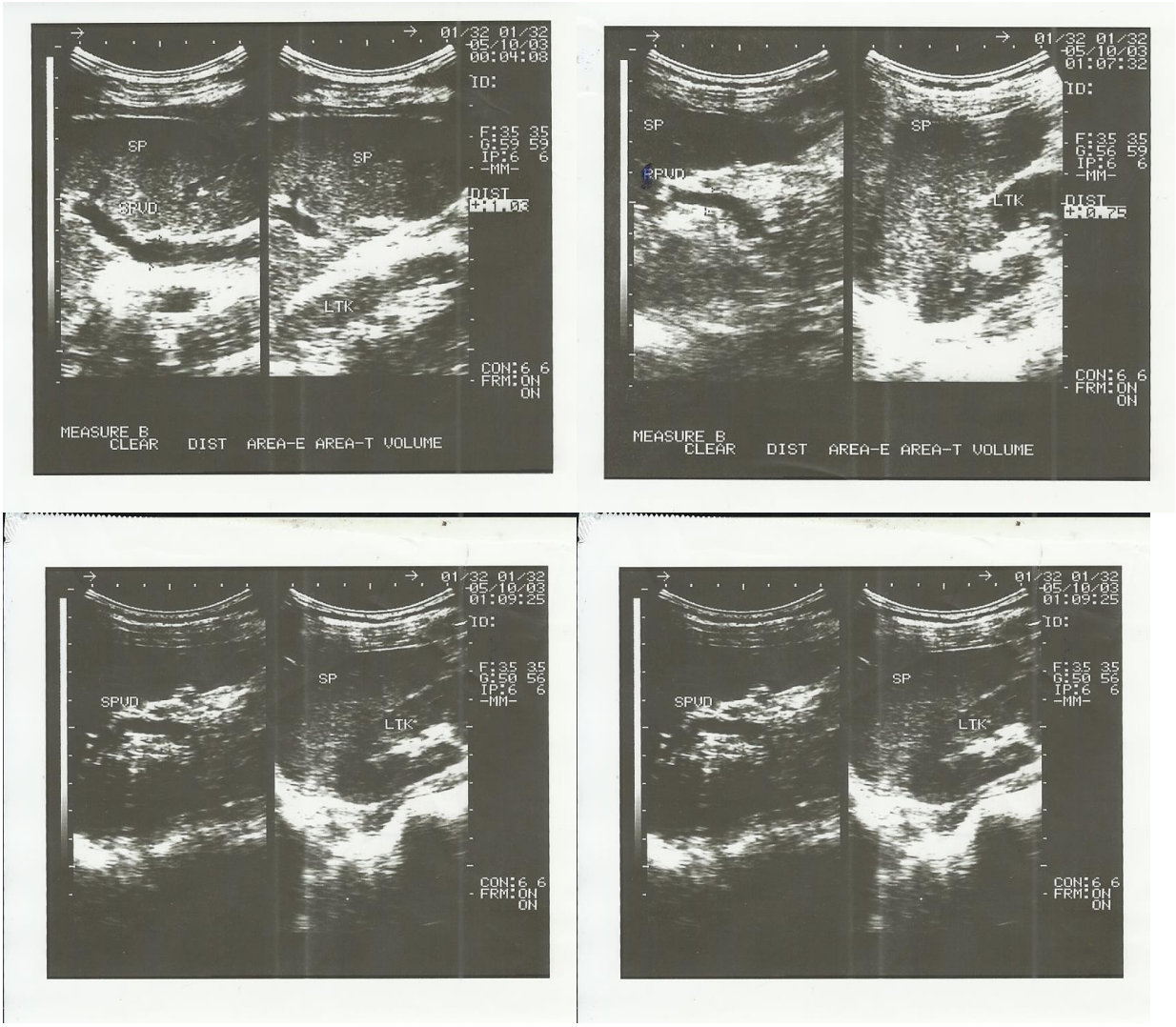


Figure (3-26) Shows Spleen and splenic vein diameter

3-2-2 Method of data collection

Urinary bladder:

The patient prepare carefully for scanning prevent from food at least 4 hours, with full bladder at least 2 hours for showing bladder pathologic change, abnormalities ,and complication . Full

bladder used as acoustic window and displaced bowel and air away from pelvic oragn. Scanning begin with evaluation of urinary bladder wall abnormalities and adjacent structure in two views (Longitudinal, transverse). The patient should be lying supine with full bladder and apply coupling agent (gel). Start with transverse scans from the pubic symphysis upwards to the umbilicus with interval distance. Starting at mid line with probe moving from right to left till covering the bladder and follow with longitudinal scan; see image below:-

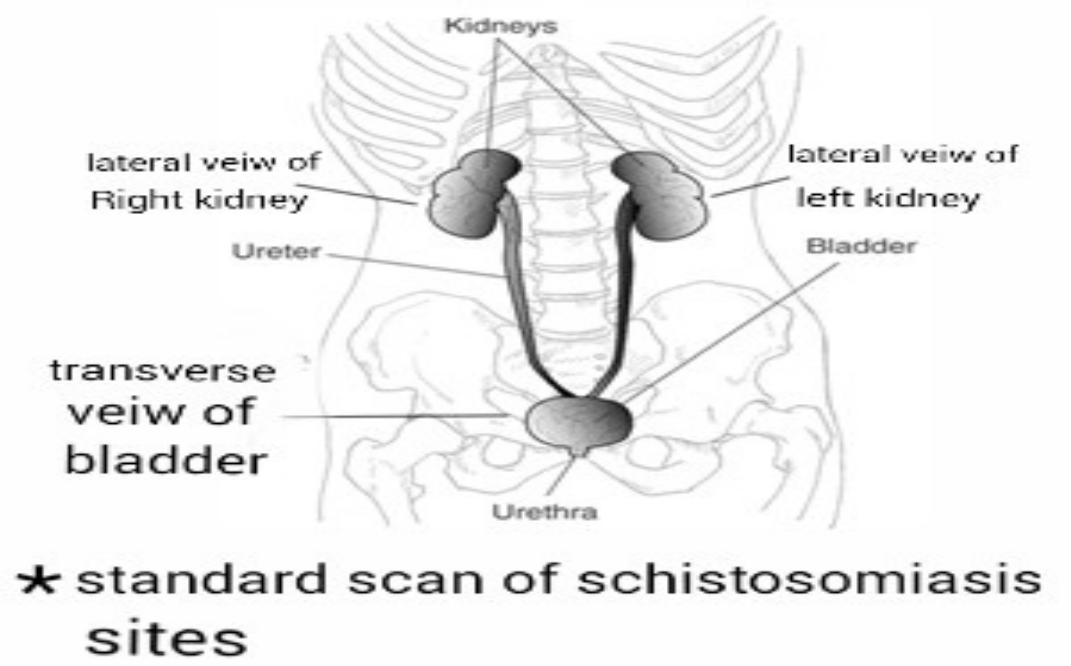


Figure (3-27) Shows Standard scan of Schistosomiasis sites

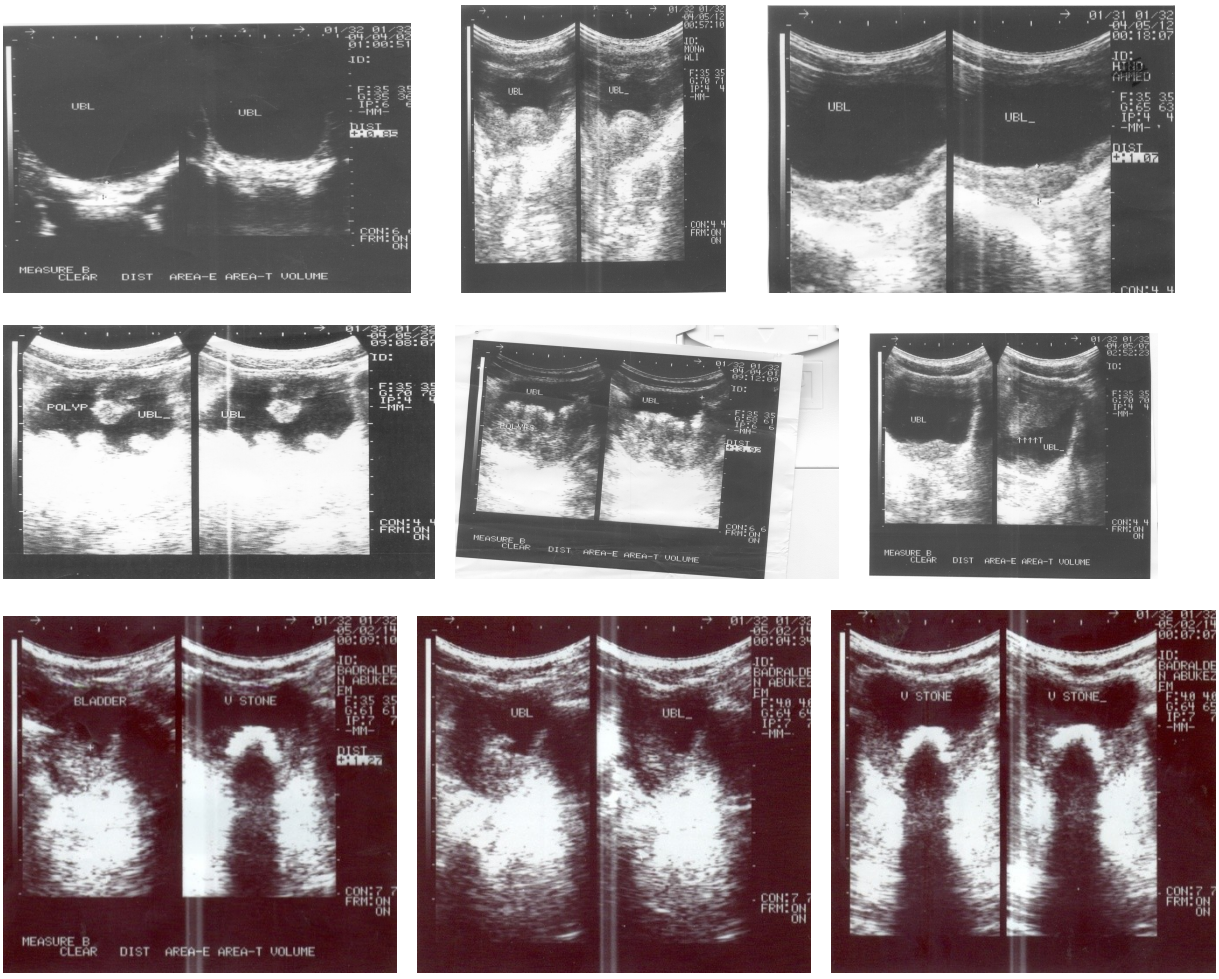


Figure (3-28) Shows normal, thick wall, polyp, calcify and v.stone

***Ureter*:**

Ureter should be scan with patient in supine position for upper and lower part on the right and left lateral position **IVC** and **CIA** used for guidance. If an abnormality is identified completed survey of the pelvic organ and adjacent structure may be taken; see image below**:-**

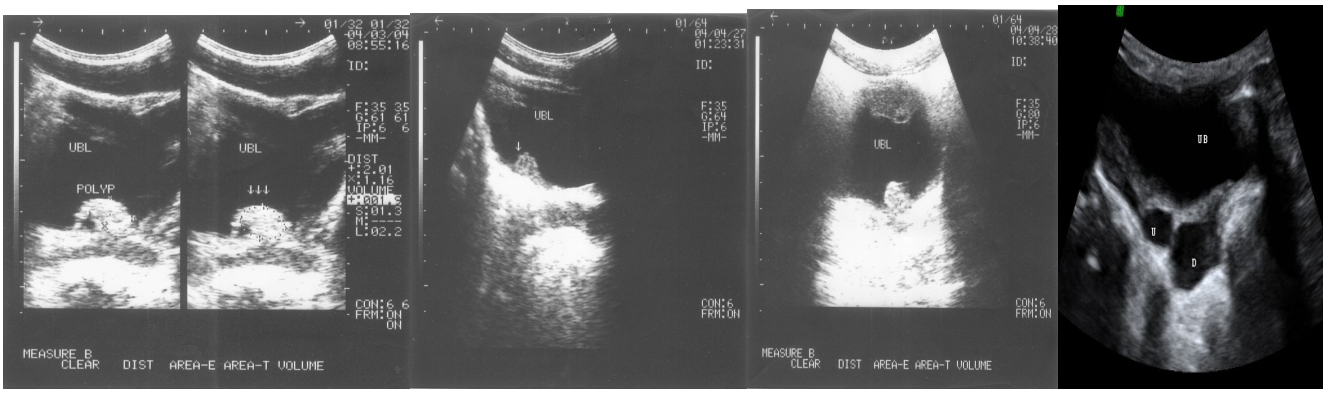


Figure (3-29) Shows Calcify ureters, Prominence, hydro-ureter, and dilation of the ureters as above

***Kidney*:-**

No patient preparation is necessary. However a well hydrated state in some times helpful. The probe of highest frequency preferable 3.5 MHz should be used.

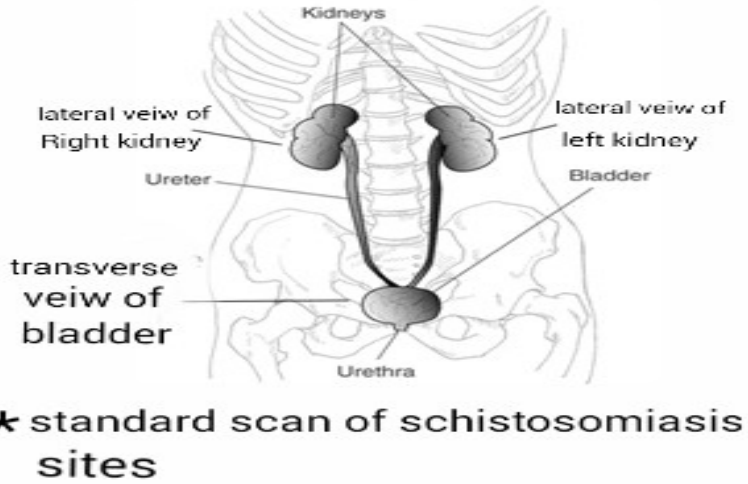
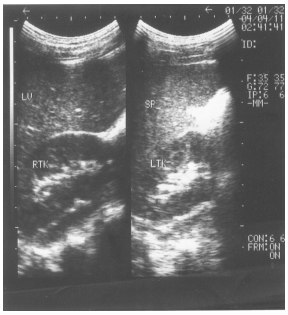
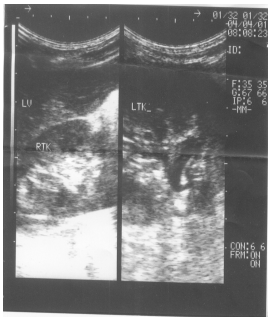
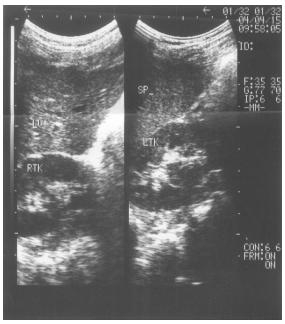
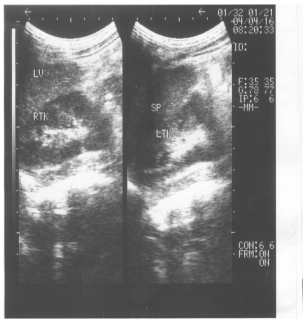


Figure (3-30) Shows Standard Scan of Schistosomiasis sites


LV
SP
RTK
LTK


LV
LTK
RTK


SP
LTK
RTK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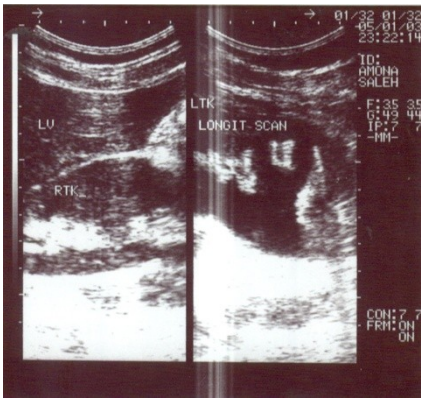
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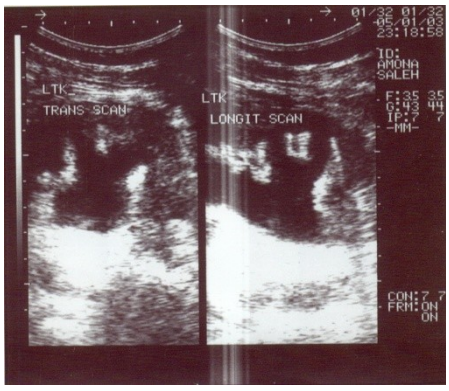
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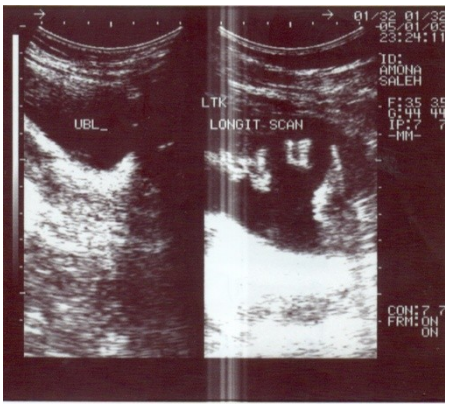
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UBL

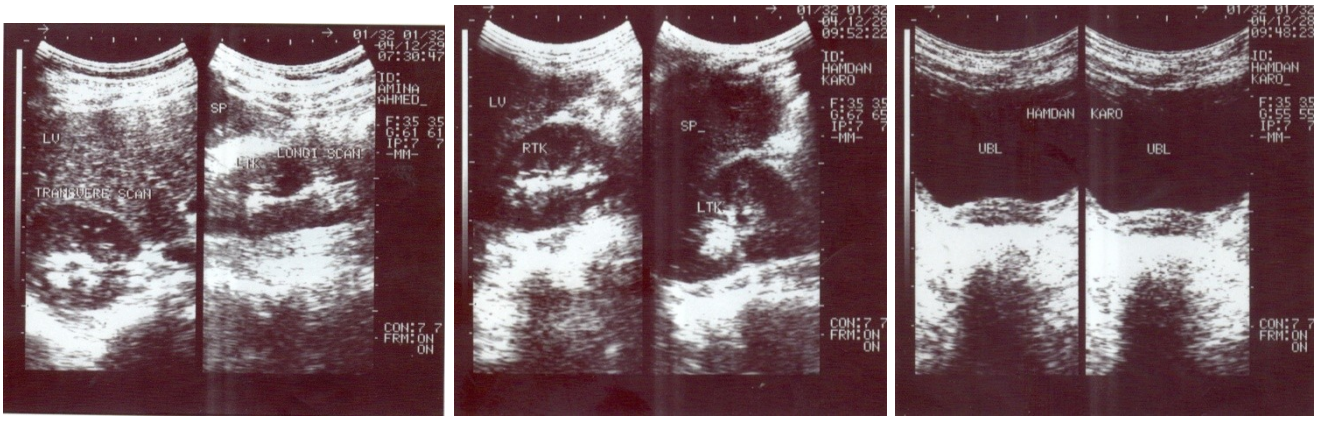


Figure (3-31) Shows normal kidney and hydronephrosis

***Right Kidney*:**

Patient in supine position the liver acts as acoustic window for examining the right kidney with best seen, angle the probe obliquely if the liver is small. Longitudinal and transverse scan are obtained of small distance intervals. In some patient gas from hepatic flexure of colon can obscure the right kidney in supine position. Rotating the patient into a slight LPO position will allow utilization of lateral aspect of right lobe of liver as a window, and taken scan as discussed above.

