بسم الله الرحمن الرحيم

Sudan University of Science and Technology

College of Graduated Studies

Characterization of Chronic Renal Failure Using Ultrasonography

توصيف الفشل الكلوي المزمن بالموجات فوق الصوتية

A thesis submitted for partial fulfillment of Academic Requirements of M.Sc in Medical Diagnostic Ultrasound

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الآية

بسم الله الرحمن الرحيم

قال تعالى :

(وَوَصَّيْنَا الْإِنسَانَ بِوَالِدَيْهِ حَمَلَتْهُ أُمُّهُ وَهْناً عَلَى وَهْنٍ وَفِصَالُهُ فِي عَامَيْنِ أَنِ اشْكُرْ لِي وَلِوَالِدَيْكَ إِلَيَّ الْمَصِيرُ**)**

صدق الله العظيم

سورة لقمان الآية (14)

Dedication

To My

Parents

Husband and kids

Sisters and brothers

C0lleagues

Lovely city Elddamer

Acknowledgment

I would like to thank God for enabling me to complete this thesis. Special thank to my family. I need to thank Dr.Babiker Abd Elwahab, the supervisor of my thesis for his continues help, supervision and guidance.

Also I need to thanks all the Sonologists staff in Elddamer hospital who help me specially Motwakel Elmahy and Sara Gafer.

AbstrAct

This study was descriptive cross sectional study. Chronic renal failure is spread widely nowadays in Elddamer City, so we need available, cheep and accurate tools for evaluate it. Study aimed to determine the role of ultrasound in diagnosis of chronic renal failure in Elddamer city. The study was conducted in Elddamer hospital (renal unit) from October 2015 to May/ 2016.

There were 50 patients50% males and 50% female, all patients had Chronic Renal Failure and referred by physician. Any had Acute Renal Failure was excluded from this study0

All these patients were scanned transabdominal using Aloka and Toshiba ultrasound machines to evaluate the size, outlines, CMD, echogenicity of both kidneys and any complication associated with CRF like stones, hydronephrosis or masses.

Collected data analyzed using SPSS program. Study found that both kidneys were small in size,58% had irregular out lines in RK,42% had regular,50%had irregular out lines in LK, 50% had regular,60% lossed CMD and 40% decreased in RK,72% loosed and 28%decreased in LK,82%were hyper echoic cortex and 18%were hypo echoic in RK, and the result same in LK. There were 6% had hydronephrosis and 94%not in RK,BUT not found in LK. There were 20% found stones and 80% not in RK,10%found and 90% not in LK. There were 20%had cyst and 80% not in RK.24%found cyst and 76%not in LK.

From all of that the study found that ultrasound was an accurate tool for diagnosis of CRF. So, the study recommended that ultrasound scanning should be used routinely to every pt with renal pathology.

ملخص الدراسة

هذه الدراسة وصفية تهدف لتوضيح دور الموجات فوق الصوتية في تشخيص الفشل الكلوي المزمن في مدينة الدامر. انتشر مرض الفشل الكلوي المزمن هذه الايام في مدينة الدامر,لذا نحتاج لوسيلة رخيصة ودقيقة لتقييمه.اجريت الدراسة في مستشفى الدامر (وحدة الكلى) في الفترة من اكتوبر2015 حتى مايو20160.

اشتملت الدراسة على 50 مريضا50%منهم رجال و50% نساء وكلهم يعانون من الفشل الكلوي المزمن وتم استبعاد كل حالات الفشل الكلوي الحاد.كل هؤلاء المرضى تم تصويرهم بواسطة جهاز الموجات فوق الصوتية لتقييم الحجم والشكل والتمايز لكلا الكليتين و أي مضاعفات قد تصاحب الفشل الكلوي المزمن.وجدت الدراسة ان كلا الكليتين صغيرتا الحجم مقارنة بالحجم الطبيعي للكلية,وان 58% لديهم شكل خارجي غيرمنتظم و42%لديهم شكل خارجي منتظم هذا بالنسبة للكلية اليمنى اما اليسرى50%شكلها الخارجي منتظم و50% غير منتظم060%فقدوا التمايز40%قل لديهم التمايزفي الكلية اليمنى ام اليسرى 72%فقدوا التمايز 18% قل لديهم التمايز في الكلية اليسرى ,82%كان الصدى قوي و18% كان اقل في كلا الكليتين ,اما موه الكلية فكان 6% فقط في الكلية اليمنى ولم توجد في الكلية اليسرى20%كان لديهم حصاوى في الكلية اليمنى و10% لديهم في الكلية اليسرى.اما بالنسبة للاورام20%كان لديهم اكياس في الكلية اليمنى و24% لديهم اكياس في اليسرى.

من كل ما سبق وجدت الدراسة ان الموجات فوق الصوتية تعتبر وسيلة دقيقة لتشخيص الفشل الكلوي المزمن, لذلك اوصت الدراسة بان يتم التصوير بالموجات فوق الصوتية بشكل دوري لكل مريض يعاني من امراض الكلى .

Contents

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List of Abbreviations

CBC	Complete Blood Count.
CKD	Chronic Kidney Diseases.
CMD	Cortico Medullar Differentiation.
CRF	Chronic Renal Failure.
CT	Computed Tomography.
GFR	Glomerular Filtration Rate.
IVU	Intra Venous Urography.
PCS	Pelvic Calyceal System.
U/S	Ultra Sound Waves.

Chapter One

Introduction

1.1 Introduction:-

The kidney is multifunctional organ .It control the conservation of body fluid, electrolyte balance, the removal of body waste, the regulation of calcium metabolism and erythropoesis.

The causes of renal disease and failure are numerous and some of the causes are not understood .Acute renal failure occurs at any age and if diagnosed and treated early, damage in many instances can be arrested and the prognosis for full recovery is excellent.CRF is measured in five stages, which are calculated using pt GFR. Stage 1 CKD is mildly diminished renal function, with few overt symptoms. Stage2 and 3 need increasing levels of supportive care from their medical providers to slow and treat their renal dysfunction. Pts in stage 4 and 5 usually require preparation of the patient towards active treatment in order to survive. Stage 5 CKD is considered a severe illness and requires some form of renal replacement therapy(dialysis) or kidney transplant whenever feasible .

Ultra sound provides an accurate method of diagnosing renal failure as it

assesses organ morphology and anatomy.

1.2 Problem of the study:

Nowadays CRF spread widely in Elddamer city, so we need available ,cheep and accurate tools for evaluate and early detection of it.

1.3Objectives:

1.3.1 General objective:

To evaluate the role of the U/S in diagnosis of chronic renal failure.

1.3.2 Specific objectives:

To assess the accuracy of U/S in diagnosis of chronic renal failure .

To determine the U/S findings in chronic renal failure .

1.4Overviewofthestudy:

This study `fails into five chapters, chapter one which was an introduction deals with introduction, problem and objectives of the study. Chapter tow deals with theoretical back ground and literature review. Chapter three about research methodology, which includes material and method . Chapter four deals with result (data presentation) . Chapter five includes discussion conclusion and recommendations.

Chapter Two

Literature review

2.1Anatomy:

The kidneys are two bean shaped organs situated in retro peritoneum on each side of the vertebral column, each one is 12cm long, 5cm wide, 2.5cm thick and the right kidney is usually about 2.5cm below the left. The both kidneys has anterior and posterior surface, upper and lower pole also has convex lateral surface and concave medial one with deep recess, the renal sinus into which the hilum leads and through it the renal vessels, the lymphatic and the ureter pass. The renal sinus contains the major calyces which arise from the pelvis and the minor calyces usually arise from each major calyx. (Burwin2001)

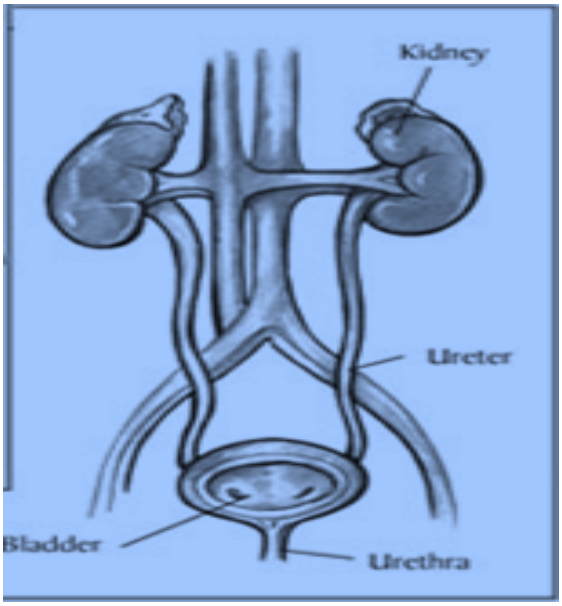

Fig 2.1. Shows normal urinary system (www.wiki.medpedia.com, 2003)

2.1.1Renal structure:-

A fibrous capsule which is adherent to the renal parenchyma, covered by perirenal fat and then the connective tissue that encloses the kidneys , suprarenal glands and lies outside is the renal fascia. Pararenal fat lies external to the renal fascia and often in large quantity. It forms part of

retroperitoneal fat. The perirenal fat, renal fascia, and pararenal fat support the kidneys and hold them in position on the posterior abdominal wall. Each kidney has a dark brown outer cortex and contains the functional units of the kidney called the nephrons. A light brown inner medulla, its composed of about a dozen renal pyramids, each having its base oriented toward the cortex, and its apex converge toward the renal sinus also contain the collecting tubules which open on the papillae. The papillae project into the minor calyces and there are usually from one to three papillae in each minor calyx . The cortex extends into the medulla between adjacent pyramids as the renal columns. (**Snell2007**)

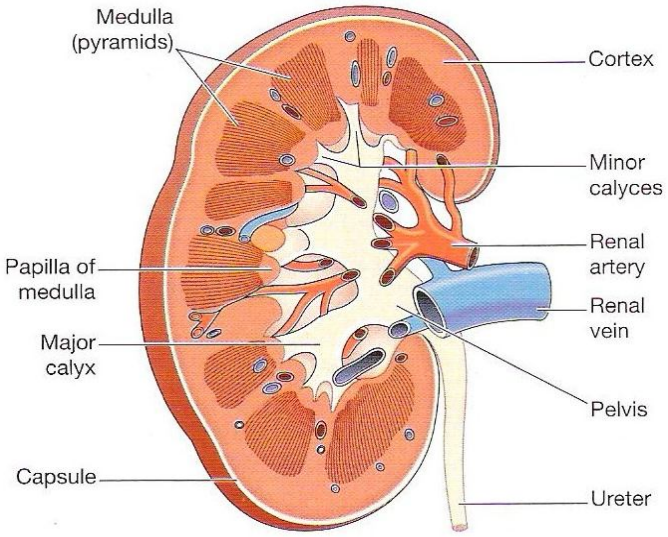

Fig 2.2. A longitudinal section of the kidney (Waugh, 2006).

2.1.1.1Nephron :

The essential functional unit of the kidney is the nephron, it's a microscopic structure of which there are about one million in each adult kidney. Its consist of the renal corpuscle, the uriniferous tubule and associated blood vessels. The renal corpuscle is about 0.2mm in diameter, which act as filter and composed of a central tuft of capillaries, the glomerulus that is surrounding by double walled capsule(Bowman's capsule), in which the primary urine accumulates in the capsular space

between its two layers. The blood enters the glomerulus by afferent arteriole and exits via an efferent arteriole. The uriniferous tubule is a long coiled tube which take awinding course from the renal corpuscle of the collecting tubule, many of which open at the apex of each renal papilla, then runs into the medulla where it joins the collecting tubule. (Warrick, 1976)

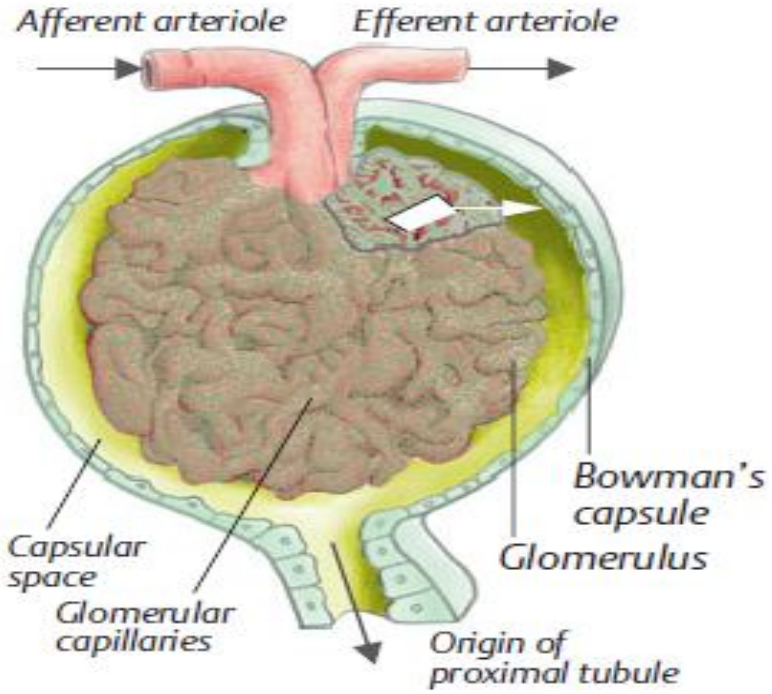

Fig 2.3. Glomerulus and Bowman's capsule (Silbernagl, 2001).

The glomerular filter comprises the fenestrated endothelium of the glomerular capillaries followed by the basal membrane as the second layer and the visceral membrane of Bowman's capsule on the urine side. The latter is formed by podocytes. The proximal tubule is the longest part of a nephron (10mm). Its twisted initial segment is the proximal convoluted tubule .The loop of Henle consists of a thick descending limb that extends into the renal medulla , a thin descending limb, a thin ascending limb and a thick ascending limb. Only about 20% of all Henle's loops are long enough to penetrate into the inner medulla. The

distal tubule has an initially straight part that merges with a distal convoluted tubule and the distal convoluted tubule merges with a connecting tubule. Many of them lead into a collecting duct which extends through the renal cortex and medulla. At the renal papilla the collecting ducts opens in the renal pelvis. From there, the urine (propelled by peristaltic contractions) passes via the ureter into the urinary bladder and, finally, into the urethra, through which the urine exits the body. (Despopouloulos,2001)

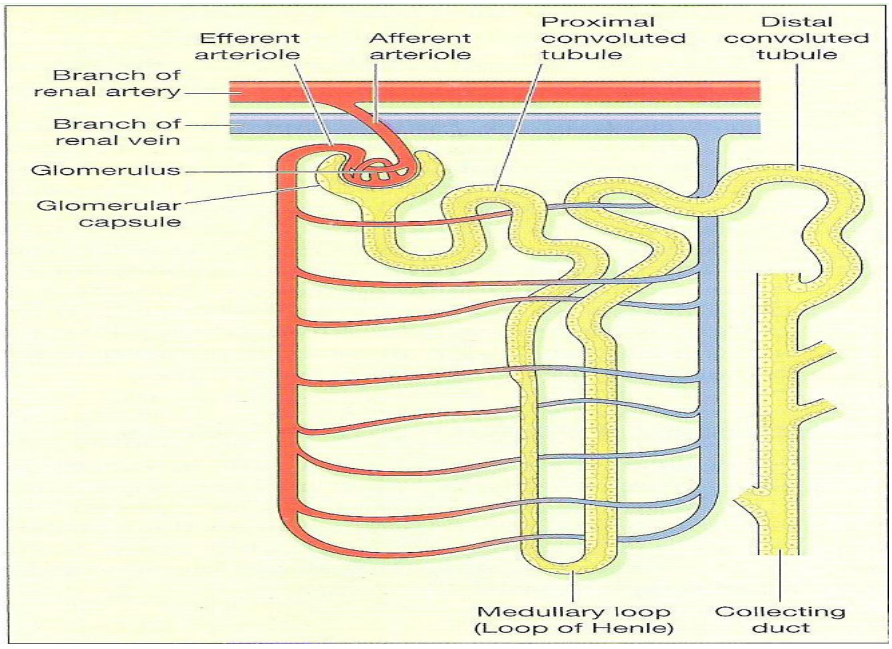

Fig 2.4. A nephron and associated blood vessels (Waugh, 2015).

2.1.3. Relation of the kidneys:-

Anteriorly the right kidney is related to the right suprarenal gland, the liver, the duodenum and hepatic flexure of the colon. Anteriorly the left kidney is related to the left suprarenal gland, the stomach, the spleen, the tail of the pancreas, the jejunum, and the splenic flexure of the colon. Posteriorly the diaphragm, the costodiaphragmatic recess of the pleura, the 12^{th} rib(of the right kidney) and the 11^{th} rib(of the left kidney), the psoas, quadrates lumborum, and transverses abdominis muscles (Snell, 2007)

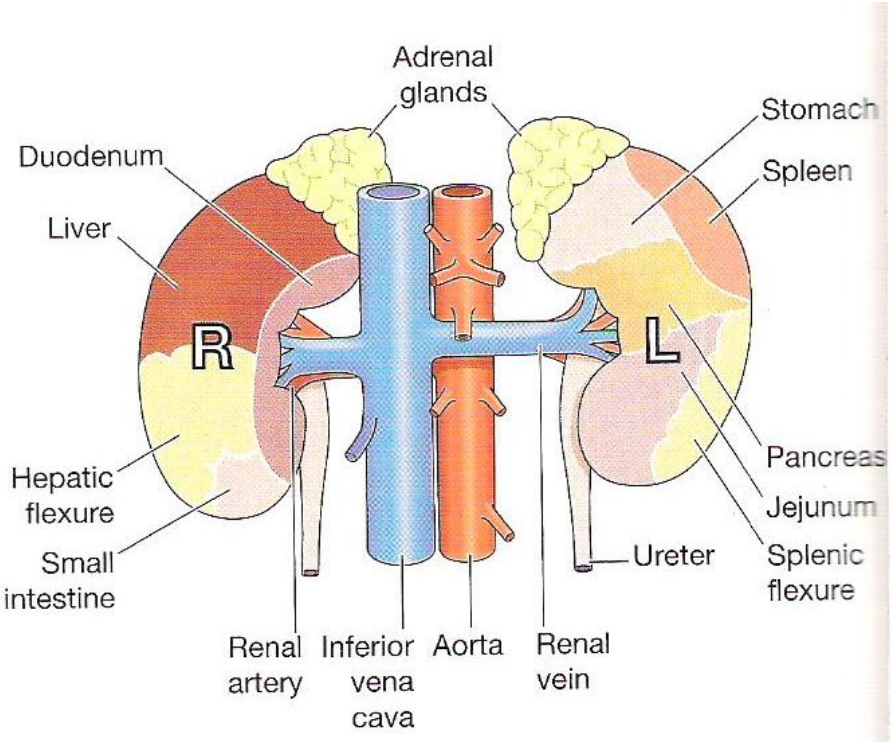

Fig 2.5. Anterior view of the kidneys showing the areas of contact with associated structures (Waugh, 2006).

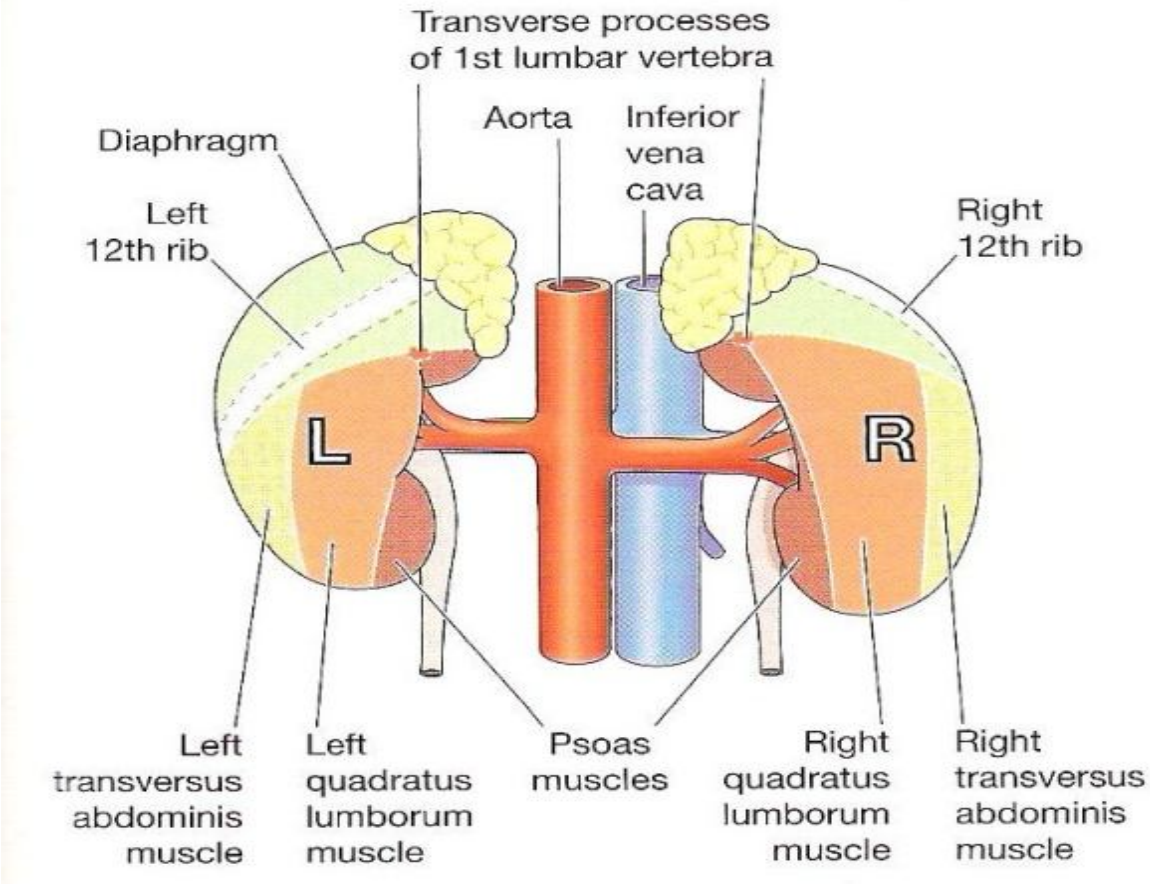

Fig 2.6. Posterior view of the kidneys showing the areas of contact with associated structures (Waugh , 2006).