***Left kidney*:**

It is best evaluated with the patient in supine and the left side up position. Longitudinal scan in this position results in coronal images of the left kidney. Since the lower pole is more anterior than upper pole on oblique scan is necessary. Inferior tip of spleen can be used as an acoustic window to visualize the upper pole of the left kidney. Transverse scan should be obtained perpendicular to oblique Longitudinal scanning plane. It is best to study the kidney in deep inspiration. Both the kidneys can be seen in prone position as well. Be carefully about kidneys anomalies (Horse shoes kidneys and ectopic kidneys). **As image below:-**

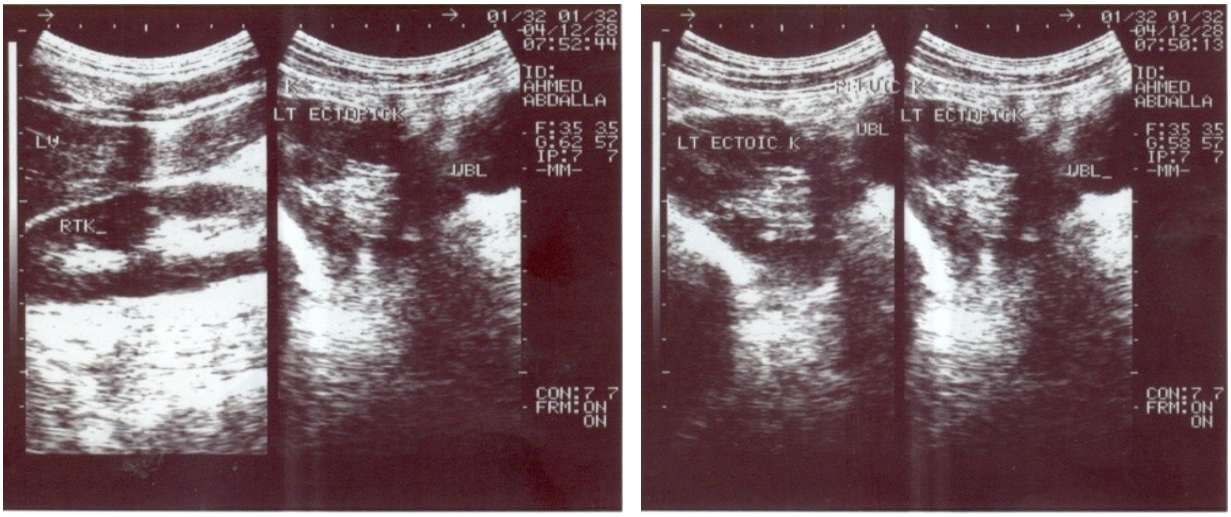


Figure (3-32) Shows Left Ectopic kidneys

3.3 Method of data analyses

The data analyzed by using standard Statistical Package for the social sciences (SPSS), where the frequency distribution of organs measurements including gender and occupation, also association between the liver size and portal vein and age, as well as the spleen size and the splenic vein.

3.4 Ethical approval

Prior scan, a formal approval was obtained from the Ethics and Scientific Committee of the medical center. After the nature of the procedure fully explained to the patient, informed consents were obtained from participants.

Chapter Four
Results

In this study the sample size was 108 patients 97(89.8%) were males and 11(10.2%) were females, their ages ranged between ˂10years ˃40 years old with mean age of 14.80±8.438years old. The result of this study showed the occurrence of bladder wall thickening in all patient population, 19 out of 108 case(17.6%) had localized urinary bladder thickness and 89 out of 108 (82 %) with general thickness. Other bladder lesions including polyps and calcification were seen in 22 patients (20%) while 86 patients (80%) showed no lesion.

The renal pelvicalyceal system (PCS) was found to be normal in the majority of patients (94%) where 6% were prominent as well as the lower ureteric end (LUE) was found to be normal in96% and abnormal in 4% .

The result of this study presented in tables and figures. The tables show the frequency distribution of occupation (4-1), gender (4-2), pelvicalyceal system status (4-3), lower ureteric end (4-4), bladder wall thickness (4-5) and bladder lesion (4-6). Similarly the graphs shows the percentage of the mentioned in addition to scatter plot portrayed the relationship between the liver size and portal vein diameter(4-7), the spleen size and splenic vein diameter(4-8), the patient age (4-9), liver and spleen size(4-10), bladder wall thickness and pre micturition percent(4-11), pre and post micturition (4-12).

Table (4-1) A frequency distribution of patient occupation

Occupation	**Frequency**
Laborer	24
Student	80
Employee	1
Farmer	3
Total	108

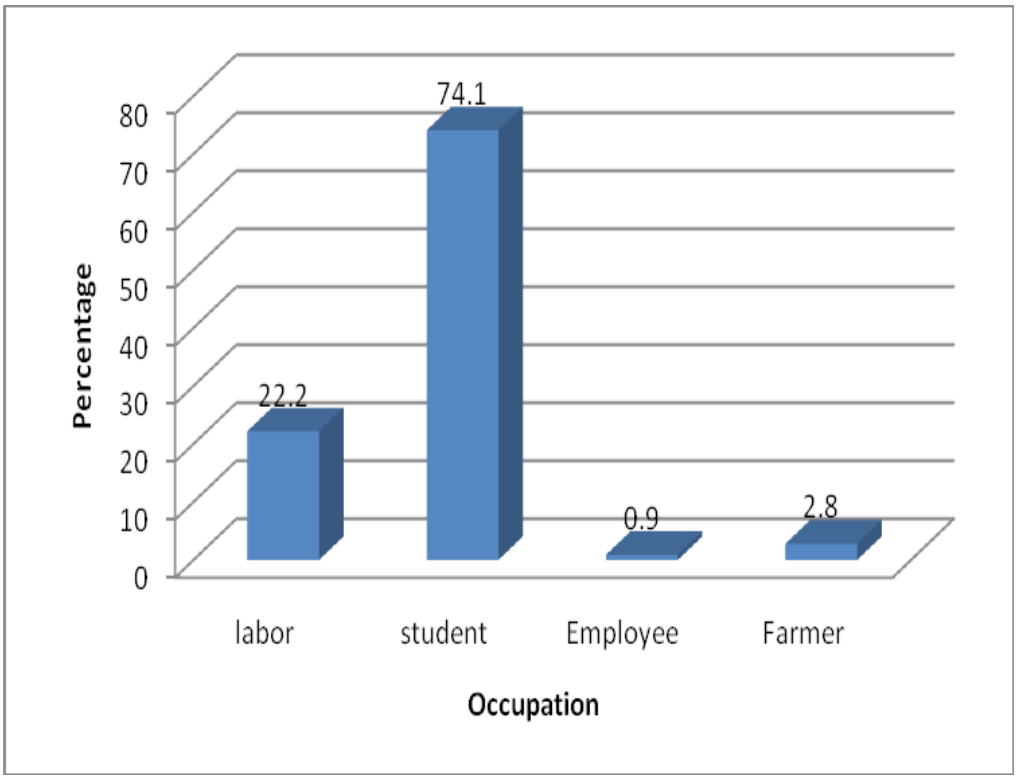


Figure (4-1) A pie graph shows the percentage of frequency distribution of patient

Table (4-2) A frequency distribution of patient gender

Gender	**Frequency**
Male	97
Female	11
Total	108

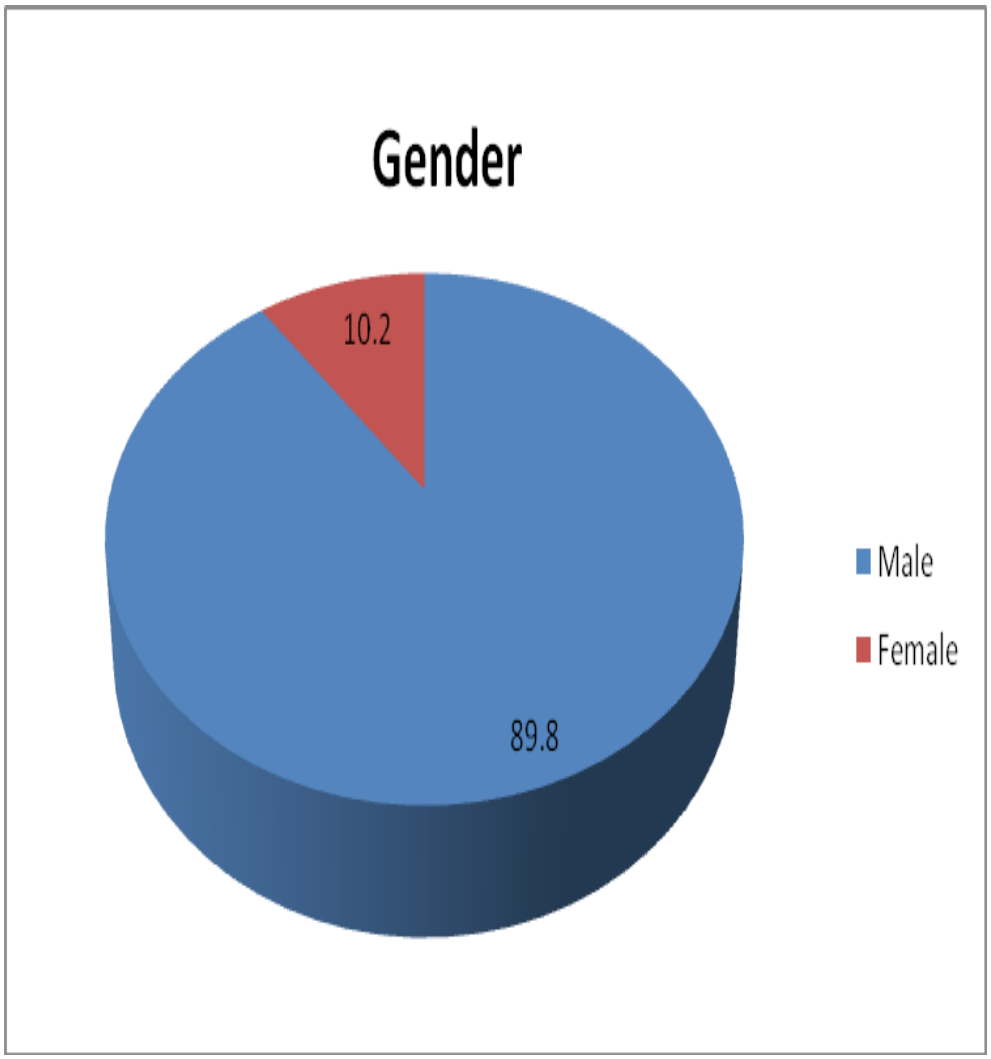


Figure (4-2) A par graph shows the percentage of gender frequency distribution

Table (4-3) A frequency distribution of the pelvicalyceal system status

Kidney PCS status	**Frequency**
Normal	102
Prominent	6
Total	108

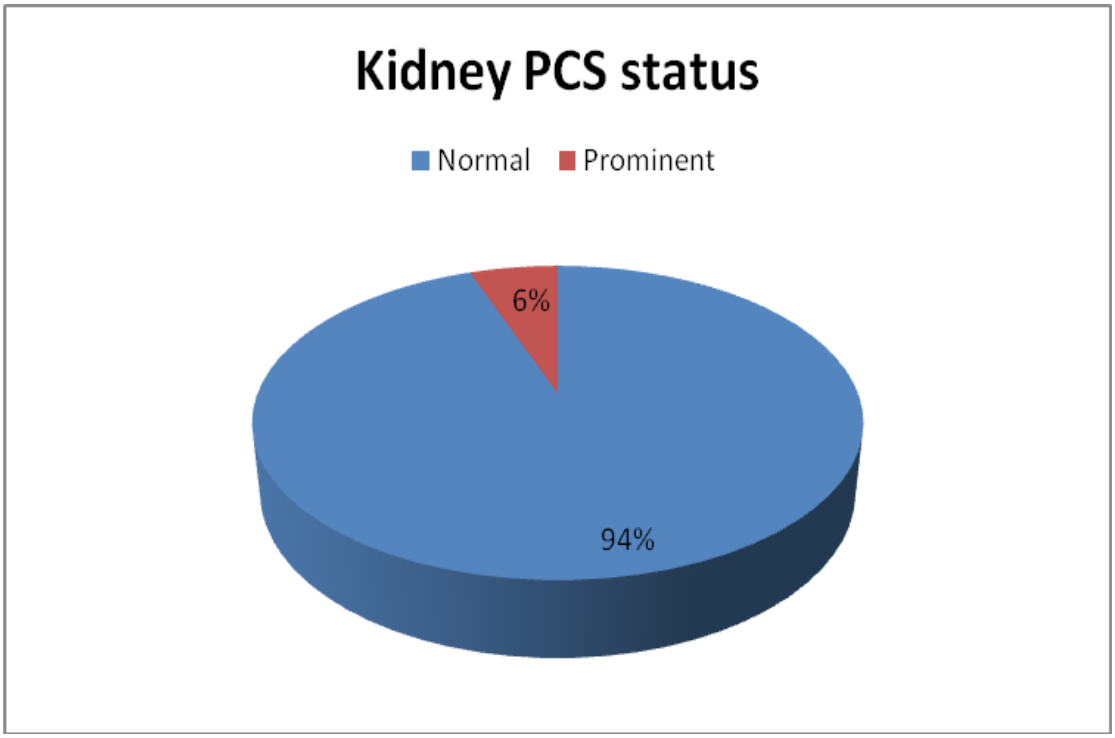


Figure (4-3) A par graph shows the percentage of kidney PCS status distribution

Table (4-4) A frequency distribution table of kidney lower ureteric end

Kidney LUE	**Frequency**
Normal	104
Abnormal	4
Total	108

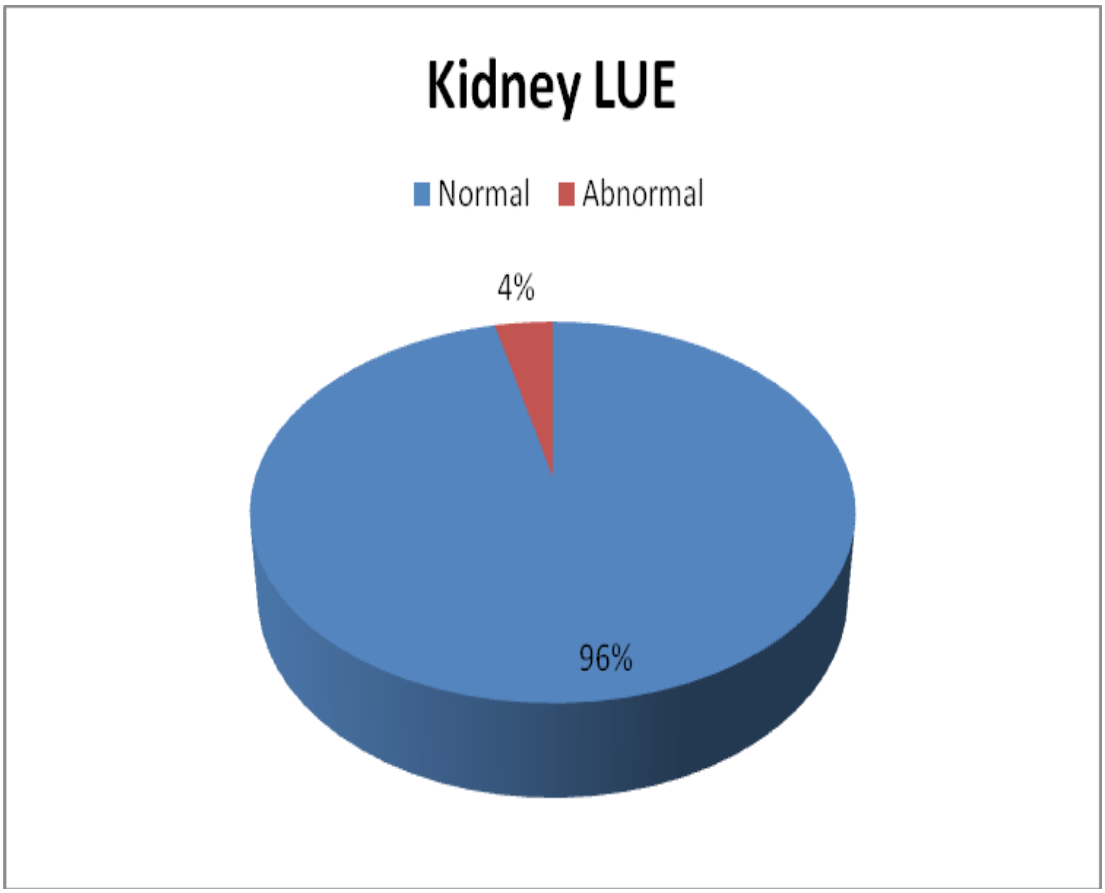


Figure (4-4) A par graph shows the percentage of kidney lower ureteric end condition