2.1.4. Blood supply:-

Arterial supply to the kidneys by the renal arteries arises from the aorta at the level of the second lumbar vertebra. Each renal artery usually divides into five segmental arteries that enter the hilum of the kidney and distributed to different areas of the kidney. Lobar arteries arise from each segmental artery and then gives off two or three interlobar arteries that enter the parenchyma through the renal columns and extend to the bases of the pyramids. At the junction of the cortex with the medulla the vessel arches across the base of the pyramid give off the arcuate arteries. It gives off branches called the interlobular arteries which supply the majority of the cortical nephrons via afferent arterioles. Venae rectae vessels drain the nephrons and form the arcuate vein. Other small venules flow into the interlobular vein which in turn drains into the arcuate vein. Lymphatic

drainage from the kidneys run close to the renal vein and drain into the para-aortic lymph nodes. The lymph then passes by the lumbar trunks to the cistern chili and thoracic duct. The nerve supply is the renal sympathetic plexus. The afferent fibers that travel through the renal plexus enter the spinal cord in the 10^{th}, 11^{th}, and 12^{th} thoracic nerves. (Snele2007)

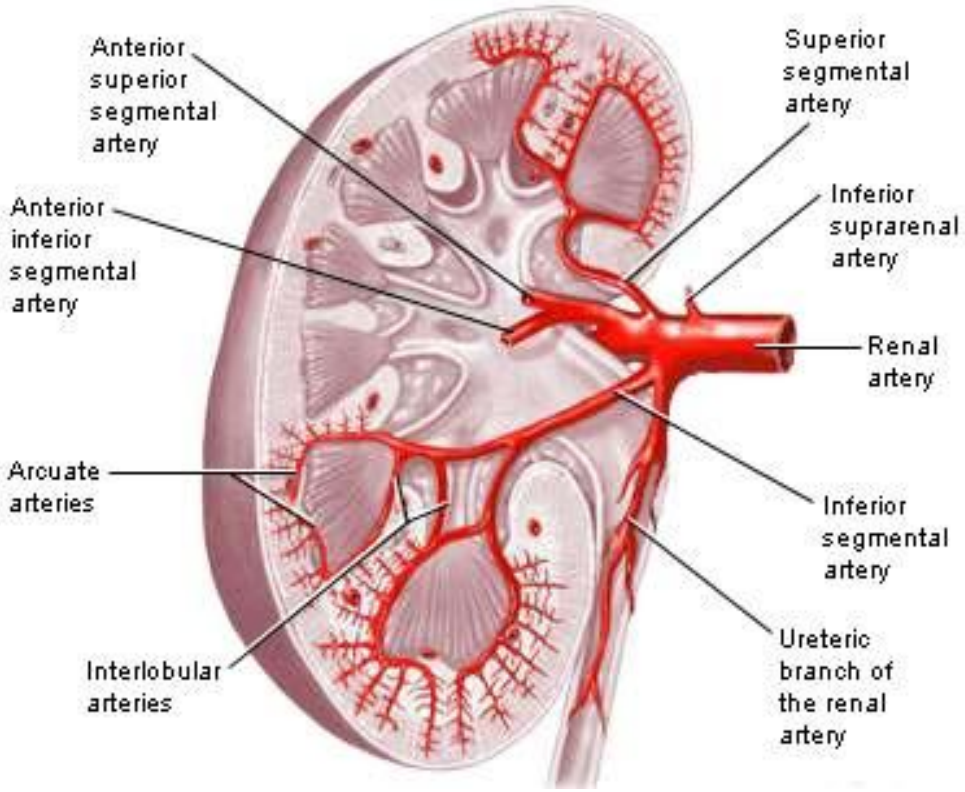

Fig 2.7. The renal arteries supply the kidneys with blood (www.nlm.nih.govAt11:45)

2.2.Physiology:-

Most people are familiar with one important function of the kidneys to rid the body of waste materials that are either ingested or produced by metabolism. A second function that is especially critical is to control the volume and composition of the body fluids. For water and virtually all electrolytes in the body, the balance between intake (due to ingestion or metabolic production) and output (due to excretion or metabolic consumption) is maintained in large part by the kidneys. This regulatory function of the kidneys maintains the stable environment of the cells necessary for them to perform their various activities. The kidneys perform their most important functions by filtering the plasma and removing substances from the filtrate at variable rates, depending on the needs of the body. Ultimately, the kidneys “clear” unwanted substances from the filtrate (and therefore from the blood) by excreting them in the urine while returning substances that are needed back to the blood. It is important to recognize that the kidneys serve multiple functions, including the excretion of metabolic waste products and foreign chemicals, regulation of water and electrolyte balances, regulation of body fluid osmolarity and electrolyte concentrations, regulation of arterial pressure, regulation of acid-base balance also secretion, metabolism and excretion of hormones andGluconeogenesis (Guton, 2006).

2.2.1. Formation of urine by the three fundamental mechanisms characterize kidney function:-

Large quantities of water and solutes are filtered from the blood through the semipermeable walls of the glomerulus and glomerular capsule by process called Filtration, in which the water and other small molecules pass through, although some are reabsorbed later. Blood cells, plasma proteins and other large molecules are too large to filter through and

therefore remain in the capillaries. Filtration is assisted by difference between the blood pressure in the glomerulus and the pressure of the filtrate in the glomerular capsule, because the efferent arteriole is narrower than the afferent arteriole. The volume of filtrate formed by both kidneys each minute is called glomerular filtration rate(GFR) is about 125ml/min are formed daily by two kidneys, but less than 1%, i.e.1 to 1.5litres,excreted as urine. (Waugh,2006)

This primary urine enters the tubule, where most of it is reabsorbed, and passes back into the blood by process called selective reabsorption , in which the composition and volume of the glomerular filtrate are altered during its passage through the convoluted tubules, the medullary loop and the collecting tubule. This process enables reabsorption, into the blood, of those filtrate constituents needed to maintain fluid and electrolyte balance and the PH of the blood. Some constituents of glomerular filtrate(e.g. glucose, amino acids) do not normally appear in urine because they are completely reabsorbed unless blood levels are excessive. Other substances reabsorbed by active transport include sodium, potassium, phosphate and chloride, also some ions, e.g. sodium and chloride, can be absorbed by both active and passive mechanisms depending on the site in the nephron (Despopoulos, 2001).

Certain substances not required(e.g., toxins) are not only reabsorbed, but actively secreted into the tubule lumen by the process called tubular secretion. The non reabsorbed residual filtrate is excreted together with the secreted substances in the final urine. Tubular secretion of hydrogen ion is important in maintaining normal blood PH. (Waugh,2006**)**

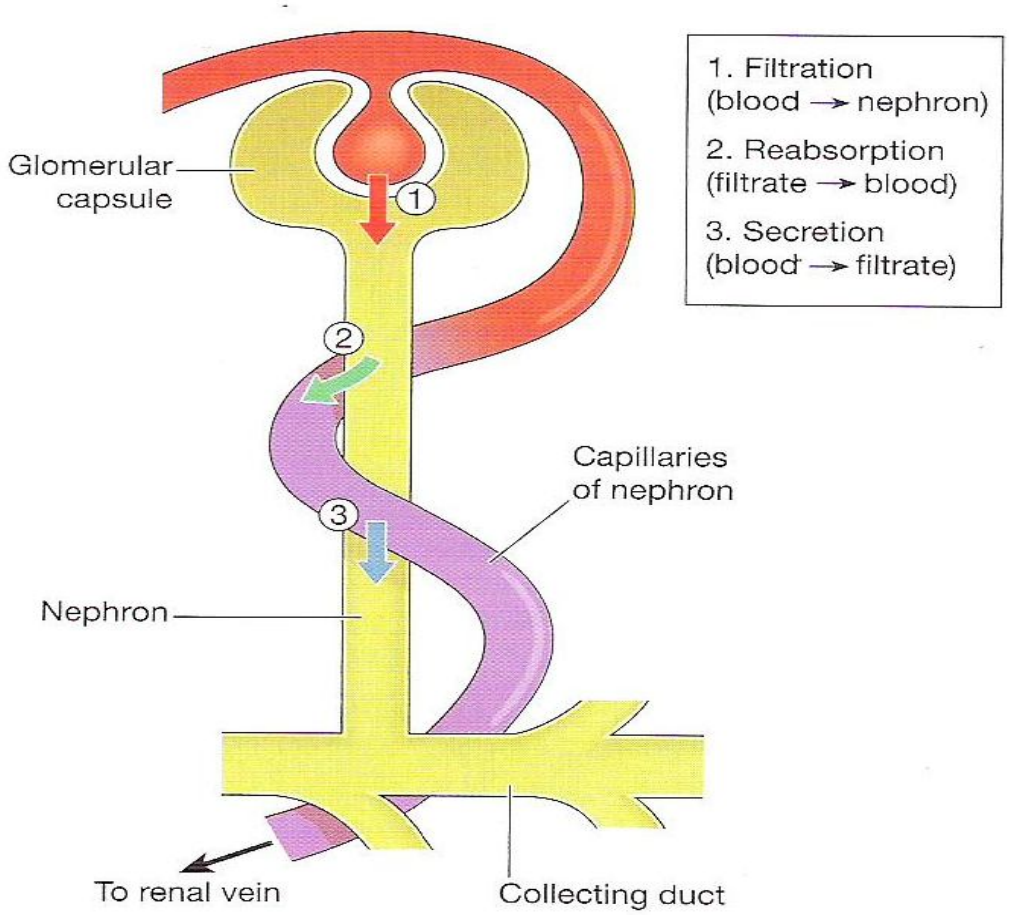

Fig 2.8. Summary of the three processes that form urine (Waugh, 2006).

2.3 Pathology:

2.3.1 Renal Failure

Renal failure, also known as kidney failure or renal insufficiency, is a medical condition in which the kidneys fail to adequately filter waste products from the blood. The two main forms are acute kidney injury, which is often reversible with adequate treatment, and chronic kidney disease, which is often not reversible. In both cases, there is usually an underlying cause.

Kidney failure is mainly determined by a decrease in glomerular filtration rate, which is the rate at which blood is filtered in the glomeruli of the kidney. The condition is detected by a decrease in or absence of urine production or determination of waste products (creatinine or urea) in the blood. Depending on the cause, hematuria (blood loss in the urine) and proteinuria (protein loss in the urine) may be noted.

In kidney failure, there may be problems with increased fluid in the body (leading to swelling), increased acid levels, raised levels of potassium, decreased levels of calcium, increased levels of phosphate, and in later stages anemia. Bone health may also be affected. Long-term kidney problems are associated with an increased risk of cardiovascular disease.

Kidney failure can be divided into two categories: acute kidney injury or chronic kidney disease. The type of renal failure is differentiated by the trend in the serum creatinine; other factors that may help differentiate acute kidney injury from chronic kidney disease include anemia and the kidney size on sonography as chronic kidney disease generally leads to anemia and small kidney size.

2.3.2 signs and symptoms:

Symptoms of kidney failure include the following:

High levels of urea in the blood, nausea, weight loss,nocturnal urination, more frequent urination, or in greater amounts than usual, with pale urine, less frequent urination, or in smaller amounts than usual ,with dark coloured urine, blood in the urine Pressure, or difficulty urinating, unusual amounts of urination, usually in large quantities ,a buildup of phosphates and potassium in the blood.

2.3.3 Causes:

Chronic kidney disease (CKD) has numerous causes. The most common causes of CKD are diabetes mellitus and long-term, uncontrolled hypertension. Polycystic kidney disease is another well-known cause of CKD. The majority of people afflicted with polycystic kidney disease have a family history of the disease. Other genetic illnesses affect kidney function, as well.