Table (4-5) A frequency distribution of bladder wall thickening

Status thickness	**Frequency**
Local	19
General	89
Total	108

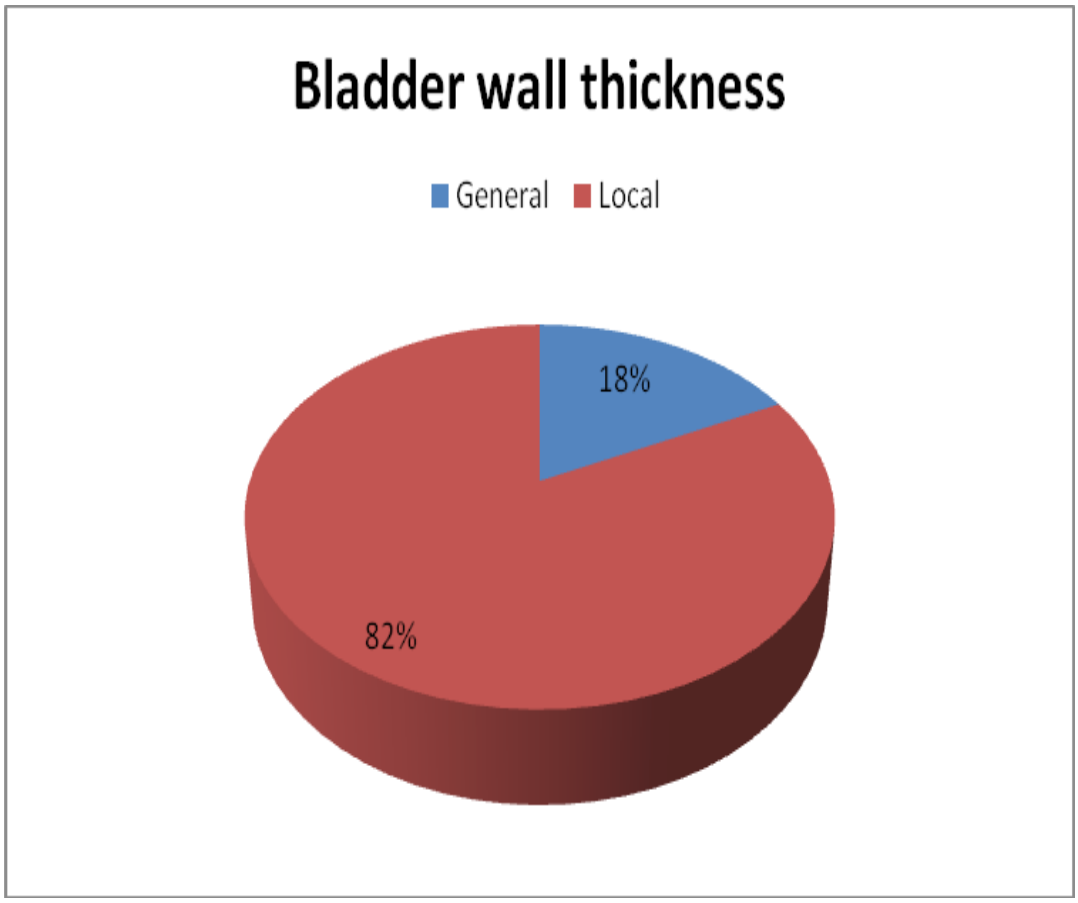


Figure (4-5) A par graph shows the percentage of the bladder wall thickening distribution

Table (4-6) A frequency of bladder lesion

Bladder lesion	**Frequency**
No	86
Yes	22
Total	108

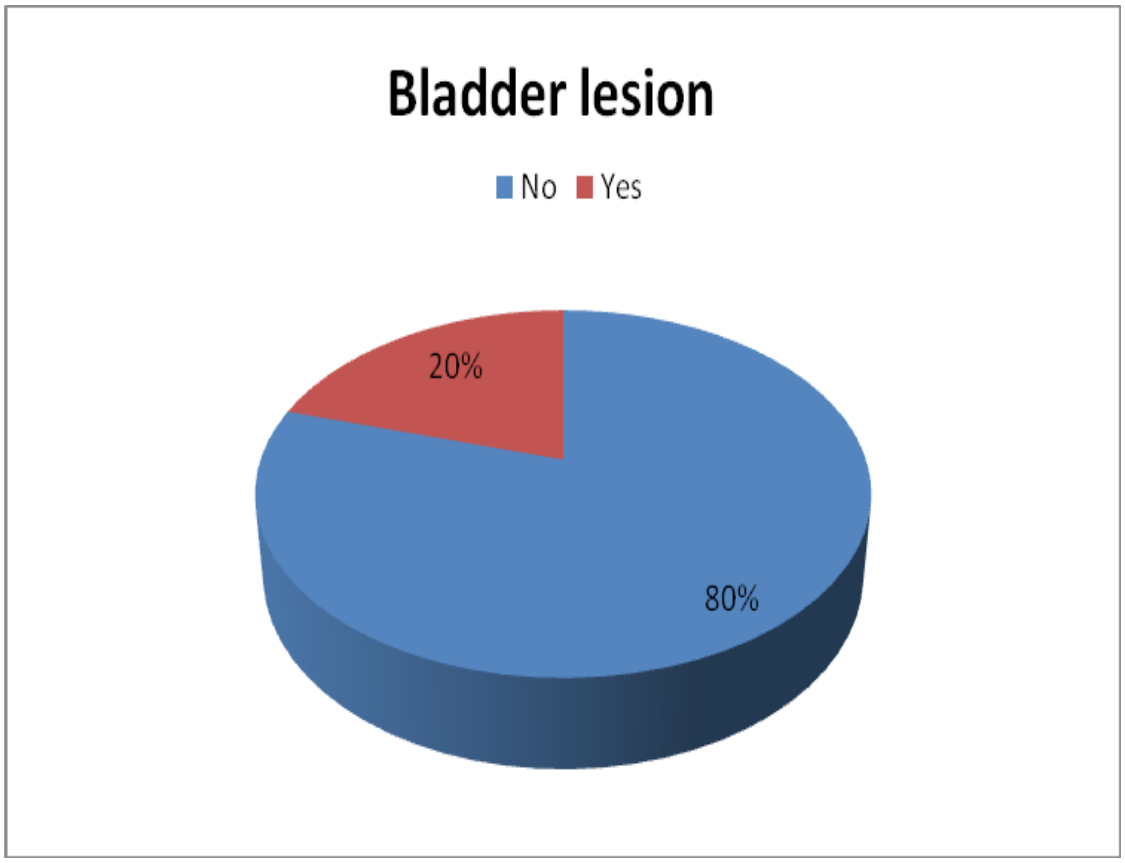


Figure (4-6) A par graph shows the percentage of bladder lesion

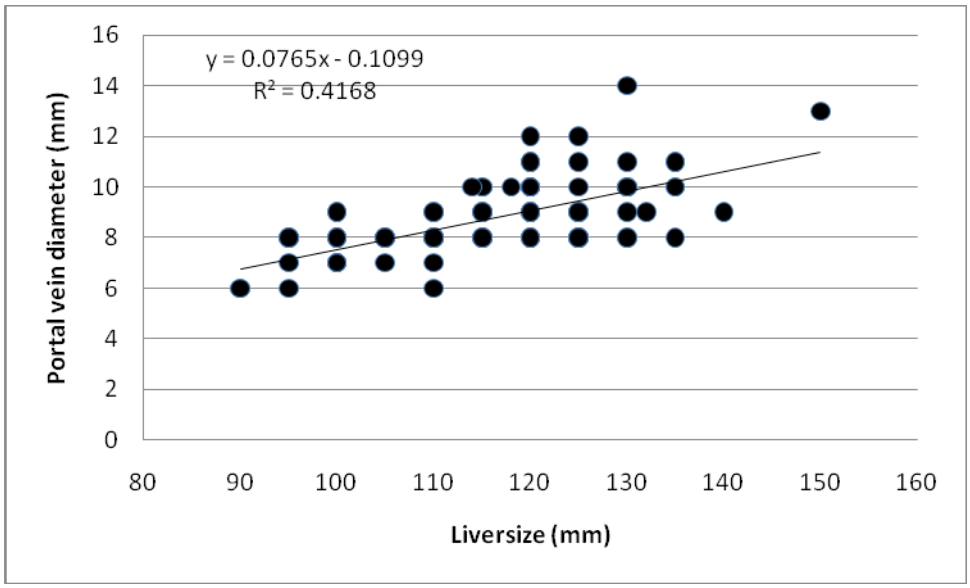


Figure (4-7) Scatter plot shows a direct linear relationship between the liver size and portal vein diameter

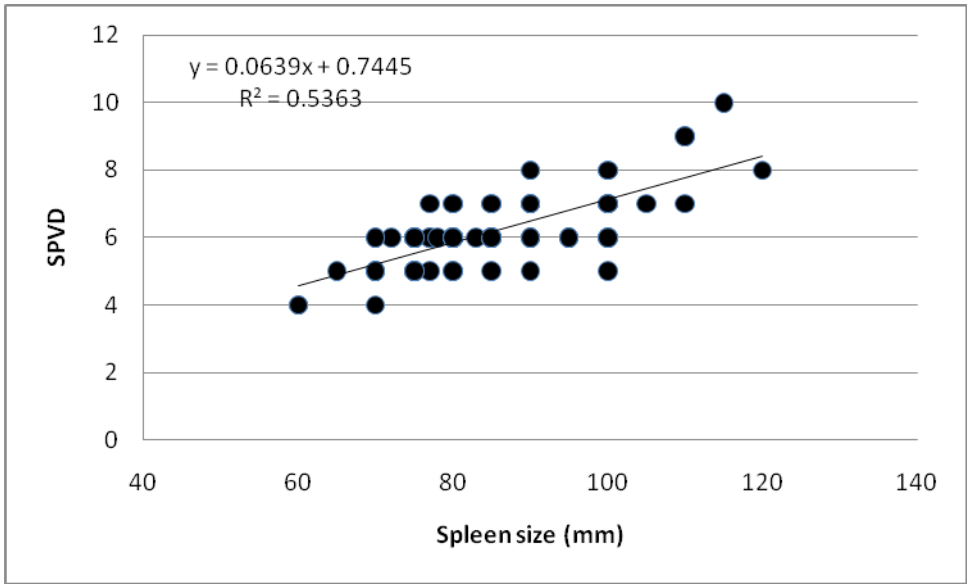


Figure (4-8) Scatter plot shows a direct linear relationship between the spleen size and splenic vein diameter

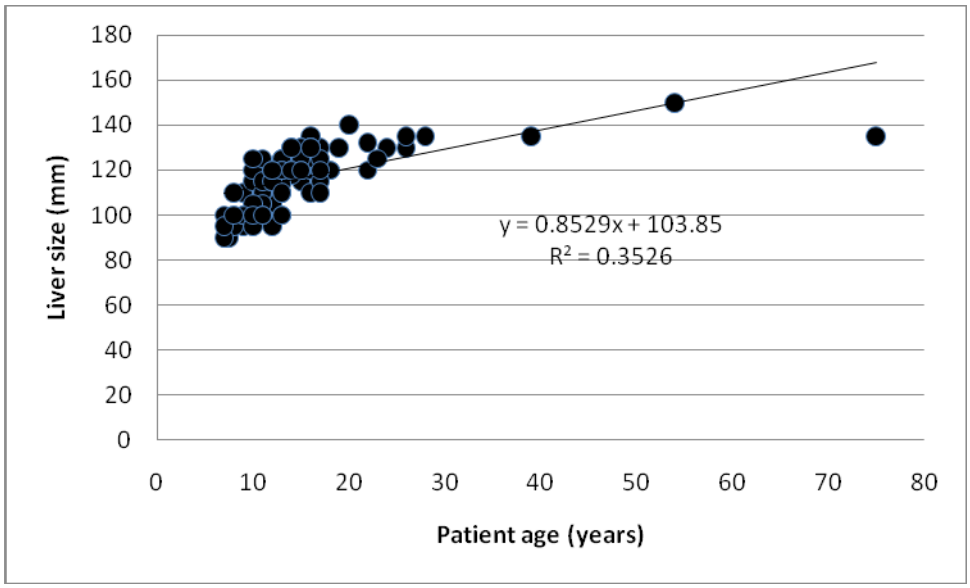


Figure (4-9) Scatter plot shows a direct linear relationship between the patient age and liver size

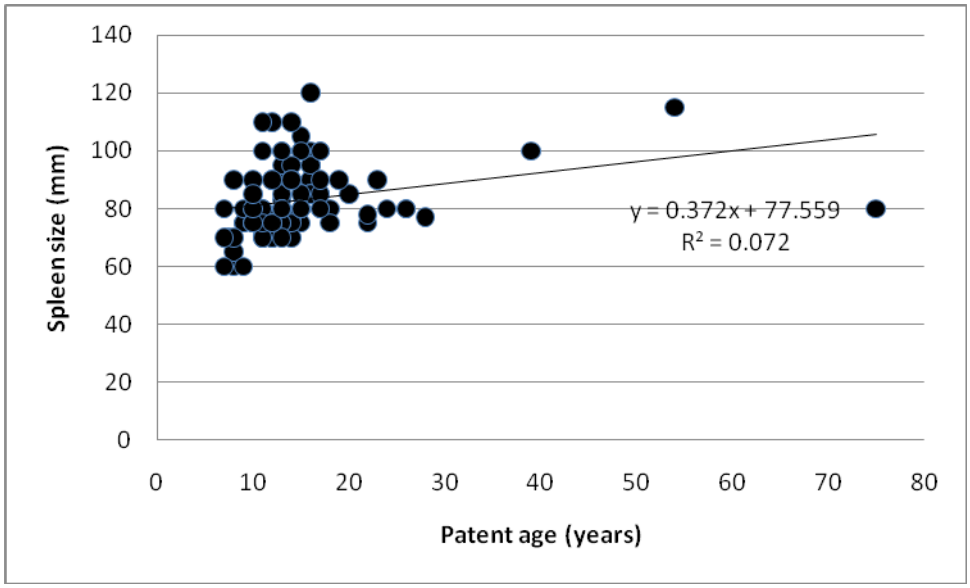


Figure (4-10) Scatter plot shows a direct linear relationship between the patient age and spleen size

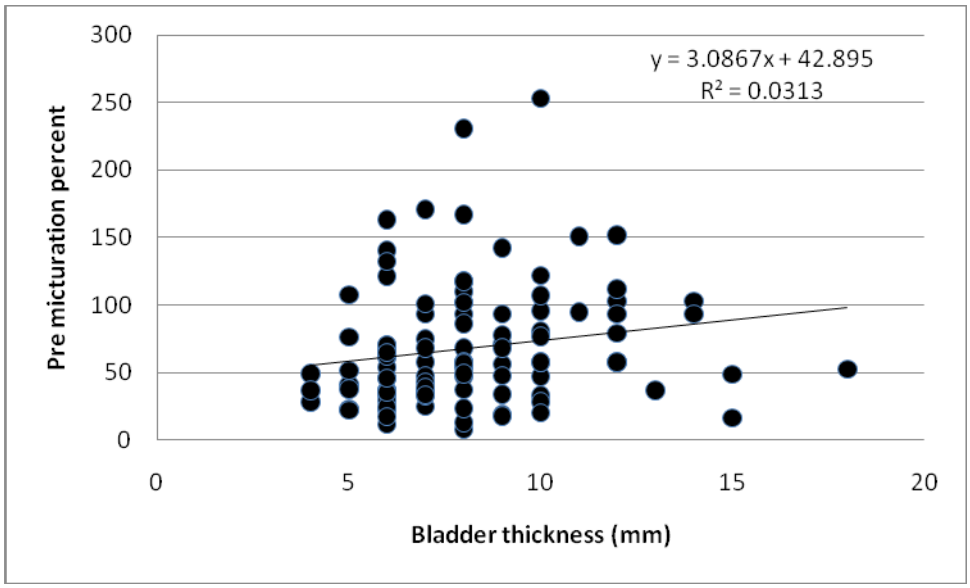


Figure (4-11) Scatter plot shows a direct linear relationship between the bladder wall thickness and pre micturition volume

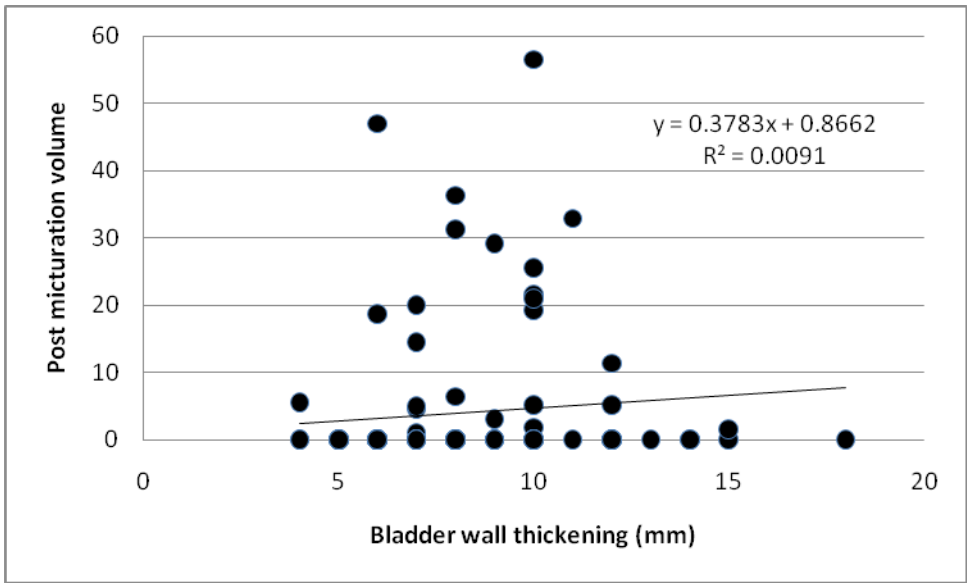


Figure (4-12) Scatter plot shows a direct linear relationship between bladder wall thickness and post micturition volume

Table (4-7) Shows A cross-tabulation table of occupation versus bladder wall thickness status

Occupation	Thickness		Total
	Local	General	
Laborer	5	19	24
Student	11	69	80
Employee	1	0	1
Farmer	2	1	3
Total	19	89	108

Table (4-8) Shows A cross-tabulation table of bladder lesion versus bladder wall thickness status

Bladder lesion	Thickness		Total
	Local	General	
No	14	72	86
Yes	5	17	22
Total	19	89	108

Table (4-9) Shows A cross-tabulation table of lower ureteric end and kidney pelvicalyceal system

Kidney PCS	Lower Ureter End		Total
	Normal	Abnormal	
Normal	101	1	102
Prominent	3	3	6
Total	104	4	108

Chapter five
Discussion, conclusion and recommendation

This study has been conducted in skikan North Kordofan State to study the ultrasound diagnostic value outcome in patient infected by bilharziasis, which include schistosoma haematobium. The scanning strategy were concerned bladder, bladder wall thickening, renal including ultrasound appearance in a descriptive cross-sectional study .

5-1 Discussion:

The value of ultrasound in diagnosing urinary Schistosomiasis is acknowledged, it can detect alterations include those of the fibrotic bladder wall and dilatation of the upper urinary tract. Developing guidelines for the standardization of the ultrasound findings in patients with urinary Schistosomiasis was convened by WHO in order to facilitate international comparison of morbidity data.

Most of the population which is 108 patients; were males 97 (89.8%) and their age ranged from 7- 55 years. The majority of them were school age children (students) 80 (74.1%), this could be explained by the fact that children usually play and swim in local contaminated water swamps and reservoirs. While the adult farmers 3 (2.8%) and laborers 24 (22.2%) usually work in the infected water sources, employee 1 (0.9%) (Table and Figure 4-1 and 4-2).

The findings of this study revealed that, the prevalence of bladder wall thickening in all patient population (8.1±2.6 mm), of whom the majority has generalized thickening 89 (82%) while 19 patients have localized thickening 18% (Figure 4-5). This result dictate that bilharziasis causes

bladder wall thickening in all infected patient as the results of the life cycle of the infection; this thickening were mostly localized but it can be generalized in some cases.

The bladder wall thickening some time associated with other bladder lesions including polyps and calcification which seen in 22 patients (20%) while 86 patients (80%) showed no lesion at the time of scanning. This result showed that even after treatment with full curative dose of praziquantel tablets, the bladder lesions and wall thickening might persist (Table and Figure 4-6). The bladder wall thickening affects the post- micturition bladder volume significantly, where an increase of thickness leads to an increase in pre- and post- micturition volume (Figure 4-11 and 4-12), where the post- micturition increases by 0.38ml/mm of bladder wall thickness.

The effects of bilharziasis on renal were not common in this study, where 102 of the cases were normal (94%). Prominence of the pelvicalyceal system was noted in 6 patients, while the lower ureteric end was affected in 4 patients. This indicates that urinary bilharziasis in the patient population affects mainly the urinary bladder and rarely the ureter and the kidney (Figure and Tables 4-3 and 4-4).

The study also investigate the impact of bilharziasis on the liver and spleen The results showed also that liver size correlates well with the portal vein diameter, and that the portal vein diameter increases by 0.8 mm for every 1 mm increase in liver size. On the other hand, the spleen size correlates equally well with the diameter of the splenic veins, which increases by 0.6 mm for every 1 mm increase in the spleen size.

As expected, the liver size increases with age, by 0.8 mm for each year of patient’s age, while the spleen increases in size by 0.4 mm per year of patient's age. These findings agree with the results

of Al-Madani et al (14) study done in Alzjazeera, in the bladder wall thickening, but there are significant differences in findings concerning the kidney and ureter abnormalities, which were more common in Aljazeera. This could be explained by the fact that an active anti-bilharziasis program had already covered the population area of this study with treatment for two years previous to the conduction of our study.

Also our finding agree with Bushra 2006 study done in Kiryiab agricultural scheme (Khartoum state) and Al-Rahad area (Kordofan state) in the bladder wall thickening , polyps ,calcification.

5-2 Conclusion:

In endemic area such as Shikan region sonography with simple portable machine unique apportunity to investigative morbidity on the community level , non invasively in larger field survey . This consider as an important tools of clinical an epidemiological research .

Aim schistosomiasis is the one of the most prevalent disease in Sudan . sonography is among the most valuable diagnostic tools for schistosomiasis related organ lesion .

This study out line typical finding seen in 108 infected patient in Shikan region.

The main objective of this study was to study the ultrasound outcome in diagnosis of bilharziasis. Early detection of urinary bilharziasis in school children by urine examination for bilharzias ova is strongly recommended to prevent morbidity and complications of urinary bilharziasis. In people living near water sources, early detection should be extended to the whole population regardless of age. The sample of this study consisted of 108 patients affected by bilharziasis, where the study conducted in Shikan northern Kordofan in the period 6-18 month. The patient scanned by ultrasound (renal system) using Fukuda 4100, with convex probe frequency 3.5.

The result of the study showed that most of the affected patients were school student 74.1% all patients showed bladder wall thickening where 82% had local thickening and 18% were generalized. The bladder wall thickening associated with 20% presence of lesion.

The result reveals that there is no significant impact of the Schistosomiasis on the pelvicalyceal system regarding the age, gender or occupation. Lower ureteric end affected significantly with advanced age and occupation. Gastro intestinal tract Schistosomiasis infection changes were significantly correlated with age, gender and occupation.

Generally the result of this study reveals that the bilharziasis affects the bladder wall rather than other parts of the renal system and mostly does not associated with lesion.

5 -3 Recommendations

- Simple, cost-effective treatment with Praziquantel tablets should be made available for all school children in the affected areas, and to the general public in areas near open infected water sources.
- Health education and promotion is vital to combat the disease by eliminating the sources of re-infection and to break the cycle of the parasite. School children and their teachers should be educated about the disease and means of prevention.
- Ultrasound examination is a reliable method to detect the presence and extent of the disease in the urinary system. However, it is more effective in detecting bladder wall thickening, polyps, calcification and both ureteric and renal effects of urinary bilharziasis.
- Ultrasound is recommended to exclude further complications or other causes of hematuria.
- Ultrasound equipment should be available for teams fighting urinary bilharziasis, as a cost-effective method of examination.
- Team members, including medical doctors, sonographers and senior nurses should be trained in using the equipment to exclude major pathologies, especially in distant rural areas where no radiologists or sinologists are available and simple portable ultrasound machines can be used.
- Ultrasound could be used for surveying endemic area and follow up after treatment.
- Ultrasound could be used as giddying for tacking biopsy.
- False laboratory test should be confirmed by ultrasound, but positive result should be followed by successive urine, ultrasound could be used to check for re- infection or any complication.
- Changes in the ureter may be seen when ulceration take place in the lumen.

References:-

Abdellmonem H (1999-2000). The presentation of human Schistosomiasis, prevalence and transmission pattern. Study in Gezira Managil, Sudan, operation research in tropical disease, final report, WHO, 106-107.

Abdel-Wahab MF (1992). Schistosoma haematobium infection in Egyptian schoolchildren: demonstration of both hepatic and urinary tract morbidity by ultrasonography. Trans R Soc Trop Am J Trop Med Hyg. 2011; 85(6): 1071-4. (4): 406-9.

Boisier P. Ultrasonic diagnosis of morbidity related to schistosomiasis due to schistosoma mansoni and schistosoma haematobium: Epidemiological and individual value. Med Trop (Mars) 2000; 60:395-401.

Bonnard P. Learning curve of vesico-urinary ultrasonography in Schistosoma haematobium infection with WHO practical guide: a ‘‘ simple to learn, examination.

Bottieau, J. clerinx, M. R. de Vega et al., (2006) " Imported katayama fever: clinical and biological features at presentation and during treatment" Journal of infection, vol. 52, no 5, pp. 339-345.

Bushra Hussein Ahmed Abdelmalik (2006).Ultrasound findings of early effects and late manifestations of Schistosoma haematobium in Sudanese patients.

Cheesbrough M (2004) laboratory practice in tropical countries, Part 1,2nd edition, Cambridge p 236.

Cheever, K. F. Hoffmann, and T. A. Wynn, (2002). "Immuno-pathology of schistosomiasis mansoni in mice and men, "Immunology Today Vol. 21,no .9,pp.465-466

Chistulo L, Loverde P, Engels D. (2004) Disease Watch Schistosomiasis. *TDR Nature ReviewsMicrobiology*.; 2:12

Cook J. A., Baker, S. T., Warren, K. S. and Jordan, P (1974).American Journal of Tropical Medicine and Hygiene. 23, 625-633.

Corachan M. (2002)Schistosomiasis and international travel. *Clin Infect Dis*. Aug 15;35(4):446-50 .

Crewe, w. and Haddock, D. (1985). A Textbook of Parasites and Human Diseases .In Great Britain. First edition: 118-127.
Croft, S.L and Brooker, S 2003.

Croft, S.L, Brooker, S (2003) recent advances in research and control of malaria, leishmaniasis, and schistosomiasis.

Crofton and Douglas, s respiratory disease .Fourth Edition A. Seaton, D'Estaing and A.G. Lesitch Black well scientific publication.

David A levison, RoinR, Hastair B, David J H &Stewart F,(2008) Muir"s text book of pathology,14th edition , pp 538-539.

Ekwunife CA, Okafor FC, Nwaorgu OC.(2009) Ultrasonographic screening of urinary schistosomiasis infected patients in Agulu community, Anambra state, southeast Nigeria. Int Arch Med;2:34.

Ekwunife CA. Ultrasonographic screening of urinary schistosomiasis infected patients in Agulu community, Anambra state, southeast Nigeria. Int Arch Med. 2009 Oct 28; 2(1):34. Doi: 10.1186/1755-7682-2-34.

Elias E, Dafalla Alassen Modsen H, Chrisren (1994). NO Acta Trap, 58(2) 115-25.

Elmadani . Ultrasound findings in urinary schistosomiasis infection in school children in the Gezira State Central Sudan. Saudi J Kidney Dis Transpl. 2013 Jan; 24(1):162-7.

Emmanual P .Papadcis, Ultrasound Instruments and Devices, Aharcount science and technology company, 1999.

Epidemiologica lsituation WHO. Available at http://www.who.int/schistosomiasis/epidemiology/en. Accessed Sept. 27,2010.

Gigase PL. (1992)Urinary bilharziasis. Acta Urol Belg;60:1-13 Garba A, Toure S, Dembele R, et al.(2009) Present and future schistosomiasis control activitieswith support from the Schistosomiasis Control Initiative in West Africa. Parasitology; 136:1731-7.

Gryseels B, Polman K, Clerinx J *et al*. (2006) Human schistosomiasis. *Lancet*; 368: 1106

Lucey DR, Maguire JH.(1993) Schistosomiasis. *Infect Dis Clin North Am*; 7: 63 .

Jordan, p., Webber, G. (1982): Schistosomiasis, Epidemiology, Treatment and control: William Heinemann Medical Books. Ltd. International Edition.

Kardorff R.Ultrasonography of ureteric abnormalities induced by schistosoma haematobium infection before and after praziquantel treatment. Br J Urol 1994; 74:703-9.
Keita . Prevalence of schistomasiasis lesions detected by ultrasonography in children Molodo, Mali. Gastroenterol Clin Biol .2005 Jun-Jul ;(6-7):652-5.

King CH. Ultrasound monitoring of structural urinary tract disease in schistosoma haematobium infection . Mem Inst Oswaldo Cruz 2002; 97 Supplies 1:149-52.

Koukounari A. Assessment of ultrasound morbidity indicators of schistosomiasis in the context of large-scale programs illustrated with experiences from Malian children. Am J Trop Med Hyg . 2006 Dec; 75(6):1042-52.

Lapa M, Dias B, Jardim C, Fernandes CJ, Dourado PM, Figueiredo M. (2009)Cardiopulmonary

manifestations of hepatosplenic schistosomiasis. *Circulation*.;119(11):1518-23.

Leder K, Weller P. (2009), Epidemiology; pathogenesis; and clinical features of schistosomiasis. *UpToDate* [serial online]. 24,1-9. Available at http://www.uptodate.com.

Sturrock RF. (2001)The Schistosomiasis and their intermediate hosts. In: Mahmood AAF. Schistosomiasis. Imperial College London; 7-83. Lesham E, Meltzer E, Marva E, Schwartz E. Travel-related Schistosomiasis Acquired in Laos. Emerging Infectious Diseases [serial online] 15:1823.available at http://www.cdc.gov/eid.

M.Y.Sukkar H.A. El-Munshid M.S.M Ardawi)- Concise Human Physiology 2th and Gillian Pocock and Christopher D.Richards ,2003 -Human Physiology ,the basis of medicine 2th }.

Mahmood Dhahir Al-Mendalawi, Professor in Pediatrics and Child health, Department of pediatrics, Al-Kindy College of Medicine, Baghdad university, Baghdad, Iraq .Ultrasound findings in urinary schistosomiasis infection in school children in Gezira State, Central Sudan.

Manasik Abdulla Amer (2013). Prevalence of schistosoma haematobium among school children I El-Obied N.Kordofan.

Monica Cheesbrough, (1992); District laboratory practice in tropical countries, Vol. -1-, U. of Cambridge, Great Britain-321-341.

Muir, s textbook of Pathology.

Mukhtar, M. M, (2000) Effects of single- dose praziquental on morbidity and mortality resulting from intestinal schistosomiasis. East Medditerranian Health Journal.

National program of the schistosomiasis prevention and control of disease (Algazera) Annual report. Ministry of health, Sudan 2003).

Odongo -Aginya El, Doehring E. Bilharzia induced pathologies and techniques of detection in Uganda: a review. East Afr Med J. 2010 Jul; 87(7):311-6.

Owor R, Madda JP: (1977) Schistosomiasis causing tumour-like lesions. East Africa Medical Jowal 54:137-141.

Philippa J-Easterbrook _ Basic medical sciences for MRCP part 1 .

Ramarakoto CE. Ulnographical findings in the urogenital organs in women and men infected with schistosoma haematobium in northern Madagascar . Trans R Soc Trop Med Hyg. 2008 Aug; 102 (8); 767-73 .doi:10.1016/j.trstmh .2008.03. 007.

Renault, A. J (1908) Notice surphematurieue eprouvent les Eurpeensdans Lahaute. Egypt Nubie. J.Gen. Med. Chir. Pharm. 17: 366- 370.

Richard S.Snell,M.R.C.S(2008) , Clinical Anatomy by regions, Snell Anatomy, Grays Anatomy.

Ross and Wilson, Anatomy and physiology in health of illness, Churchill Livingstone, 2002. Schistosomiasis, Fact Sheet No 115; February 2010.

World Health Organization. Available at http://www.who.int/mediacentre/factsheets/fs115/en/. Accessed Oct 5, 2010.

Schistosomiasis, Fact Sheet No 115; February 2010. World Health Organization. Available at http://www.who.int/mediacentre/factsheets/fs115/en/. Accessed Oct 5, 2010 Weekly epidemiological record 30 April No.18,2010, 85, 157-164. World health Organization.Available at http://www.who.int/wer.

Starhan R. Sonographic response in the liver and urinary bladder of children 14 months after treatment for schistosomiasis. Trop Doct. 2013 Apr; 43(2):71-4. Doi: 10.1177/0049475513490422.

Strikland GT, Abdel-WahabMF. Abdominal ultrasonography for assessing morbidity from schistosomiasis .1. Community studies. *Trans R Soc Trop Med Hyg*. 1993, 87 (2): 132-4.

Tim Taylor, Anatomy and Physiology Instructor.
Ukoll, EMA (1992). Prevention and control of parasitic disease in tropical Africa .University press PLC .Ibdan, Nigeria p199.

Van Der Werf MJ, De Vlas SJ. Diagnosis of urinary schistosomiasis: a novel approach to compare bladder pathology measured by ultrasound and three methods for haematuria detection. Am J Trop Med Hyg. 2004 Jul; 71(1):98-106.

Warren, K. (1973). Regulation of the prevalence and intensity of schistosomiasis in man: Immunology or ecology Journal of Infection Disease. 127:595-598.

Weekly epidemiological record 30 April No.18,2010, 85, 157-164. World health Organization. Available at http://www.who.int/wer.

WHO (2006) Preventive chemotherapy in human helminthiasis. Coordinated use of anthelminthic drugs in control interventions: a manual for health professionals and programme managers. World Health Organization, Geneva.

WHO, (2006). Preventive chemotherapy & transmission control. Department of control of Neglected tropical diseases.

WHO, 2007. Schistosomiasis and soil transmitted helminthes country profile, Laos PDR. World Health Organization, Geneva.