Overuse of common drugs such as ibuprofen, and acetaminophen (paracetamol) can also cause chronic kidney damage.

Some infectious diseases, such as hantavirus, can attack the kidneys, causing kidney failure.

2.4 Investigations done for CRF:

2.4.1 Lab investigations:

Laboratory studies are an important adjunct to clinical evaluation for assessment of renal function. An initial workup of a patient may include a complete blood count (CBC); serum electrolytes including sodium, potassium, chloride, bicarbonate, calcium, and phosphorus; blood urea,

nitrogen and creatinine; blood glucose and glycocylated hemoglobin. Glomerular filtration rate (GFR) can be calculated.

Urine studies may include urine electrolytes, creatinine, protein, fractional excretion of sodium (FENA) and other studies to assist in evaluation of the etiology of a patient's renal disease.

Urinalysis is used to evaluate urine for its pH, protein, glucose, specific gravity and the presence of blood. Microscopic analysis can be helpful in the identification of casts, red blood cells, white blood cells and crystals.

2.4.2Biopsy:

The role of the renal biopsy is to diagnose renal disease in which the etiology is not clear based upon noninvasive means (clinical history, past medical history, medication history, physical exam, laboratory studies, imaging studies).

A detailed description of renal biopsy interpretation is beyond the scope of this article. In general, a renal pathologist will perform a detailed morphological evaluation and integrate the morphologic findings with the clinical history and laboratory data, ultimately arriving at a pathological diagnosis. A renal pathologist is a physician who has undergone general training in anatomic pathology and additional specially training in the interpretation of renal biopsy specimens.

Ideally, multiple core sections are obtained and evaluated for adequacy (presence of glomeruli) intraoperatively. A pathologist/pathology assistant divides the specimen(s) for submission for light microscopy, immunofluorescence microscopy and electron microscopy.

The pathologist will examine the specimen using light microscopy with multiple staining techniques (hematoxylin and eosin/H&E, PAS, trichrome, silver stain) on multiple level sections. Multiple immunofluorescence stains are performed to evaluate for antibody,

protein and complement deposition. Finally, ultra-structural examination is performed with electron microscopy and may reveal the presence of electron-dense deposits or other characteristic abnormalities that may suggest an etiology for the patient's renal disease.**2.4.3Radiological investigations:**

2.4.3.1 IVU:

Is seldom in diagnostic advanced renal diseasesAcontrast is injected intravenously.IVU provides both functional and anatomic information and has the advantage of demonstraring the entire urinary tract and its consederd on ideal method of demonstrating calculi Its limitation it is reliance on renal function.

2.4.3.2 CT:

Utilizes radiation to create aseries of thin body section which supply three dimensional cross sectional views of kidneys as well as the adjacent organs.The sections are taken before and after an intravenous contrast medium. Functional kidneys will collect and excrete the contrast agent thus enabling an evaluation of renal function. CT disadvantages include limited facilities, expensive ,hazarded of ionizing radiation, contrast collection and excretionrely on renal function

2.4.3.3 U/S:

Every pt should undergo ultrasonography for renal size and echogenicity which is typically small and hyper echoic but large if obstructed ,DM. poly cystic amyloid US is also used to exclude hydronephrosis, solid cystic structures and extension of tumors in to renal vein or IVC.

2.5. Ultrasound examination of kidneys:-

2.5.1. Ultrasound technique for kidneys:-

The examination begin with the patient in supine position ,by using 3to5 MHZ frequency and the scans are performed in the sagittal and transverse planes . The right kidney is readily demonstrated through the right lobe of the liver. Generally a subcostal approach displays the (more anterior) lower pole to best effect, while an intercostal approach is best for demonstrating the upper pole. The left kidney is not usually demonstrable sagittally because it lies posterior to the stomach and splenic flexure. The spleen can be used as an acoustic window to the upper pole by scanning coronally, from the patient's left side, with the patient supine or decubitus (left side raised), but, unless the spleen is enlarged, the lower pole must usually be imaged from the left side posteriorly. Coronal sections of both kidneys are particularly useful as they display the renal pelvic calyceal system (PCS) and its relationship to the renal hilum . This section demonstrates the main blood vessels and ureter (if dilated). (Burwin2001)

2.5.2. Ultrasound appearances of Normal kidneys:-

The normal renal outline is smooth, and the cortical thickness between the capsule and cortical medullary junction is uniform with a slight prominence at the pole. The cortex of the normal kidney is slightly hypoechoic when compared to the adjacent liver parenchyma, although this is age-dependent. In young people it may be of similar echogenicity and in the elderly it is not unusual for it to be comparatively hyperechoic and thin. The medullary pyramids are seen as regularly spaced, echo-poor triangular structures between the cortex and the renal sinus and are more prominent in neonates. The tiny reflective structures often seen at the margins of the pyramids are echoes from the arcuate arteries which branch around the pyramids. The renal sinus containing the PCS is hyperechoic due to sinus fat which surrounds the vessels. The main artery

and vein can be readily demonstrated at the renal hilum and should not be confused with a mild degree of PCS dilatation. Colour Doppler can help differentiate. The kidney develops in the fetus from a number of lobes, which fuse. Occasionally the traces of these lobes can be seen on the surface of the kidney, forming fetal lobulations ; these may persist into adulthood**(**Bates2004).

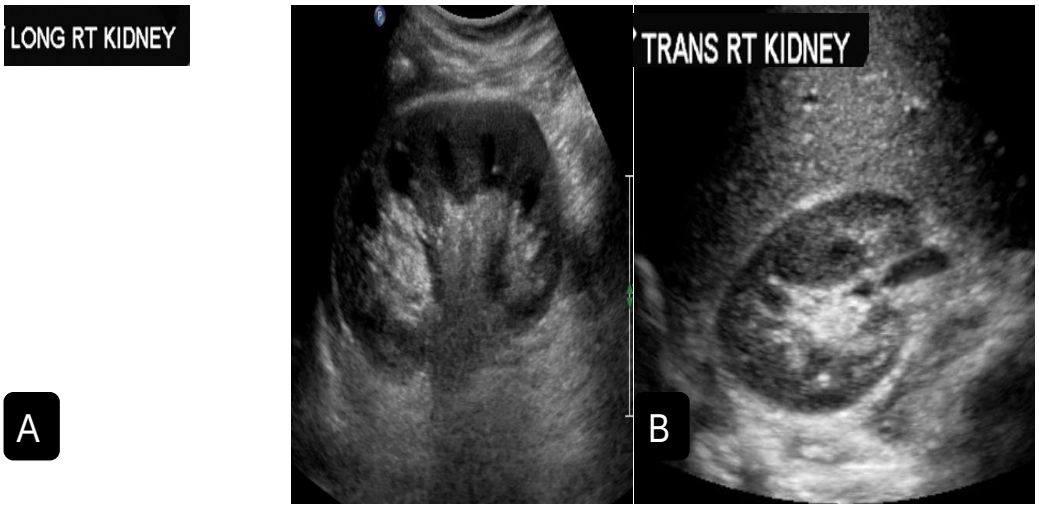

Fig.2.9 Normal kidney. Longitudinal (A) and transverse (B) gray-scale sonogram.(from www.springerlink.com .2006)

2.6 Previous studies:-

Bader Aldeen Arahim Abu Naib2007 studied the role of ultra sound in diagnosis CRF . The study involved one hundred patients suffering from different renal problems at diagnostic center in kingdom of Saudi Arabia Medina Munawara in the period between first of November 2005 to February 2007.All patients were evaluated sonographically. Patients age ranged between 16 years and 66 years with the average age of 46 years Author found that the occupation had great deal with CRF.All patient in study showed significantly high levels of serum cereatinine and blood urea Their renal ultrasound finding showed shrunken and hyperechoic kidenes with loss of CMD.Some of them showed some associated ultrasound findings like cysts stones and hydronephrosis. One case presented with hematuria and dysurea and burning micturation and lion and suprapupic pain with normal chemistry turned to be bladder mass sonographically. Finally he desided that U/S is the most easily and accurate diagnostic imaging modality in evaluating renal diseases especially CFR.

AwadiaGareeballh, Moawia Gamer addin Hago, Mustafa Sultanalshabi, Fth elrahmanAlagab , Jumaa Tamboul and Suliman salih The study was to assess the sonographic finding in Renal Parencnymal diseases using gray-scaleU/S inorder to classify these diseases at Sudanese . The results of abdominal sonograpnic studies of 240 patients who were suspected with renal diseases. They had been scaned with ultra sound to assess the kidney. They were above 20 years old suffering fromimpaired renal functions came to different hospitals in Khartoum state sudan from 2009 up to may2013. Authors sonographically found that the echogenicity of renal parenchyma and cortex were both equally and grossly increased in

acute and chronic and end stage.i.e increased in all types of renal parenchymal diseases.They found that the CMDwas mainly distrabted in acute parenchymad disease and loss in chronic end stage parenchymal.So they decided that U/S provided useful and accurate diagnosis of renal parenchymal diseases.

Chapter Three

Material and Method

3-1 Materials:

-Sony printer with thermal paper**.**

-Computer for data analysis**.**

3-2 Design of the study:

This is adescriptive cross sectional study

3-3 Place and duration of the study:

This study carried out in Eldammer city from October 2015 to May 2016

3-4 Population of the study:

The population of this study was patient with chronic renal failure. Patients associated with other kidney complications were excluded.

3-5 Sample size and type:

This study consisted of 50 patients, 50% were males and 50% were females.

3-6 Inclusive cretaria:

All patients with CRF.

3-7 Exclusive cretaria:

Every patients with other kidney diseases.

3.8 Technique*:* ***(****Imaging protocols****)***

3.8.1 Trans abdominal U/S scanning:

(A) Patient Preparations:

The bladder must be full enough, gives patient 4 to 5 glasses of fluid and examined after one hour. Do not allow the patient to micturate, Alternatively fill the bladder through a urethral catheter with sterile normal saline, Stop when patient feels uncomfortable.

(B) Position of the patient:

Start with the patient lying supine .Cover the right upper abdomen liberally with coupling agent.

(C) Choice of transducer:

Uses a curve linear probe of 3.5 MHZ frequency for adult and 5.0 MHZ for children and thin adult patients .

(D) Scanning technique:

The right kidney can be seen best with the patient supine, using the liver as an acoustic window.

Scanning is always done in deep suspended inspiration: ask the patient to take a deep breath and hold the breath in .do not forget to tell the patient to relax and breathe normally again.

Start with a longitudinal scan over the right upper abdomen and then follow with a transverse scan. Next rotate the patient to the left lateral decubitus position to visualize the right kidney in this coronal view.

To visualize the left kidney apply coupling agent to the left upper abdomen. If the left kidney cannot be seen (usually because of excess bowl gas), try the right decubitus position.

If the kidneys have not been imaged adequately, scan throw the lower intercostal spaces.

Both kidneys can also be examined with the patient sitting or standing erect.

3-9 Methods of data collection:

Using a special data collection sheet ,sample of 50patients with chronic renal faliurewere studied by trans abdominal ultrasound scanning and data was collected using a data collecting sheet which designed to evaluate, size, surface characteristics (outlines) and the echogenicity of kidneys.

3-10 Data analysis: Ultrasonographic sonograms took place and information of the patient was collected using special data collecting sheet and stored within USB.

3-11 Ethical approval:

The ethical approval was granted from the hospital and the radiology department; which include commitment of no disclose of any information concerning the patient identification.