Appendix (1)

Shikan – North kordofan

US Appearance in Bilhraziasis

( ) Data collection sheet. NO

---------- :Name

---------- :Age

-------- :Occupation

---------- :Residence

( ) Gender: Male ( ) Female

( ) Lab test: positive

Liver

Size ( ) mm

Echogenicity( ) ( )

Texture

PPF

PVD = ( ) MM & Echogenicity

Lesion

Spleen

Size ( ) mm

Echogenicity( ) ( )

Texture

SPVD = ( ) MM & Echogenicity

Lesion

Esophageal varicose

Kidney

Calyces

(PCS (prominent- or normal

(Lower ureteric ends (reflex-prominent

Lesion

Urinary bladder wall texture

( ) Generalized thickening size

( ) Local thickening size

Other lesion

% ( ) Post micturition volume

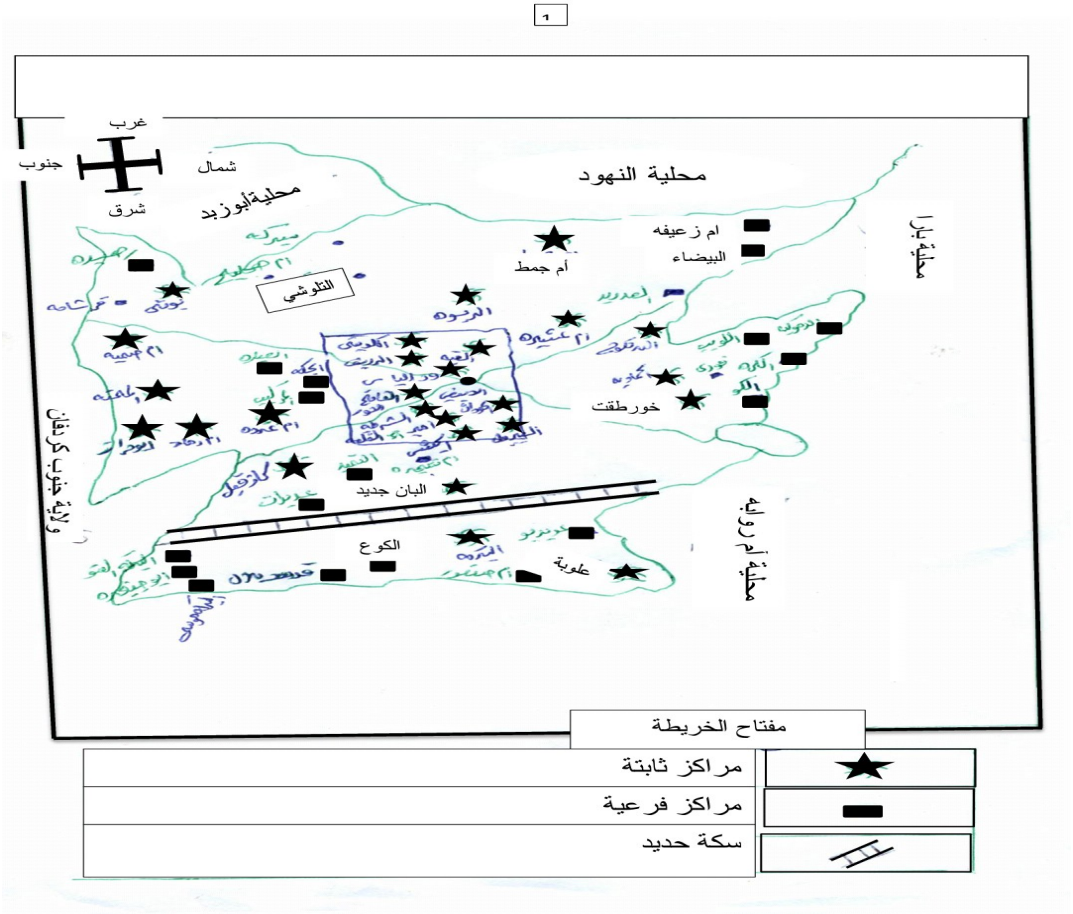
% ( ) After micturition volume

Ascites

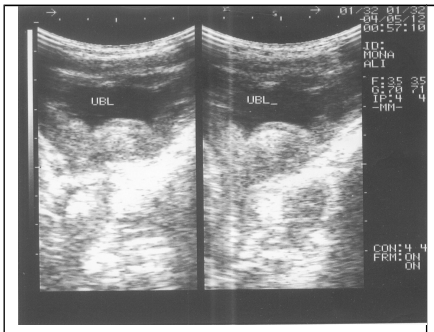
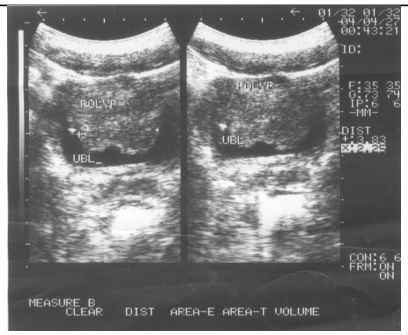
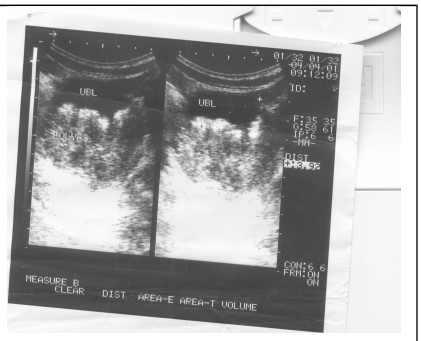
Shikan map location

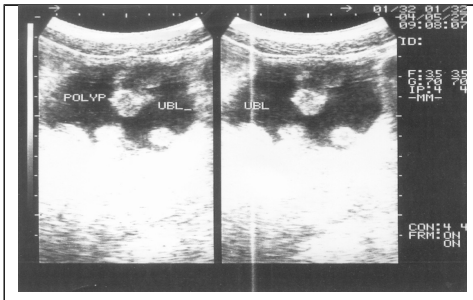
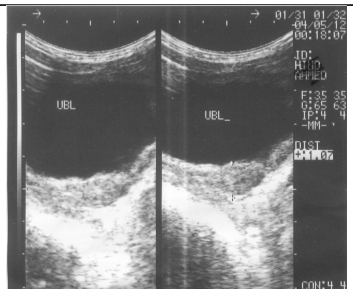
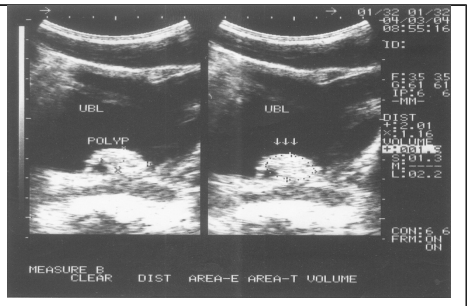

ولاية شمال كردفان
محليه شيكان

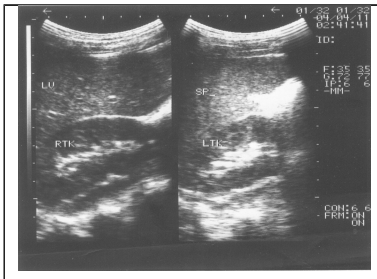
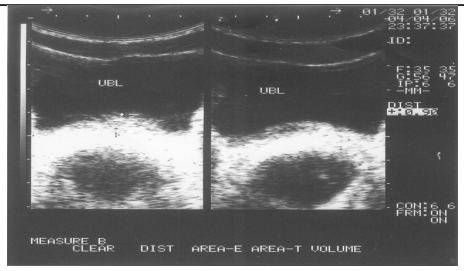
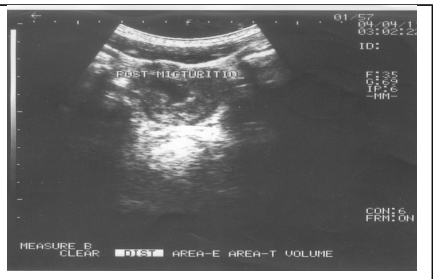
٦

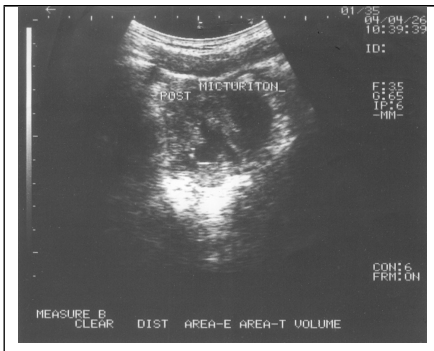
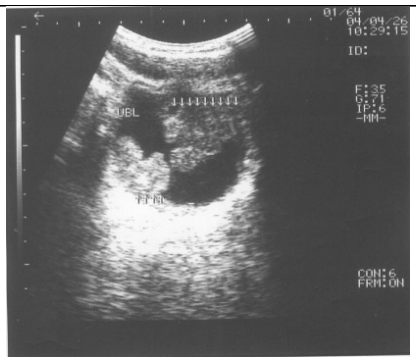
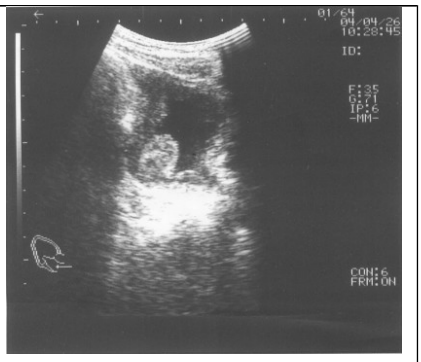

غرب
جنوب
شمال
شرق
محلية ابوزبد
محلية النهود
ام زعيفه
البيضاء
ام جمط
التلوشي
محلية بارا
خورطقت
البان جديد
الكوع
طوبة
ولاية جنوب كردفان
محلية أم روابه
مفتاح الخريطة
مراكز ثابتة
مراكز فرعية
سكة حديد

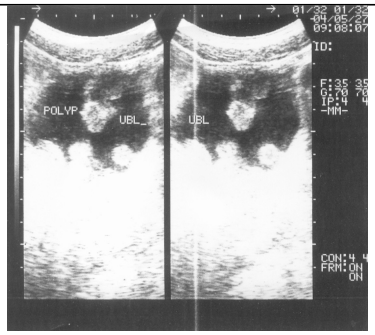
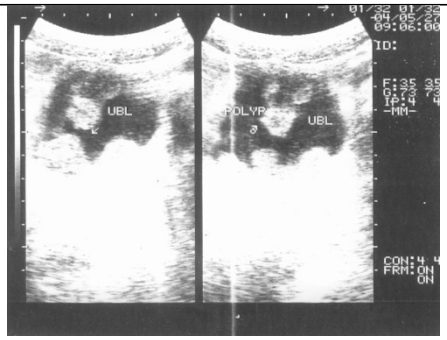
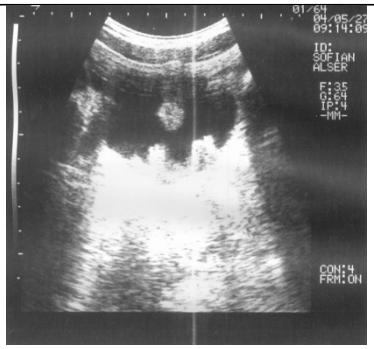
Bladder, bladder wall, Ureters, and renal schistosoma abnormality

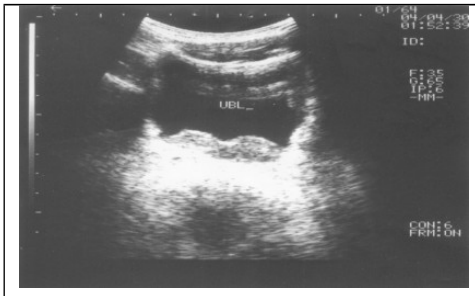
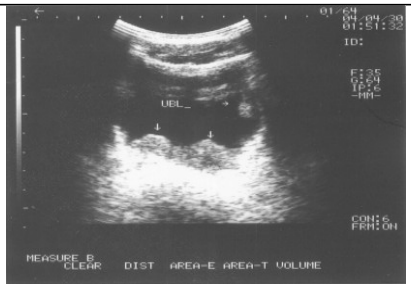
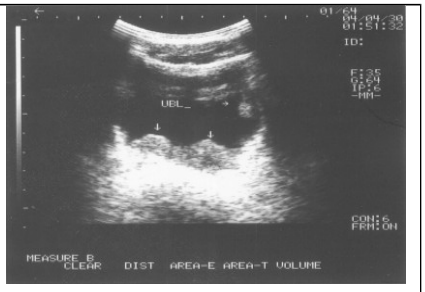
		
Bladder wall thickening	Bladder lesion	Bladder lesion with calcify

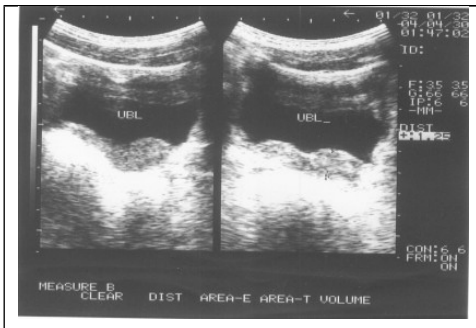
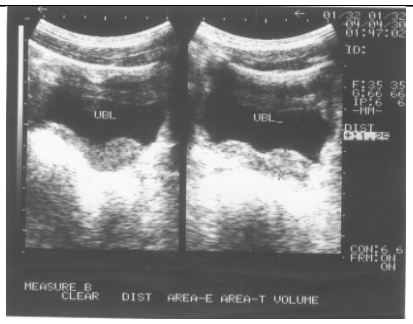
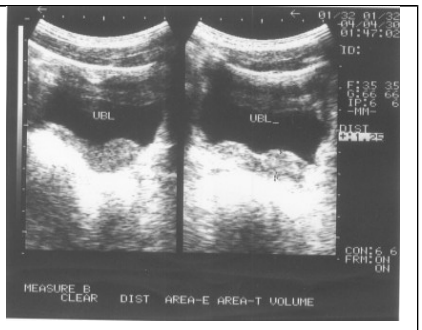
		
Polyps(lesions)	Bladder wall thickening	Calcify ureter

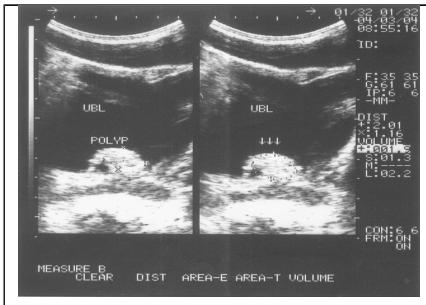
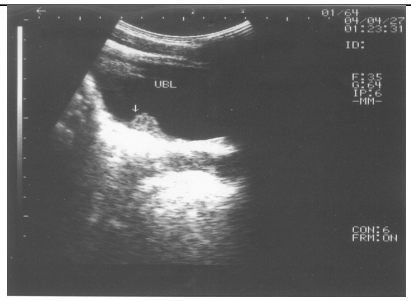
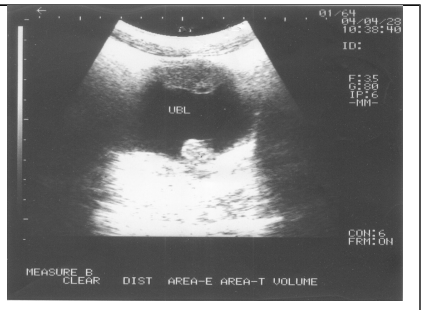
		
Right and left kidney	Bladder wall thickening (full)	Post micturition

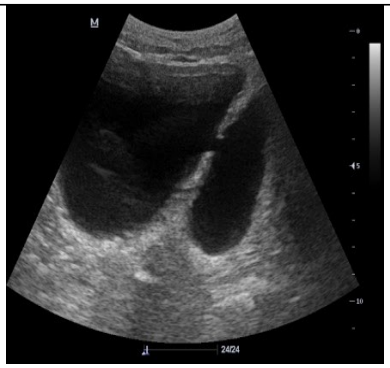
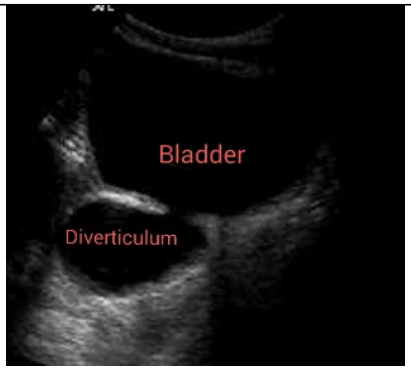
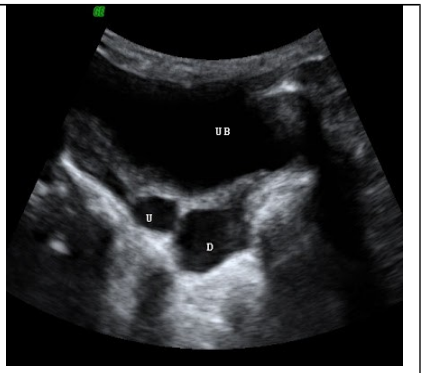
		
Post mucturition	Polyps (lesions)	Polyps

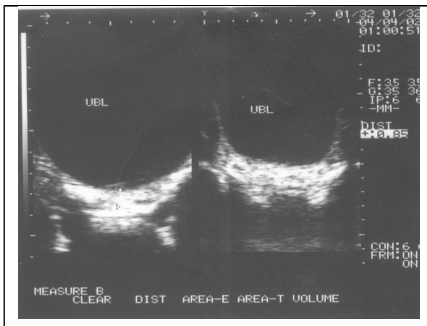
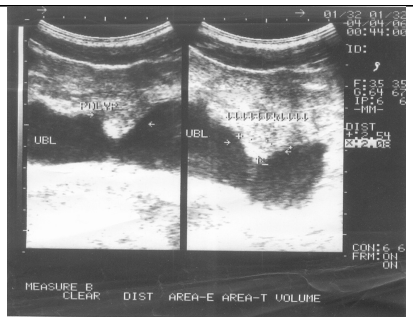
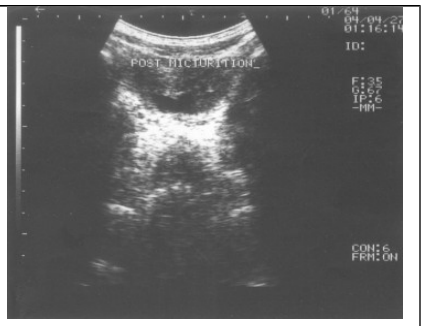
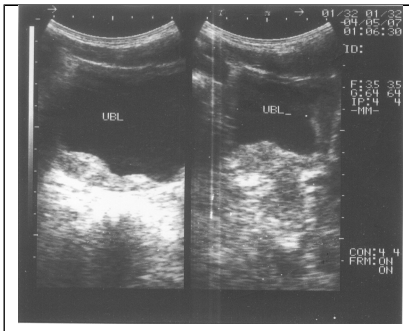
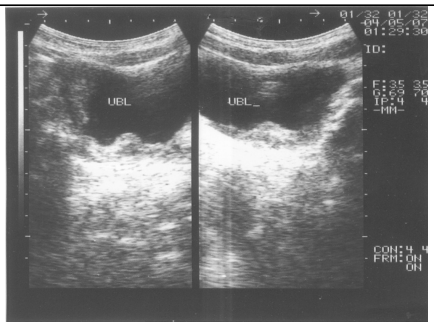
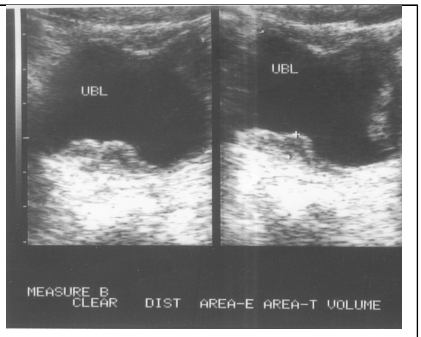
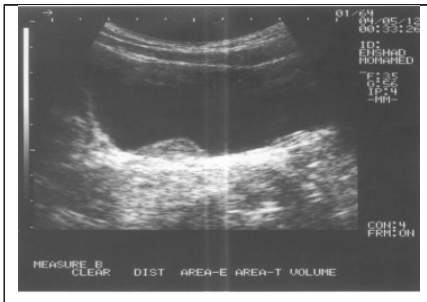
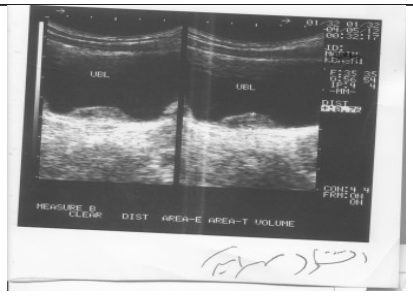
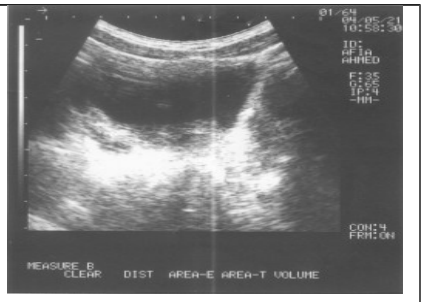
		
Polyps	Polyps	Polyps

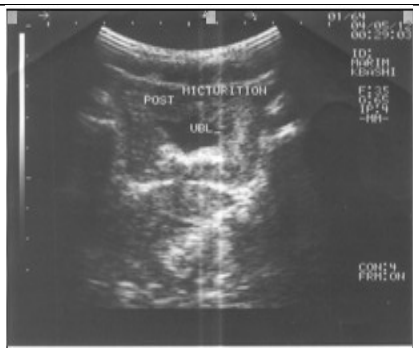
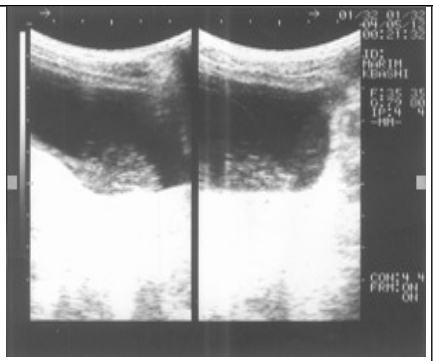
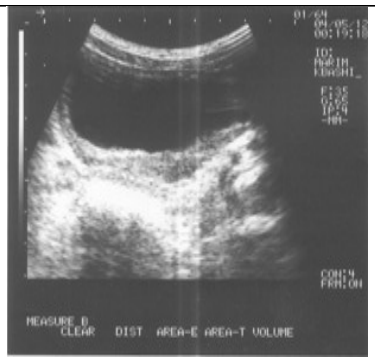
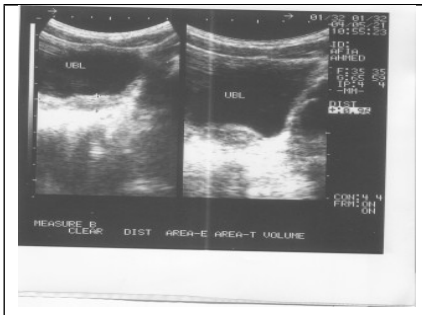
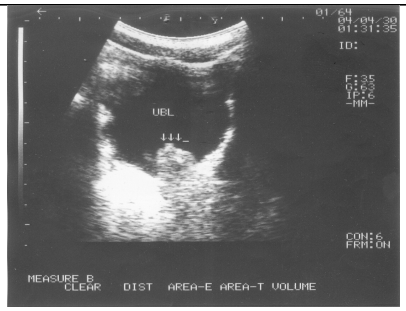
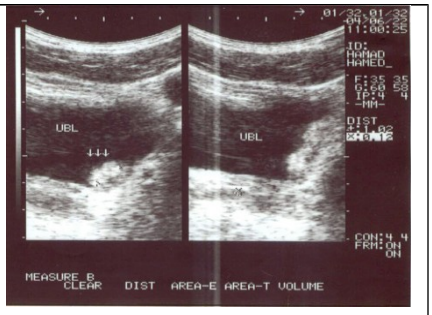
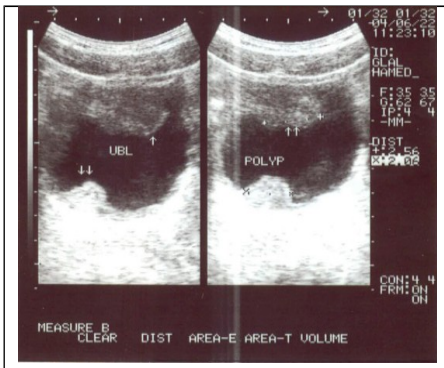
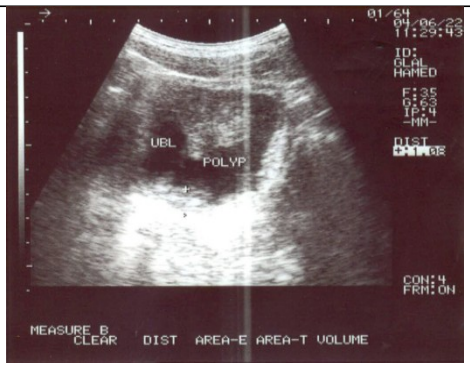
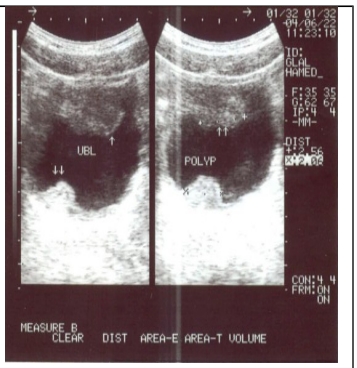
		
Bladder wall thickening	Bladder wall thickening	Bladder wall thickening

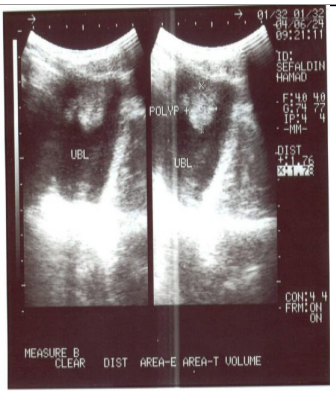
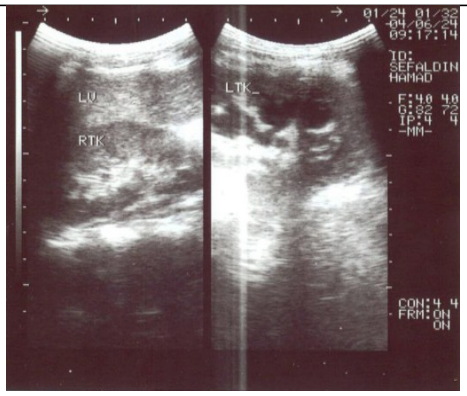
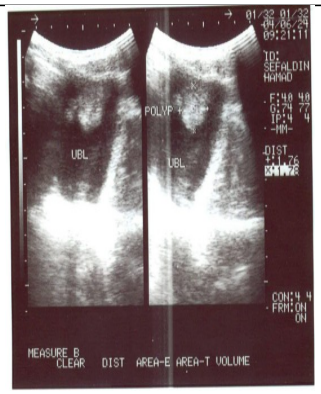
		
Bladder wall thickening	Bladder wall thickening	Bladder wall thickening

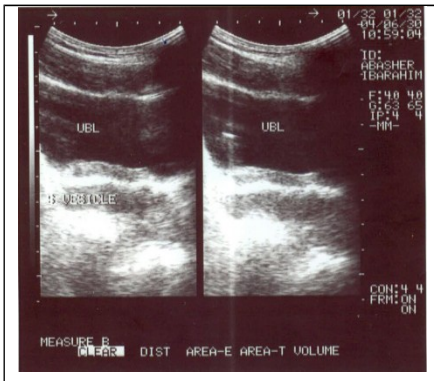
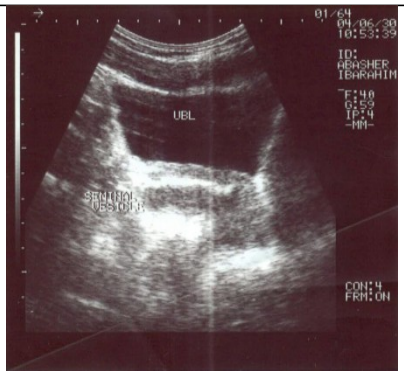
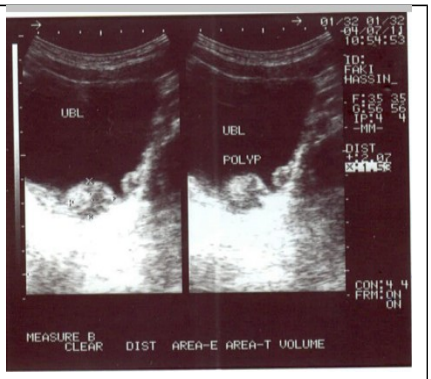
		
Calcify ureter	Right ureter	Left ureter

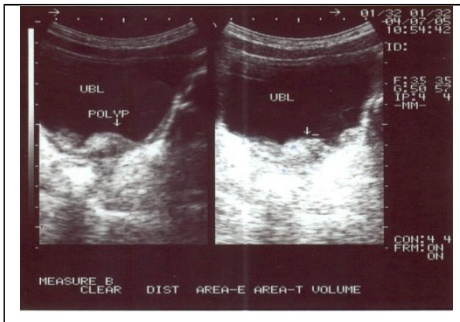
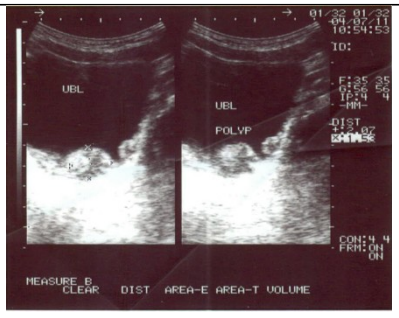
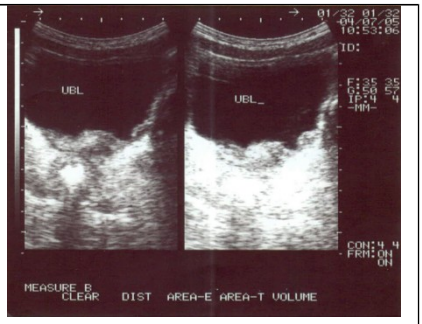
		
Diverticulum	Diverticulum	Hydroureter_dilatation

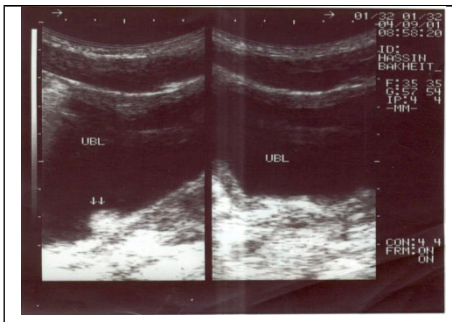
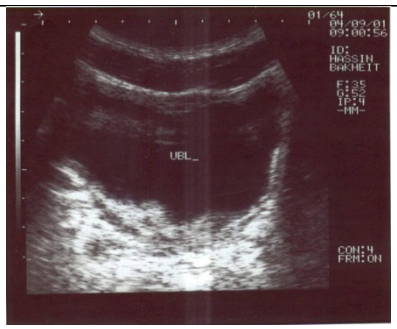
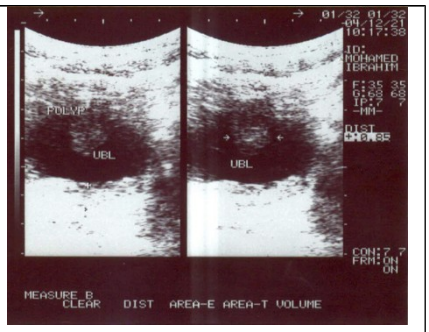
		
Pre mucturition	Polyp	Post micturition
		
Bladder wall thickening	Bladder wall thickening	Bladder wall thickening
		
Bladder wall thickening	Bladder wall thickening	Bladder wall thickening

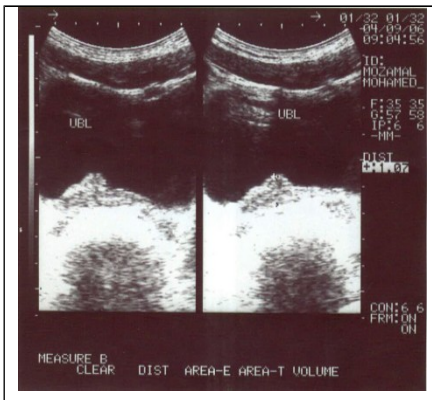
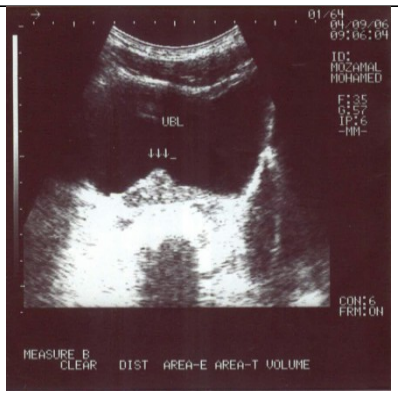
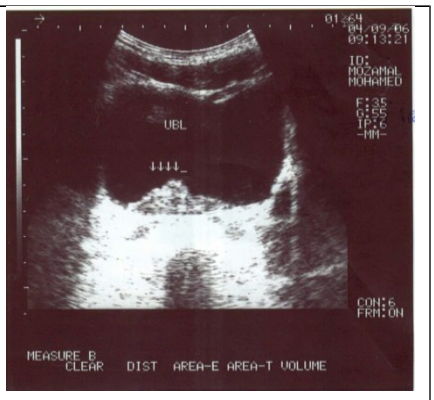
		
Post mucturition	Bladder wall thickening	Bladder wall thickening
		
Bladder wall thickening	Calcify	Bladder wall thickening
		
Polyps	Polyps and thick wall	Polyps

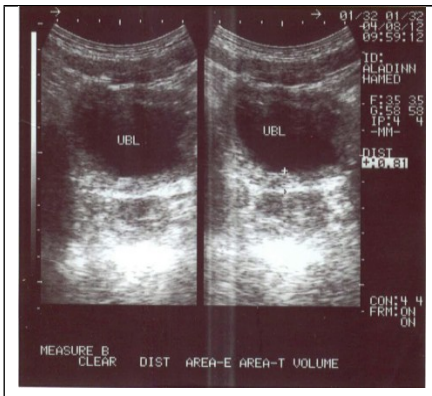
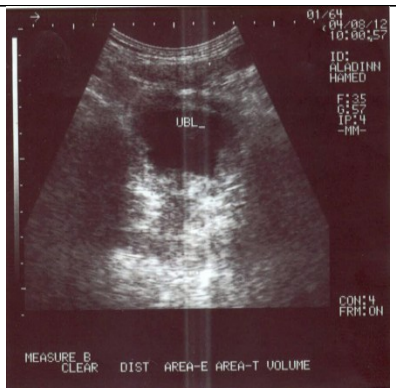
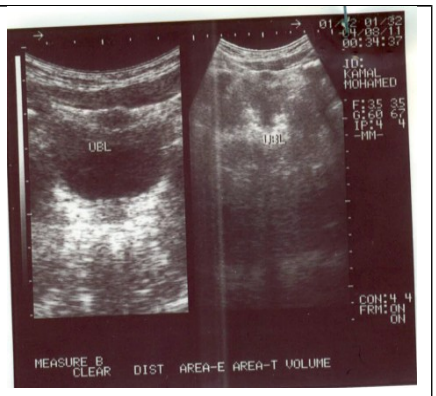
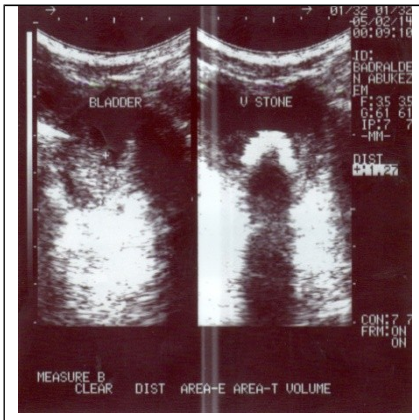
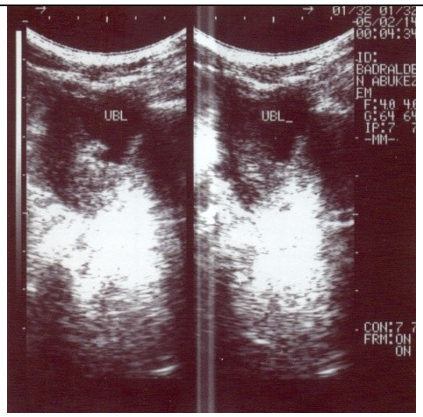
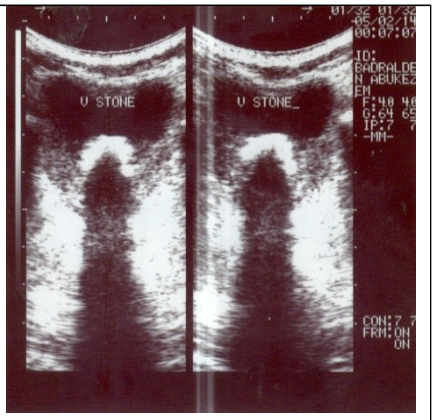
		