Chapter Four

Results

4. Result:

Table 4-1 Shows frequency of distribution of gender:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	25	50.0	50.0	50.0
	Female	25	50.0	50.0	100.0
	Total	50	100.0	100.0	

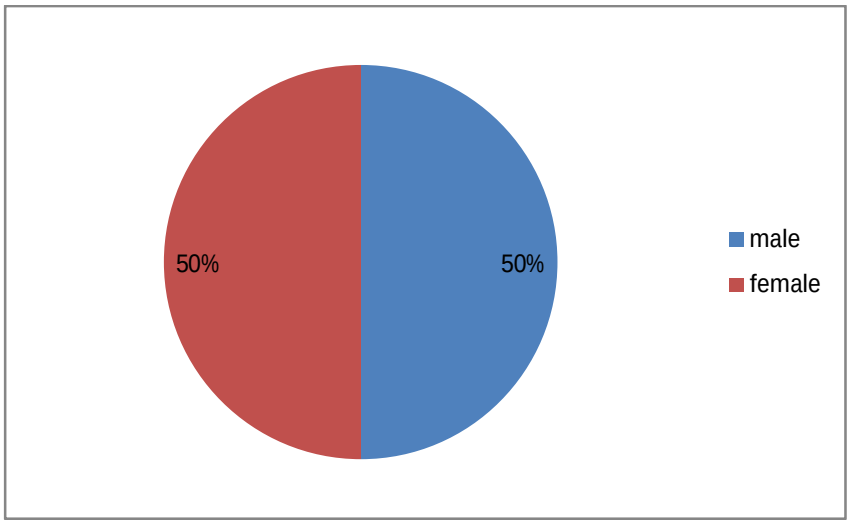

Figure 4-1 Shows gender distribution

Table 4-2 shows frequency distribution of occupations

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Merchant	4	8.0	8.0	8.0
	farmer	4	8.0	8.0	16.0
	Employee	8	16.0	16.0	32.0
	teacher	1	2.0	2.0	34.0
	free work	11	22.0	22.0	56.0
	house keeper	22	44.0	44.0	100.0
	Total	50	100.0	100.0	

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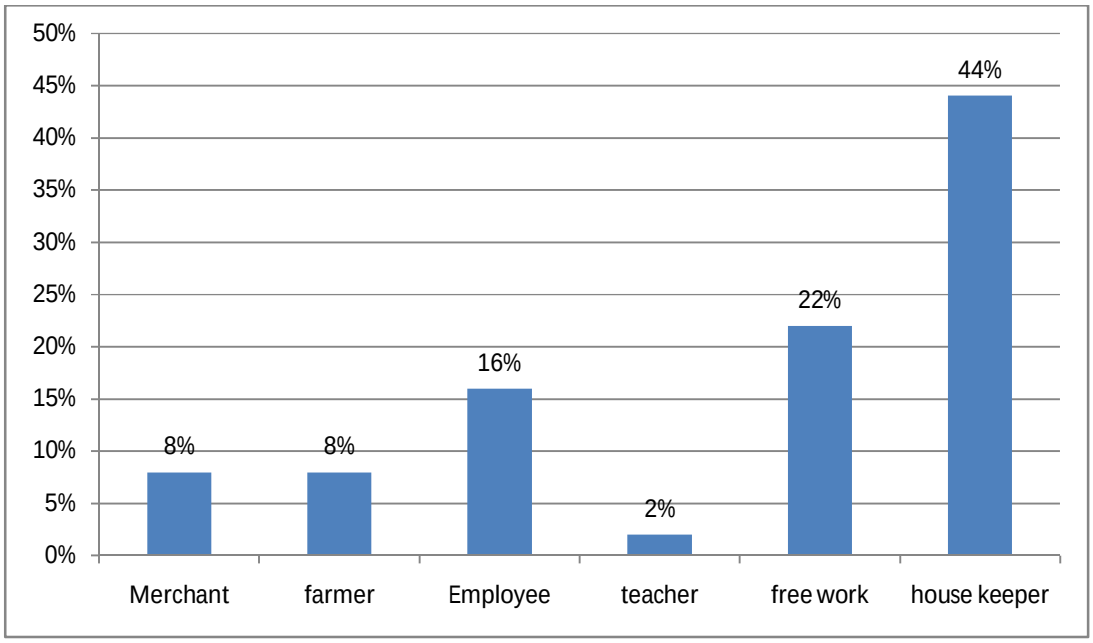

Figure 4-2 Shows frequency distribution of occupations

Table 4-3 Shows the frequency distribution of clinical signs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Dysurea	11	22.0	22.0	22.0
	Polyurea	14	28.0	28.0	50.0
	Fever	5	10.0	10.0	60.0
	Edema	9	18.0	18.0	78.0
	Polyurea & Fever	11	22.0	22.0	100.0
	Total	50	100.0	100.0	

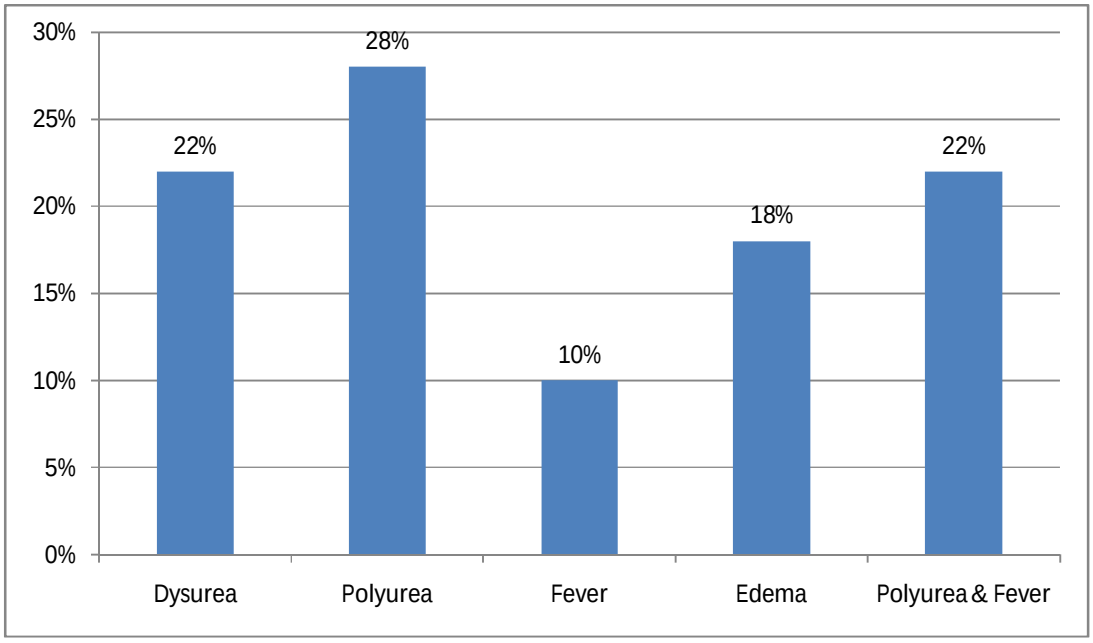

Figure 4-3 Shows the clinical signs distribution

Table 4-4 shows the descriptive statistics of lab findings

	N			Mean	Std. Deviation
Creatine	50			10.5460	2.18793
Blood Urea	50			111.6100	26.04963
Total	50				

Table4-5 Shows the descriptive statistics of right kidney measurement.

	N	Minimum	Maximum	Mean	Std. Deviation
Length	50	3.10	9.60	7.3540	1.37027
AP	50	1.00	4.00	3.1760	.59575
Thickness	50	2.00	3.100	2.580	.55640
Valid N (listwise)	50				

Table 4-6 shows the frequency of right kidney outlines distributions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Irregular	29	58.0	58.0	58.0
	regular	21	42.0	42.0	100.0
	Total	50	100.0	100.0	

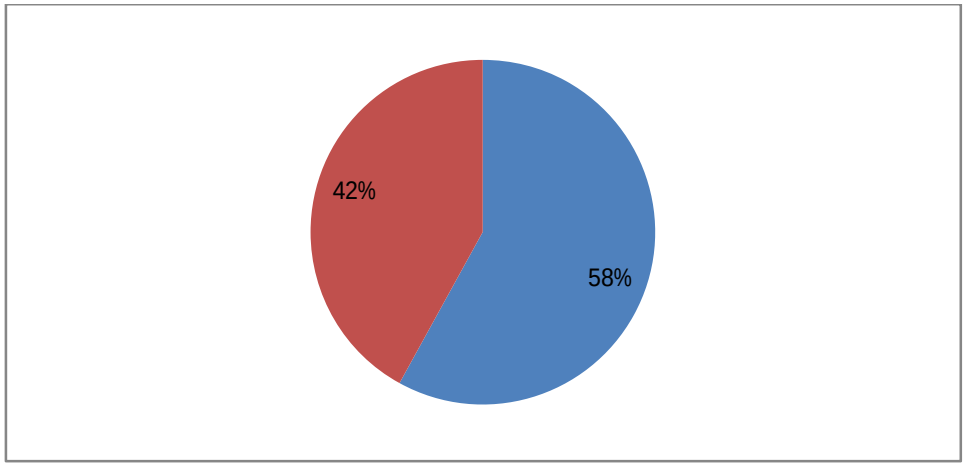

Figure 4-4 Shows the out lines of right kidney distribution

Table 4-7 Showes the Right kidney CMD frequency distributions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Decrease	20	40.0	40.0	40.0
	Loss	30	60.0	60.0	100.0
	Normal	0	0	0	
Total		50	100%		

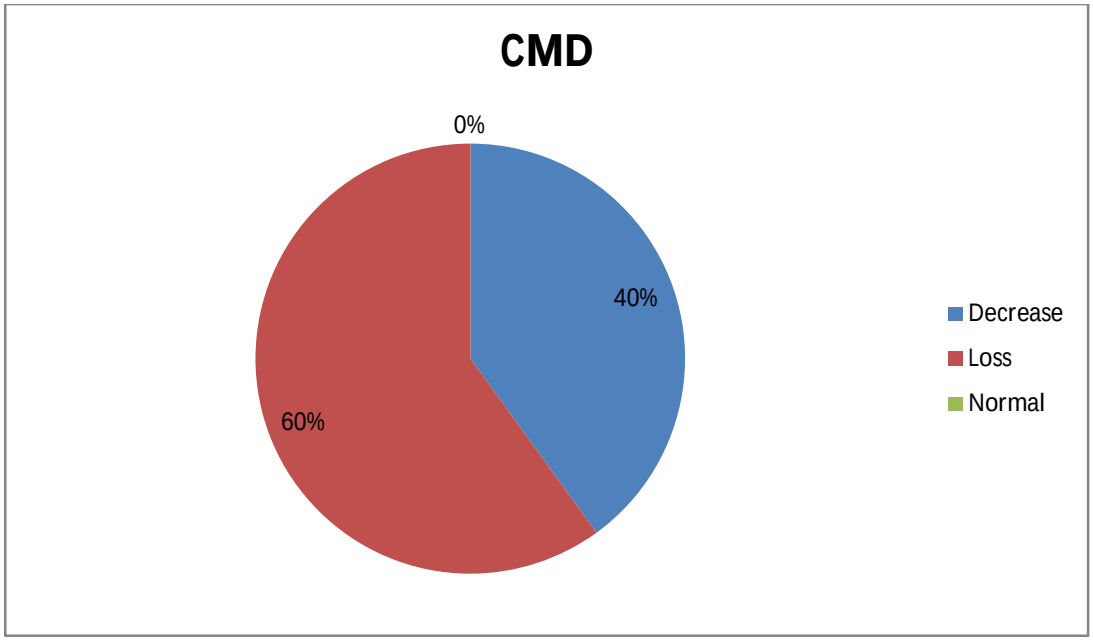

Figure 4-5 Shows the CMD frequency distribution

Table 4-8 Shows the cortex echogenicity of right kidney frequency distribution

Echogenicity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Hyper	41	82.0	82.0	82.0
	Hypo	9	18.0	18.0	100.0
	Total	50	100.0	100.0	