Polyps	Left kidney hydronephrosis	Polyps

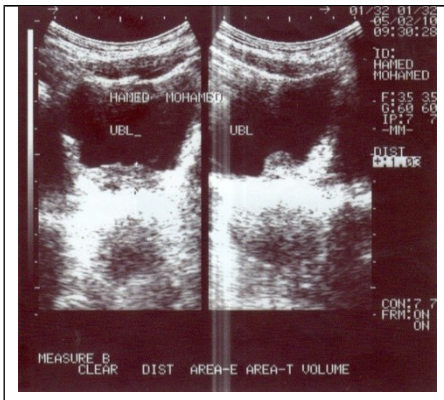
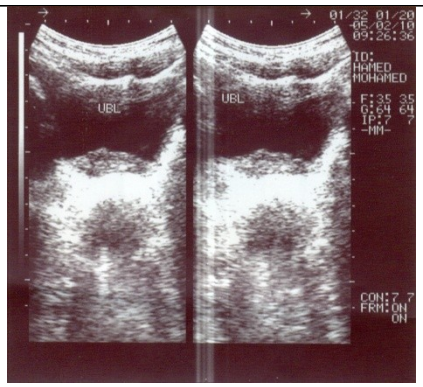
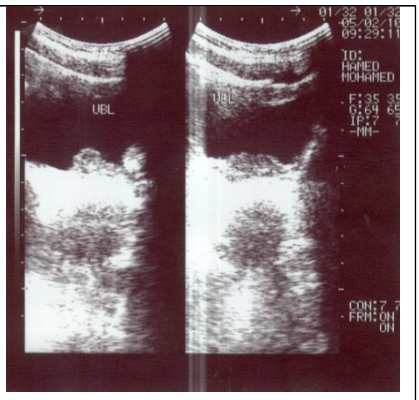
		
Thick wall with prominence of The seminal vesicle	Thick wall with prominence of the seminal vesicle	Thick wall with polyp

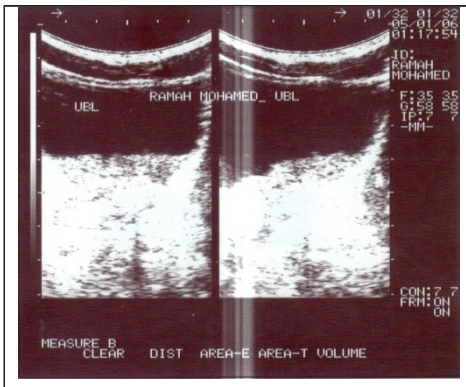
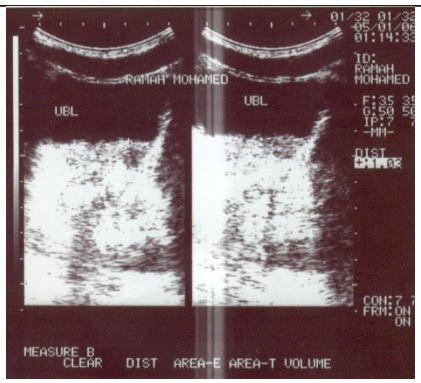
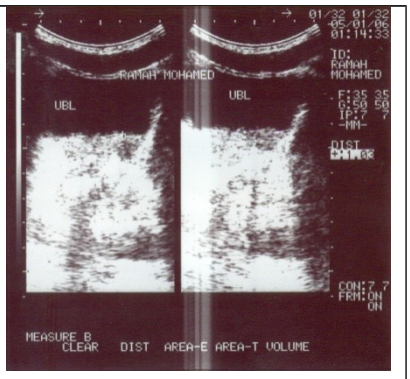
		
Bladder wall thickening with Polyp	Bladder wall thickening with Polyp	Bladder wall thickening

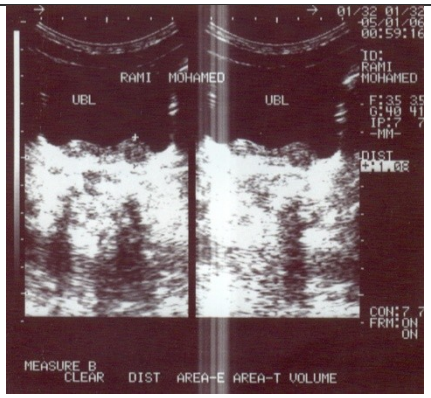
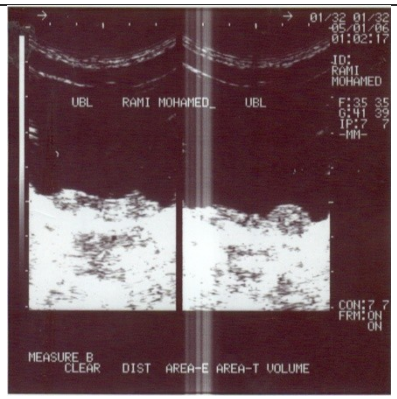
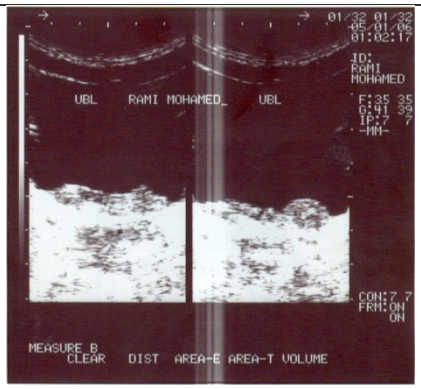
		
Bladder wall thickening	Bladder wall thickening	Thick wall with polyp

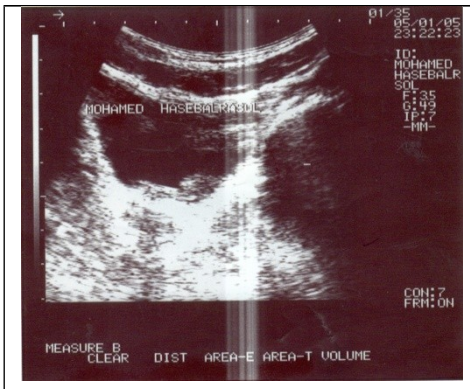
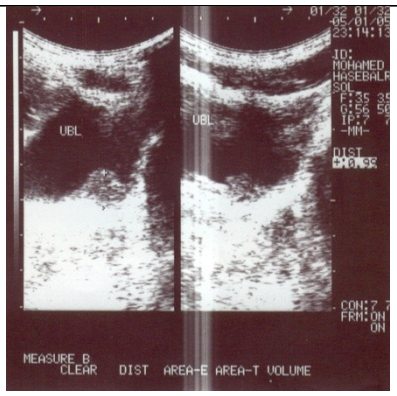
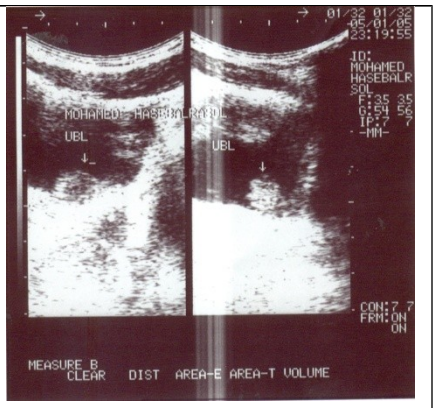
		
Bladder wall thickening	Bladder wall thickening	Bladder wall thickening

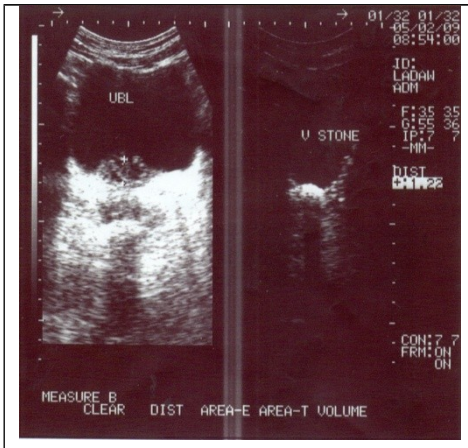
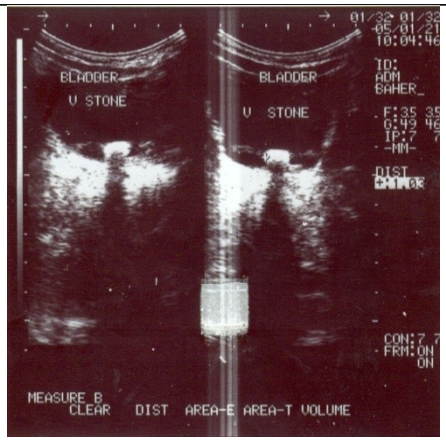
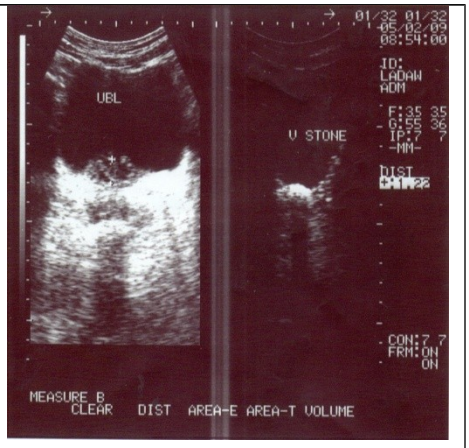
		
Bladder wall thickening	Bladder wall thickening	Bladder wall thickening
		
Bladder wall thickening with Vesicle stone	Bladder wall thickening	Vesicle stone

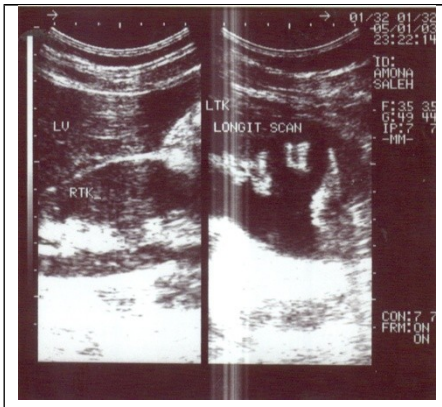
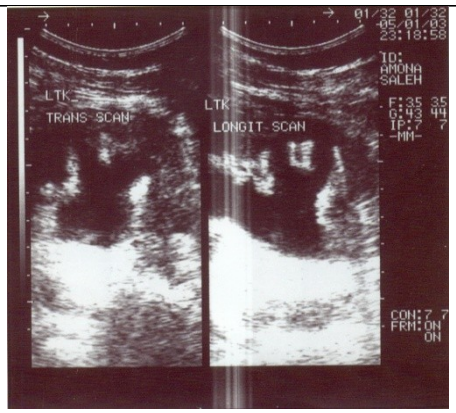
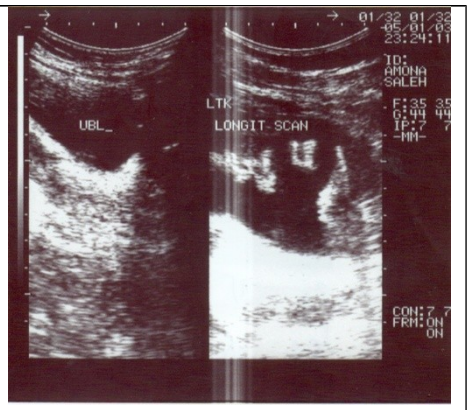
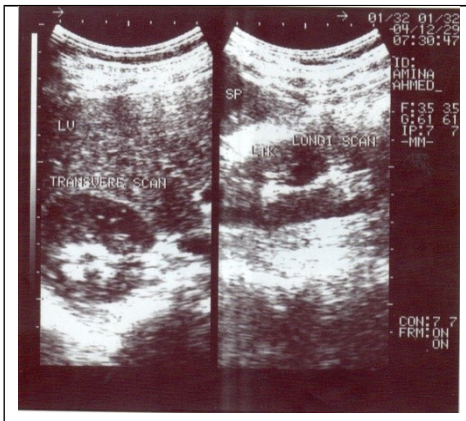
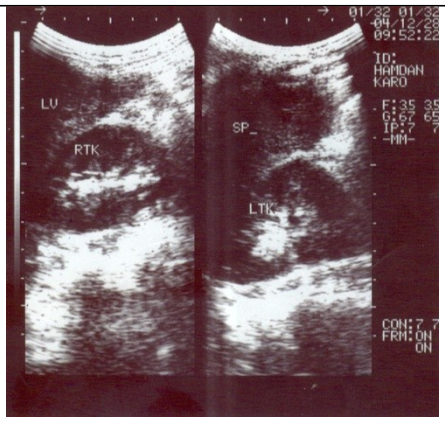
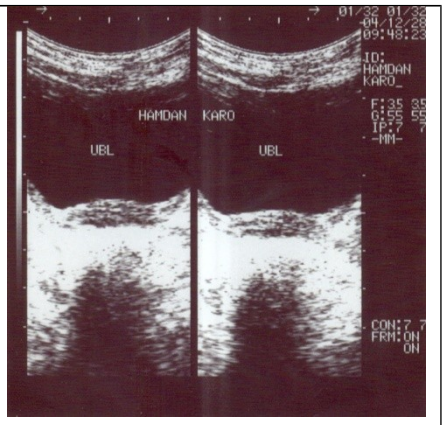
		