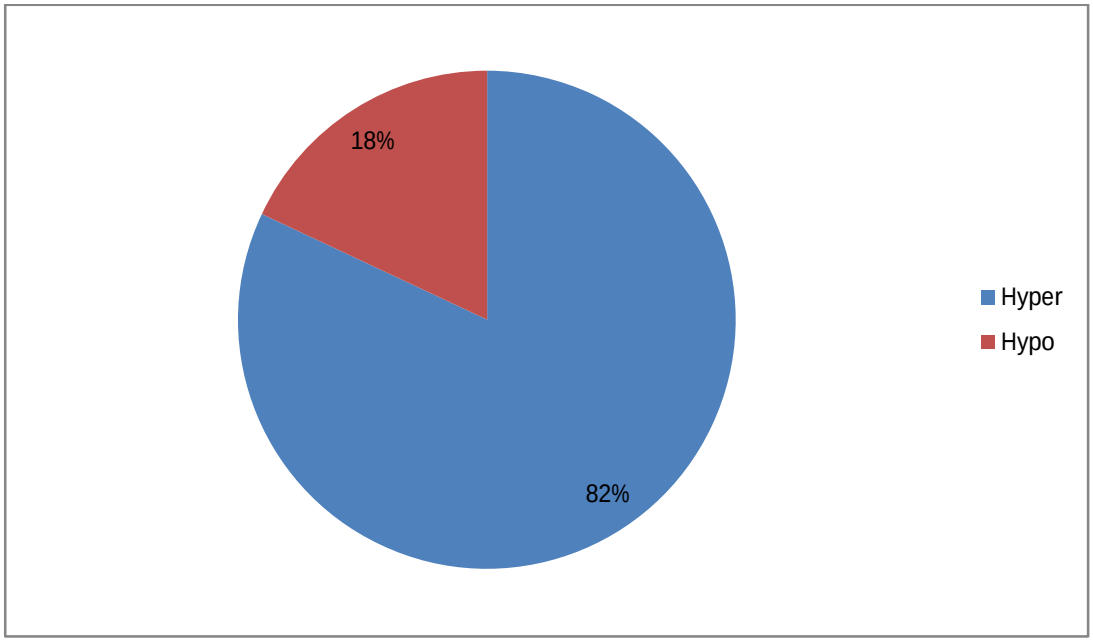

Figure 4-6 Shows the cortex echogenicity of right kidney distribution

Table 4-9 shows the frequency of presence of hydronephrosei right kidney

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	3	6.0	6.0	6.0
No	47	94.0	94.0	100.0
Total	50	100.0	100.0	

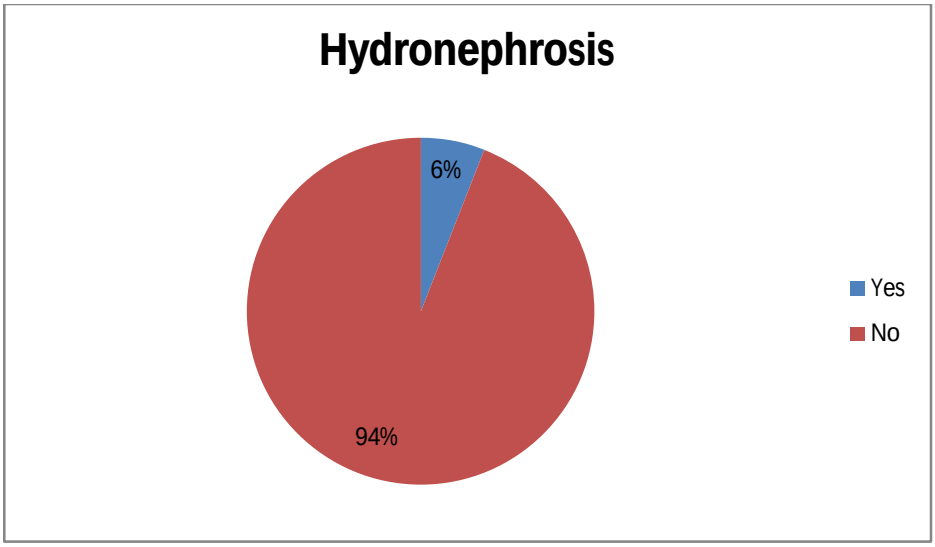

Figure 4-7 Shows the presence of hydronephrosis in right kidney distribution

Table 4-10 shows the frequency of presence of stone in right kidney

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	found	10	20.0	20.0	20.0
	Not found	40	80.0	80.0	100.0
	Total	50	100.0	100.0	

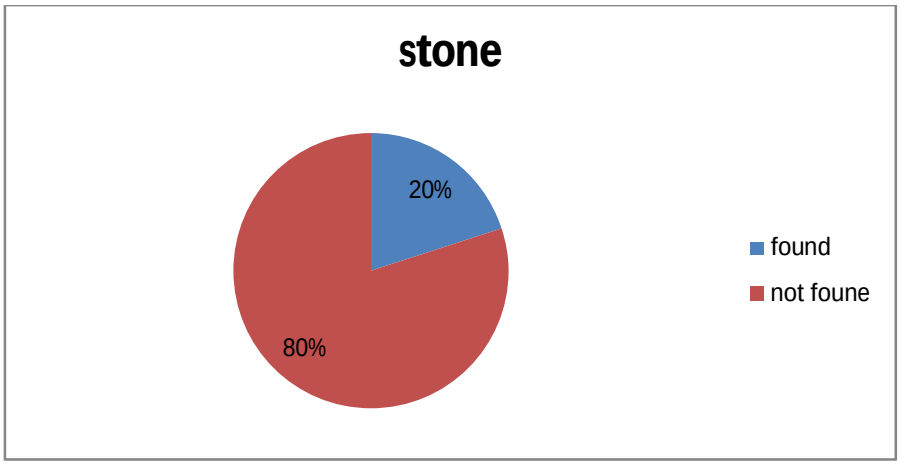

Figure 4-8 Shows the presence of stone in right kidney

Table 4-11 Shows the frequency of presence of masses in right kidney

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Cyst	10	20.0	20.0	20.0
	Non	40	80.0	80.0	100.0
	Total	50	100.0	100.0	

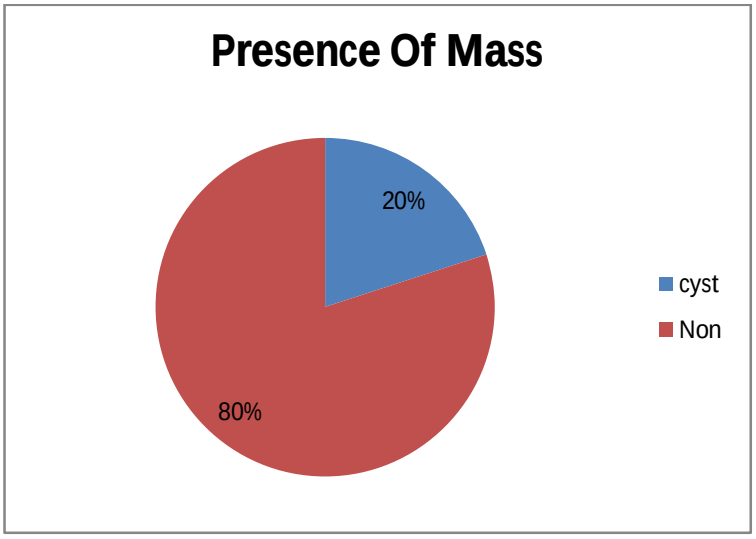

Figure 4-9 Shows the presence of masses in right kidney

Table 4-12 Shows the descriptive statistics measurement of left kidney

	N	Minimum	Maximum	Mean	Std. Deviation
Length	50	3.70	9.00	5.9540	1.44296
AP	49	2.00	4.90	3.0694	.63021
Thickness	49	1.50	3.90	2.3592	.52038
cortex thickness	12	.30	.90	.4750	.17645
Medullar Thickness	12	.60	2.30	1.1250	.44747
Valid N (listwise)	12				

Table 4-13 Shows the descriptive statistics of left kidney out lines:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Regular	25	50.0	50.0	50.0
	Irregular	25	50.0	50.0	100.0
	Total	50	100.0	100.0	

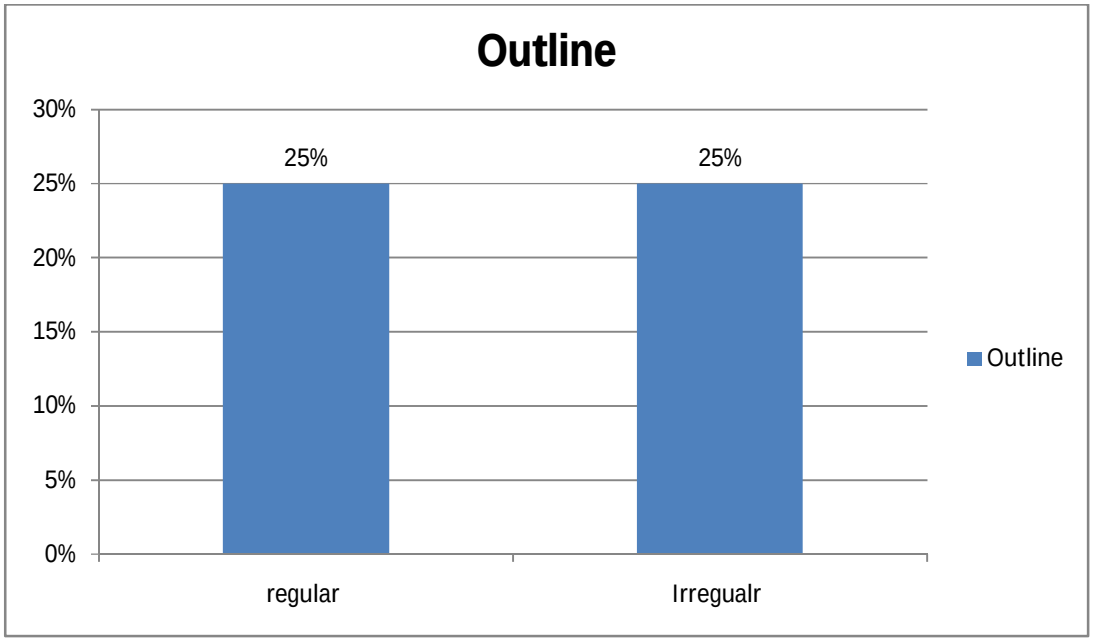

Figure 4-10 Shows the descriptive statistics of left kidney out lines

Table 4-14 Shows the frequency of CMD of left kidney distribution

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Decrease	14	28.0	28.0	28.0
	Loss	36	72.0	72.0	100.0
	Total	50	100.0	100.0	

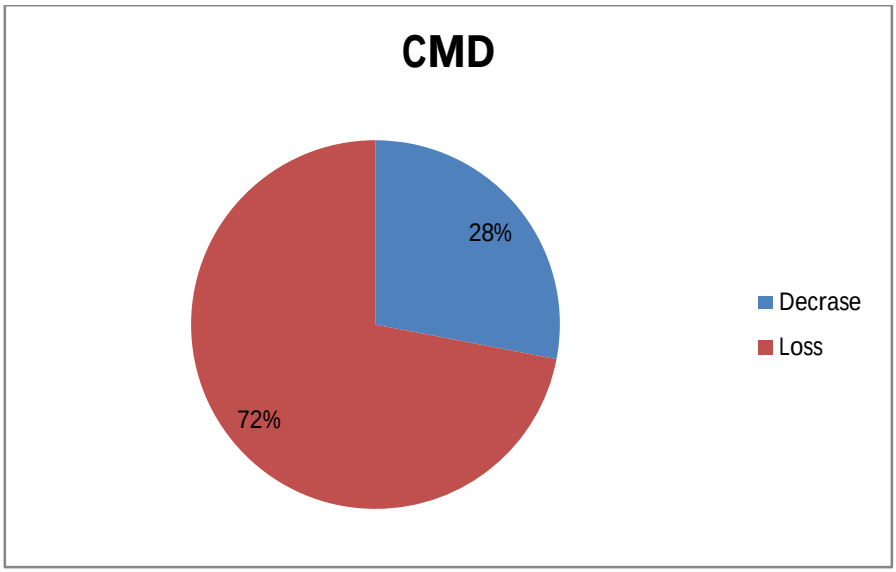

Figure 4-11 Shows the CMD of left kidney distribution

Table 4-15 Shows the frequency of cortex echogenicity of left kidney:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Hyper	41	82.0	82	82
	HYpo	9	18.0	1800	100.0
	Total	50	100	100.0	

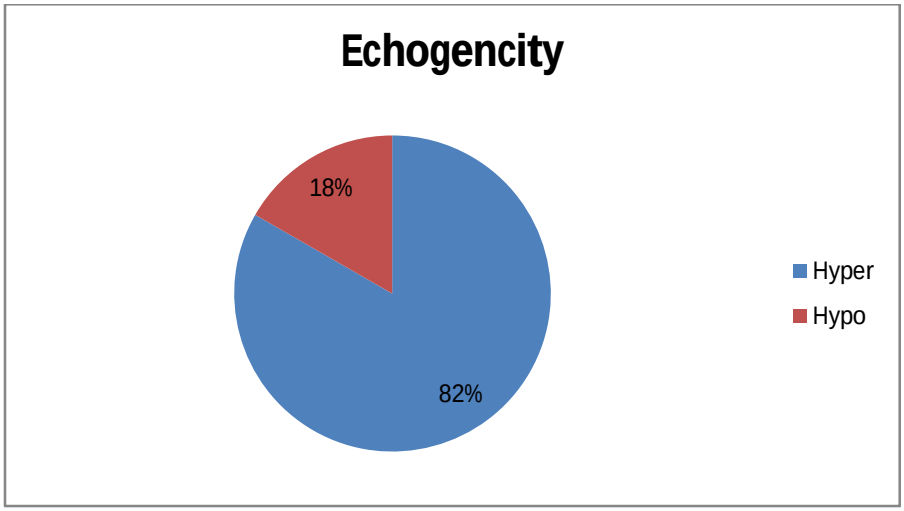

Figure 4-12 Shows the cortex echogenicity of left kidney

Table 4-16 Shows the frequency of presence of stones in left kidney:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	found	5	10.0	10.0	10.0
	Not found	45	90.0	90.0	100.0
	Total	50	100.0	100.0	

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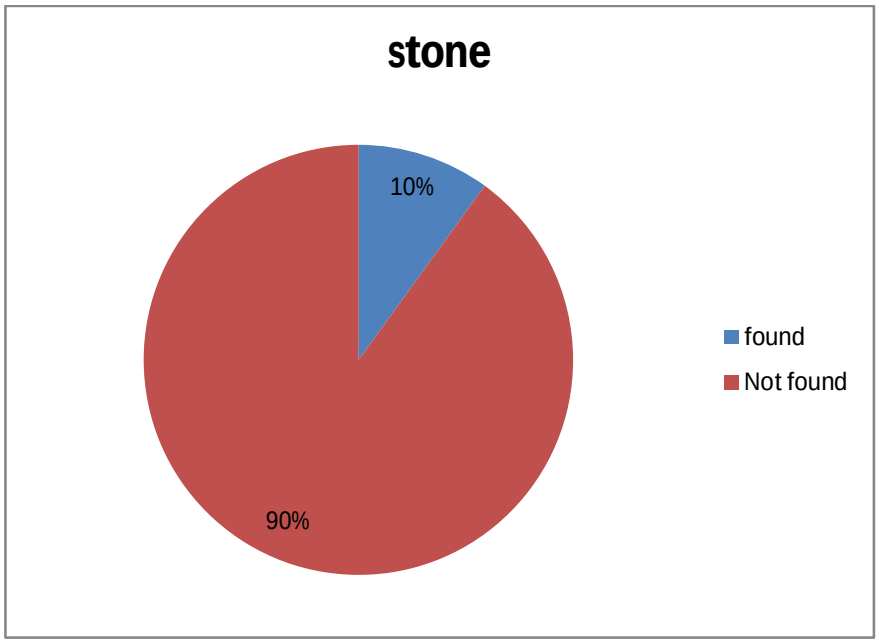

Figure 4-13 Shows the presence of stones in left kidney

Table 4-17 Shows the frequency of presence of masses in left kidney:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Cyst	12	24.0	24.0	24.0
	Non	38	76.0	76.0	100.0
	Total	50	100.0	100.0	

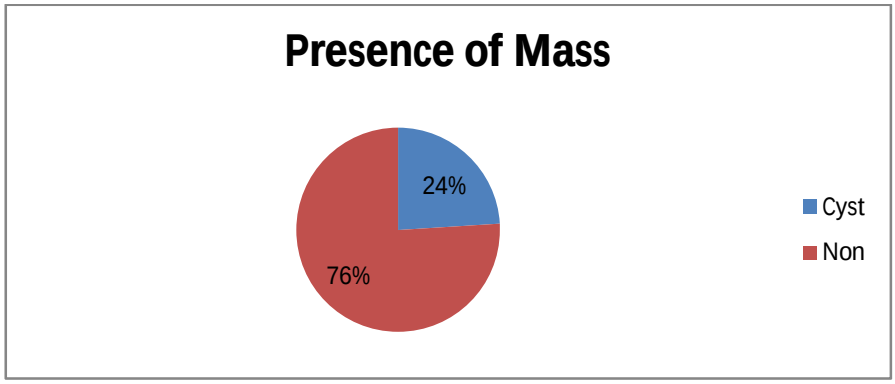

Figure 4-14 Shows the presence of masses in left kidney

Chapter Five

Discussion, Conclusion and

Recommendations

5.1 Discussions:-

The study done to evaluate the role of U/S in early detection of chronic renal failure, In which there were fifty symptomatic patients with CRFevaluated descriptively with U/S.

Study showed that; the mean age of patients under study was 48 years old, these means productive age group has got high significance, similar result achieved by BadreAdin.A.Rahim.

Also study found that house keepers had the highest incidence44% and teacher 2% had low incidence(Figure4-2), so the occupation in this study carried out avery low significance with respect to the very high percentage of CRF, similar result achieved byDr: Awadia Gareeb Alla.

There were 11 (22%) patients complained of dysurea, 14 (28%) complained frompolyurea, 5 (10%) patients had fever , 9 patients (18%)had edema and 11 patients (22%) hadpolyurea and fever (Figure 4-3), but all patients showed significantly high level of creatinine and blood urea(Table4-4).

Study showed that U/S findings of chronic renal failure were decreasedrenal sizewith thin cortex(Table4-5), irregular out lines (Table4-12), (Figure4-4)and(Figure4-10),decrease or loss of CMD (Figures 4-5, 4-11) ,hyper echoicogeniciy of kidney(Figures 4-6, 4-13).Some of them showed other associated sonographic findings mainly cysts, stonesand hydronephrosisasshown in(Figures 4-7, 4-8, 4-9, 4,13 and 4-14) which were resulted by BadreAdin and Awadia.

5.2. Conclusions:-

This study was proved its hypothesis that; the U/S scanning is accurate, noninvasive, inexpensive, available and easily tool for evaluating patients with different renal diseases especially chronic renal failure.

Study found that; the mean age of patients under study was 48 years old; these means productive age group has got high significance

U/S findings of chronic renal failure were decreased renal size with thin cortex, irregular out lines, hyper echoicogeniciy of kidney and decrease or loss of CMD with or without association of cysts,stones and hydronephrosis.

5.3. Recommendations:-

- Ultrasound scanning should be used in every patient with renal pathology.
- The ultrasound machine should be available and important for early detection and differentiation between two types of renal failures.
- Ultrasound scanning should be done with tissue harmonic imaging
- All housekeepers must an annual medical examinations with espical attention to the renal system
- The operator should update their knowledge and any information regarding U/S
- Governmental hospitals should provide excellent advanced machines.
- According to the high cost of scientific research which the researcher was faced, the government should appeal universities in Sudan and companies to support the researchers in order to improve plans of treating and management of such diseases.
- Further studies should be carried out in this field on many aspects such as increasing the number of patients, comparing between the role of U/S scanning and other diagnostic tools such as laboratory investigation and using color Doppler ultrasonography.