Bladder wall thickening	Bladder wall thickening	Bladder wall thickening

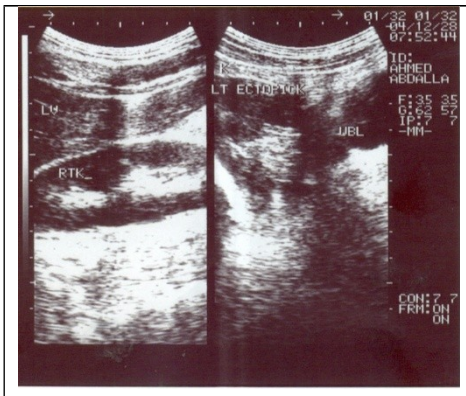
		
Bladder wall thickening	Bladder wall thickening	Bladder wall thinkening

		
Bladder wall thickening	Bladder wall thickening	bladder wall thickening

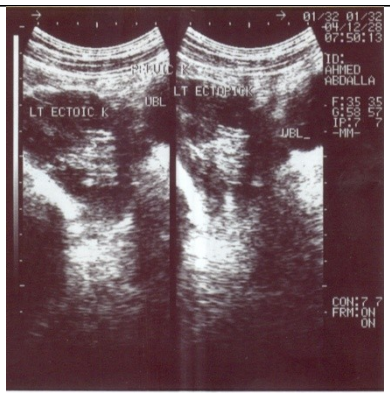
		
Bladder wall thickening	Bladder wall thickening	Bladder wall thickening

		
Thick wall with vesicle stone	Vesicle stone	Thick wall with vesicle stone

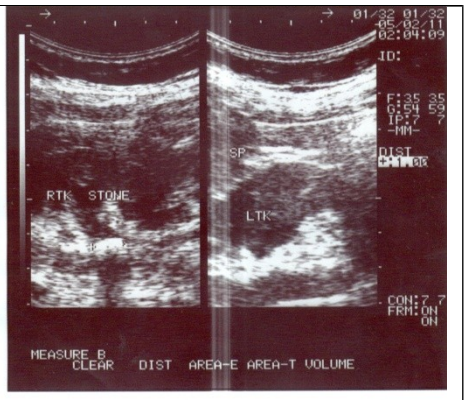
		
Left hydronephrosis	hydronephrosis	hydronephrosis
		
Normal kidneys	Normal kidneys	bladder wall thickening



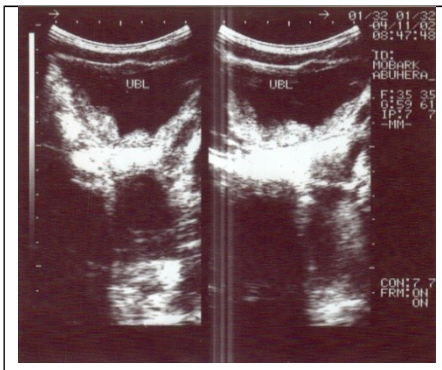
Left ectopic kidney



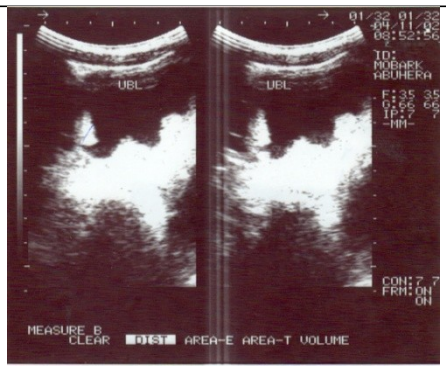
Ectopic kidney



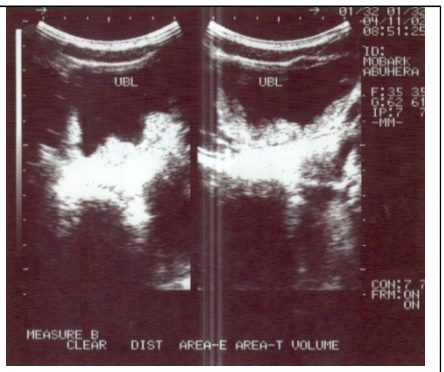
Right renal pelvic stone



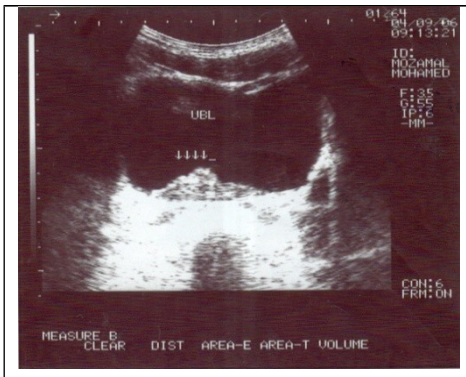
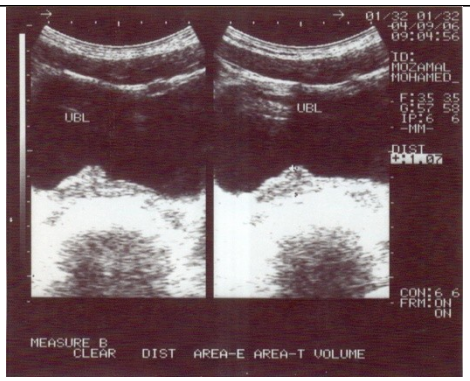
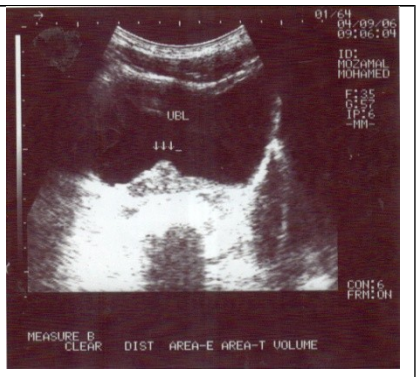
Bladder wall thickening

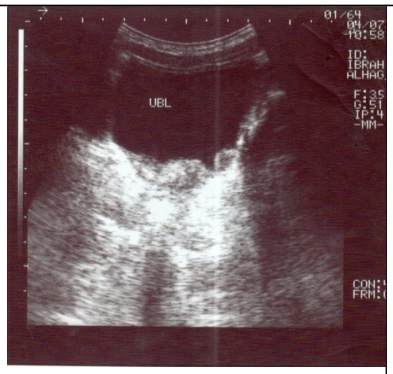
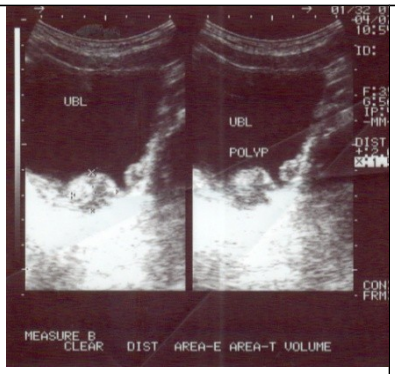
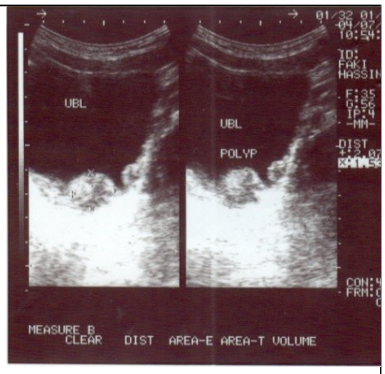


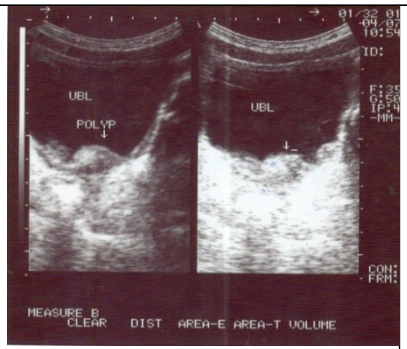
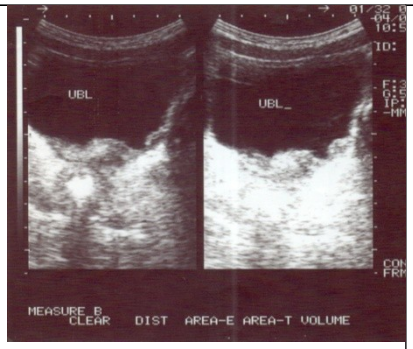
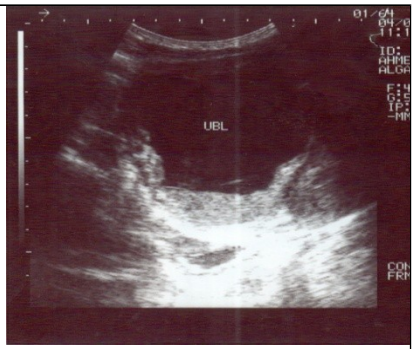
Bladder wall thickening

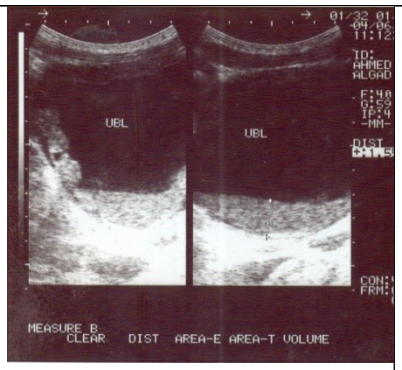


Bladder wall thickening

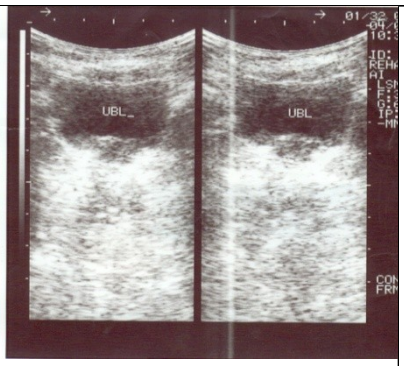
		
Bladder wall thickening	Bladder wall thickening	Bladder wall thikening

		
Bladder wall thickening	**Bladder wall thickening and Polyp**	**Bladder wall thickening and Polyp**

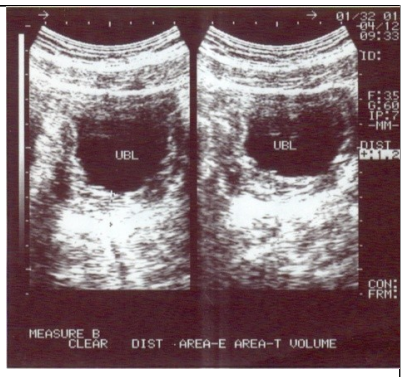
		
Bladder wall thickening	Bladder wall thickening	Bladder wall thickening



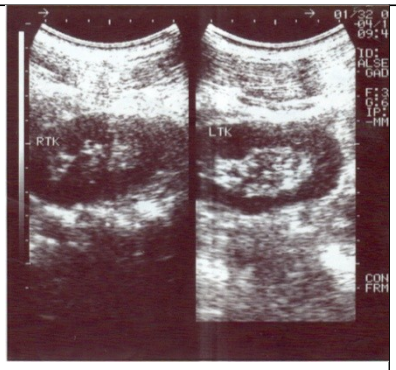
Bladder wall thickening



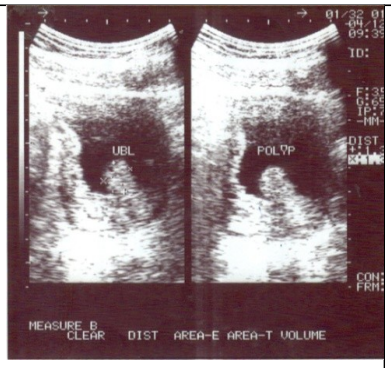
Bladder wall thickening



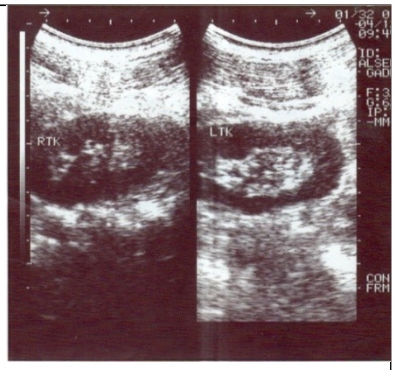
Bladder wall thickening



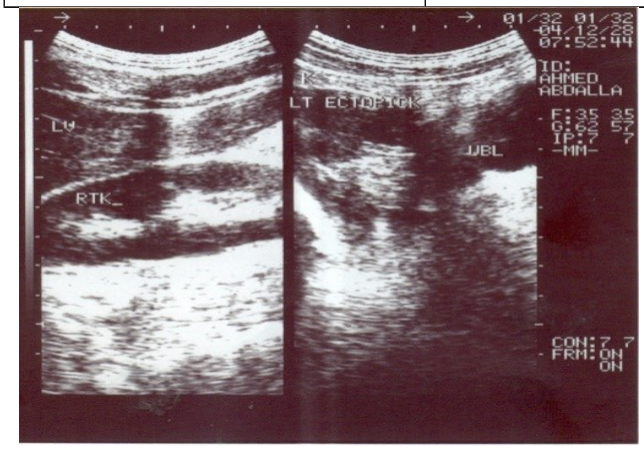
Normal kidney

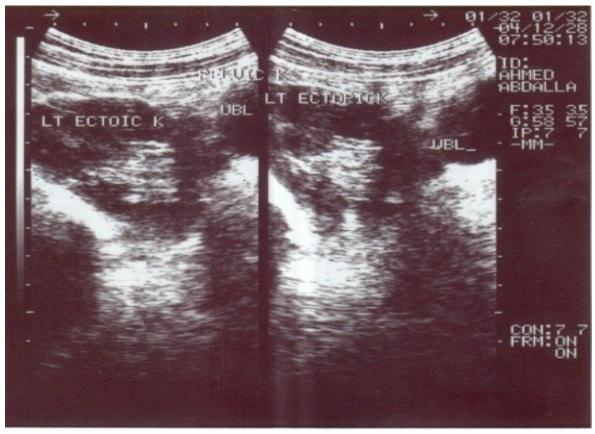


Bladder wall kidney with Polyp

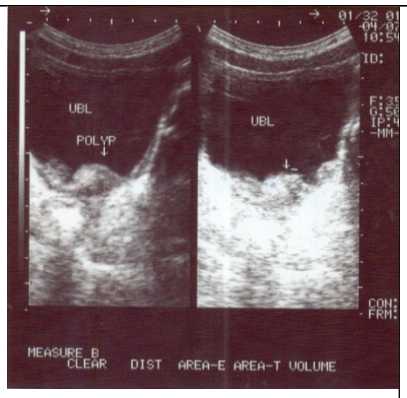
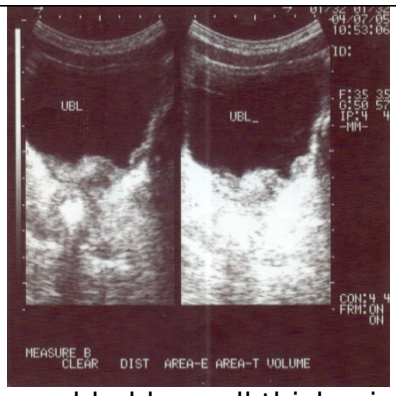
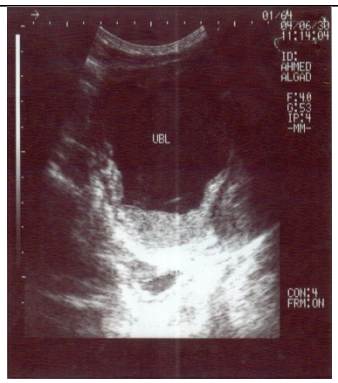


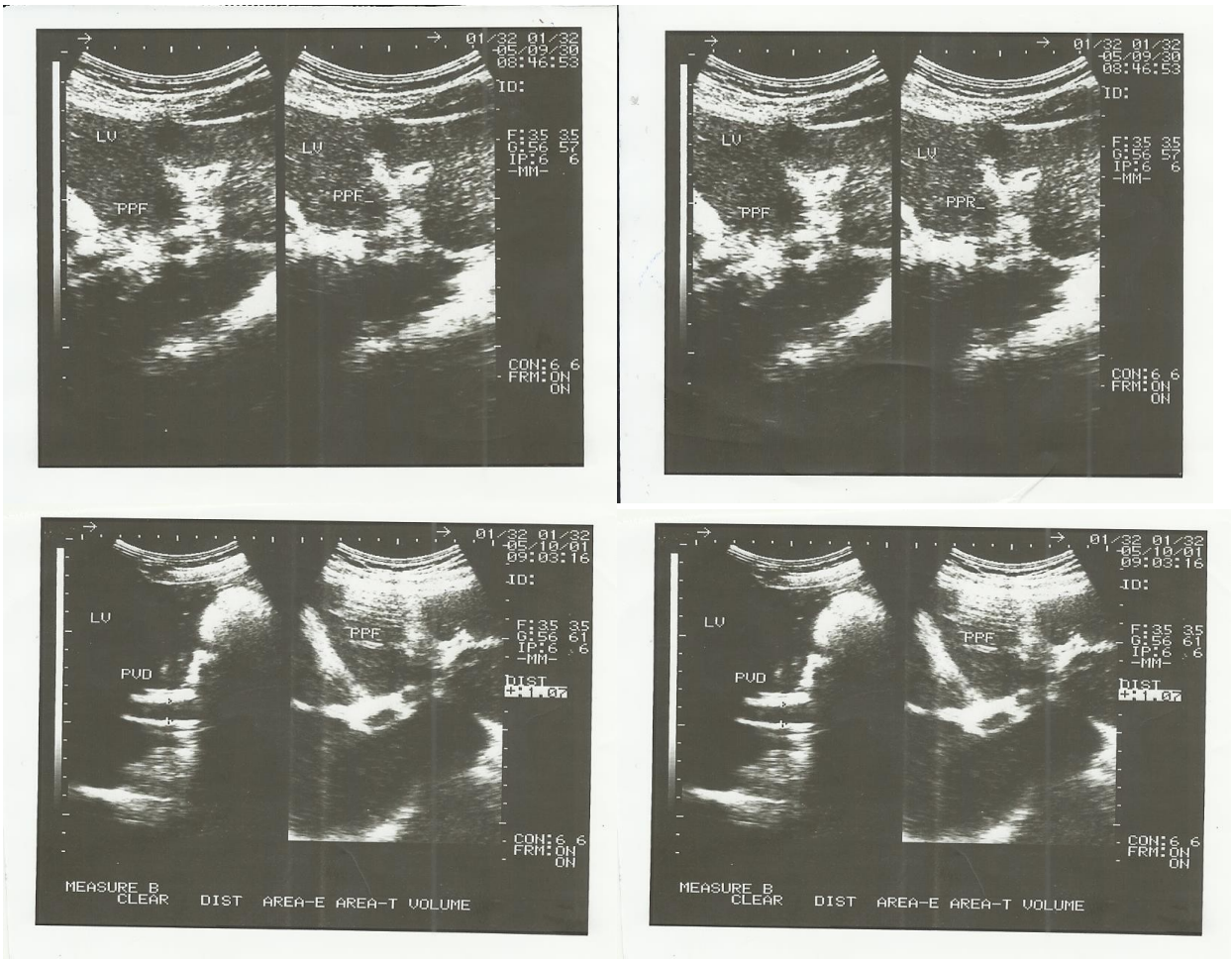
Normal kidney



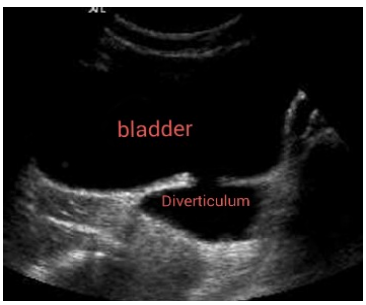
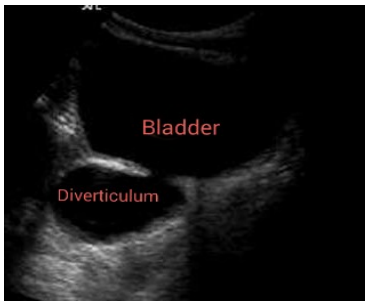
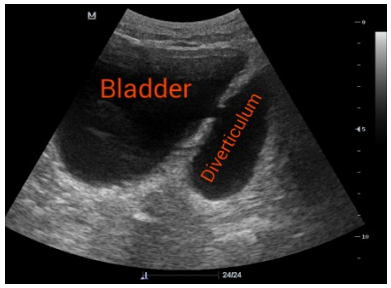


Ectopic kidneys

		
Bladder wall thickening with Polyp	bladder wall thickening	Bladder wall thickening



Periportal fibrosis


bladder
Diverticulum

Bladder
Diverticulum

Bladder
Diverticulum

Appendix (2)