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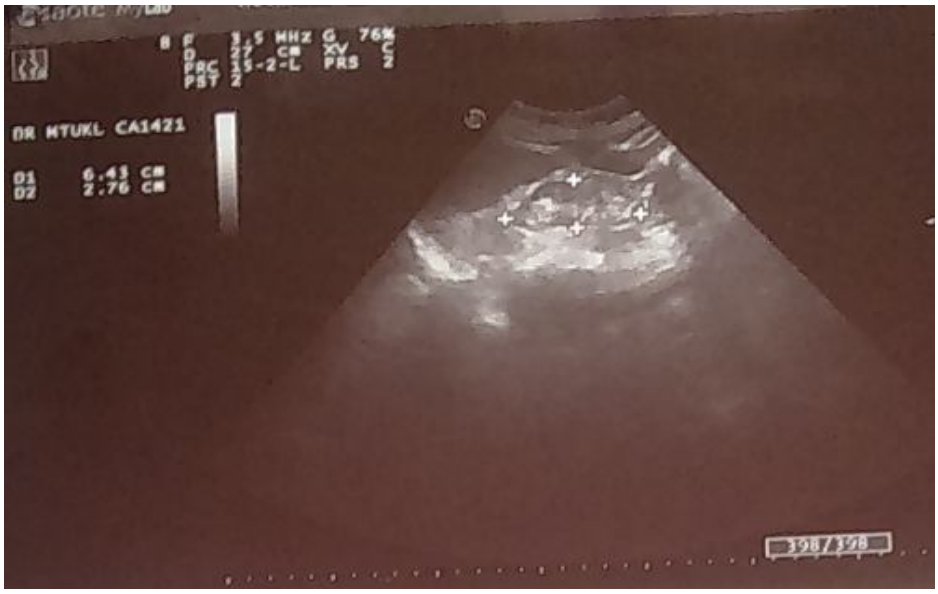
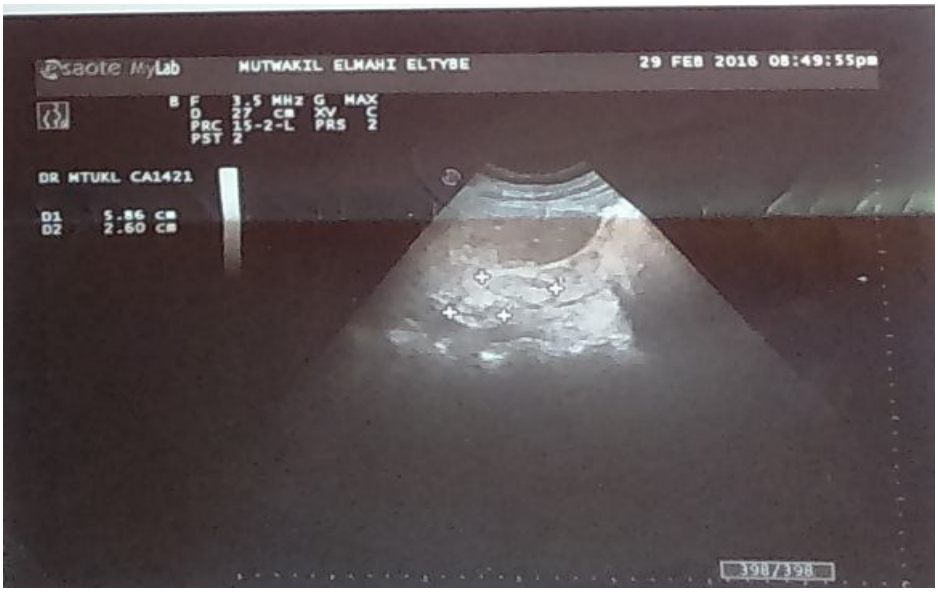
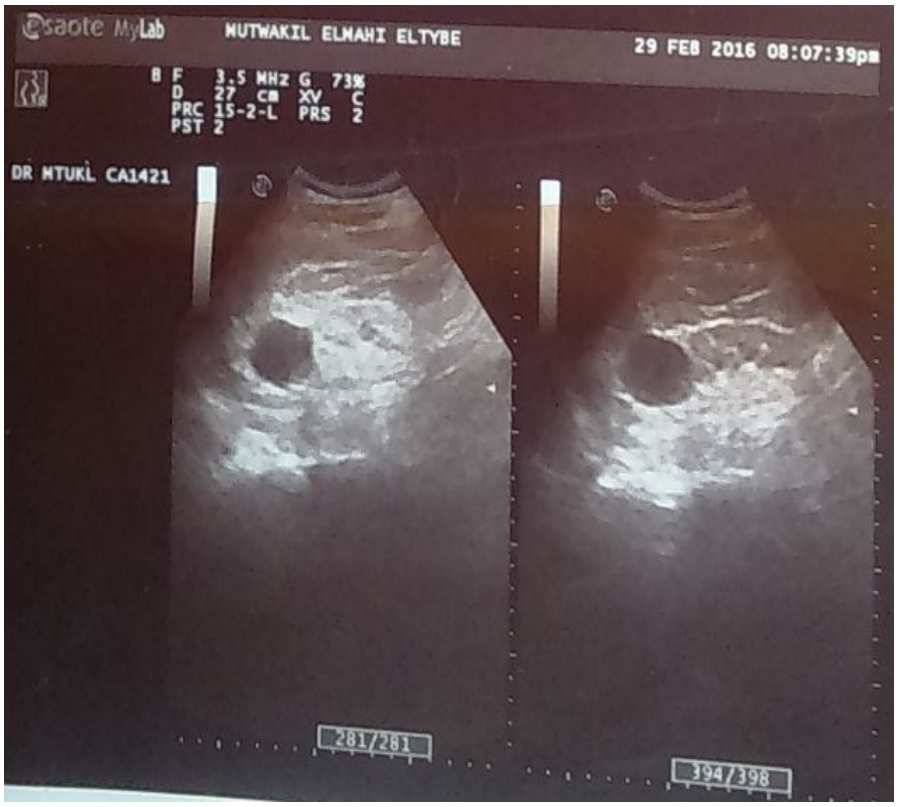
Appendices



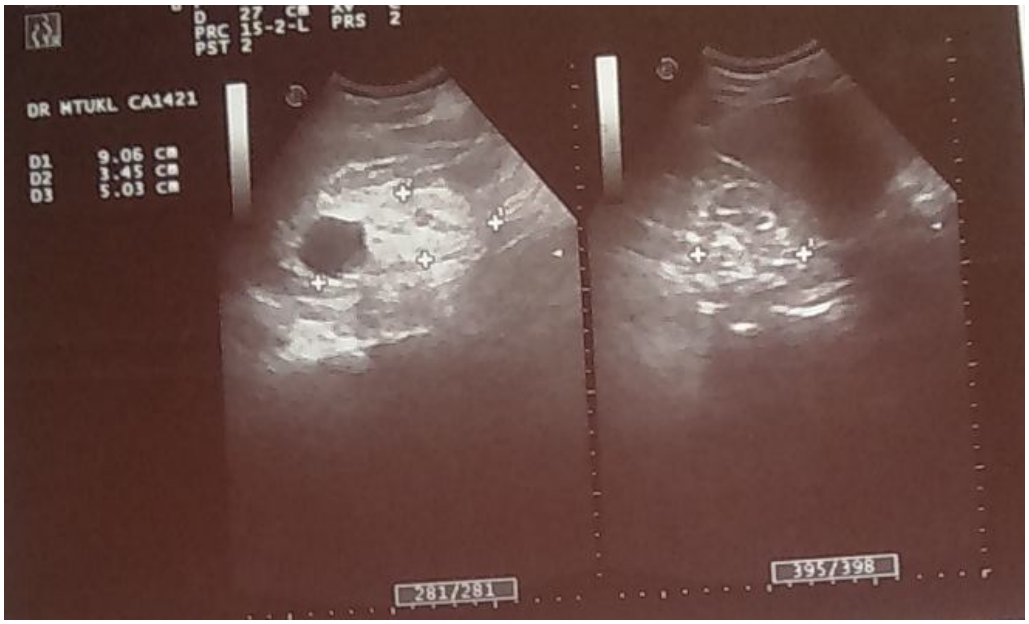
Appendex(1): U/S image of male of 60years old had CRF shows small size and hyper echoic kidney



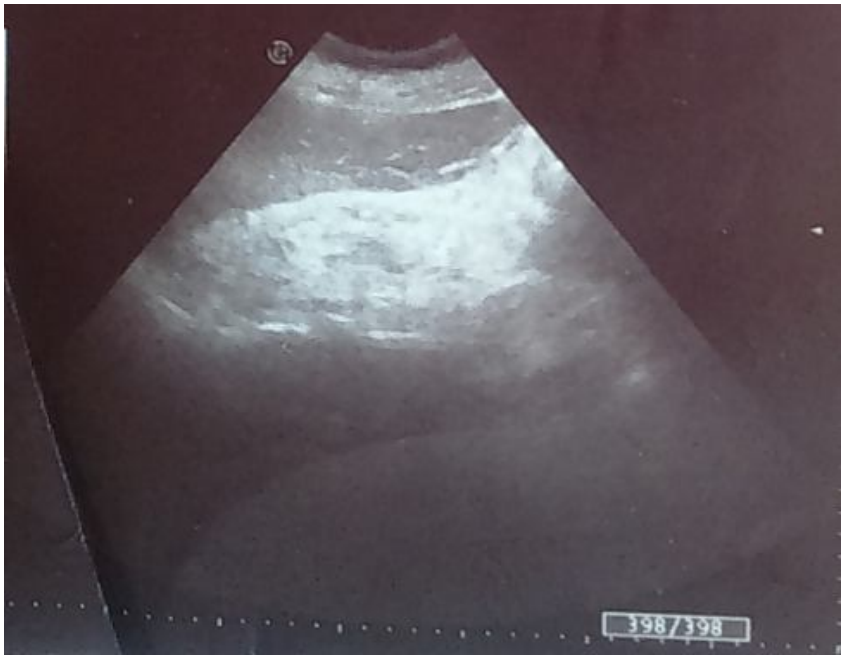
Appendex (2): U/S image of male 60 years old had CRF shows small size and hyper echoic kidney with lose of CMD.



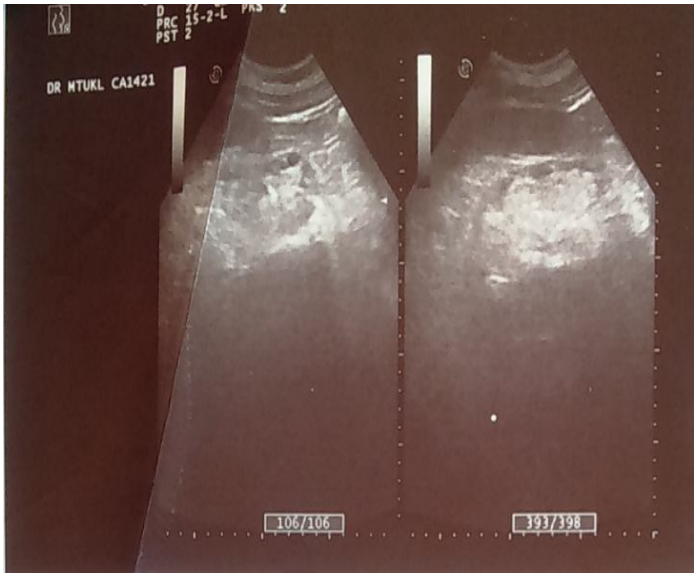
Appendex(3): U/S image of male57years old had CRF shows cyst.



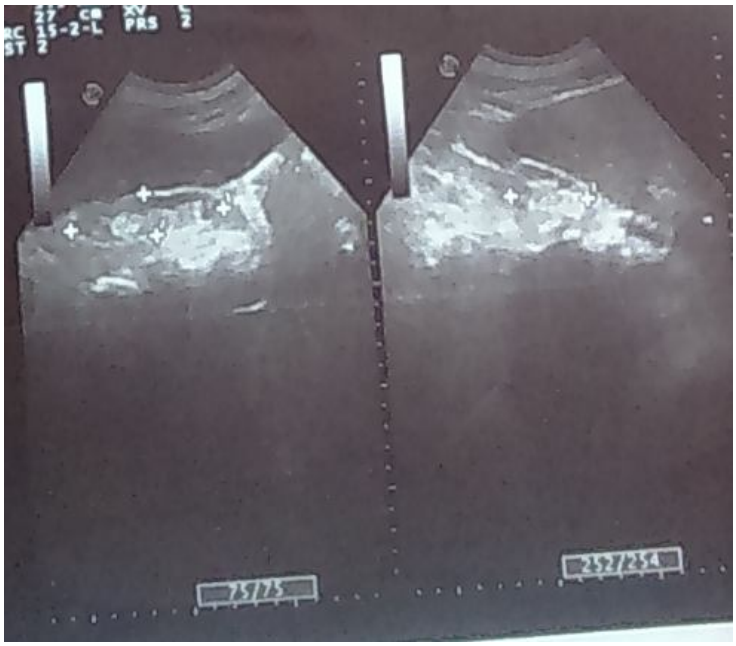
Appendex(4): U/S image of male57years old had CRF shows cyst and stone.



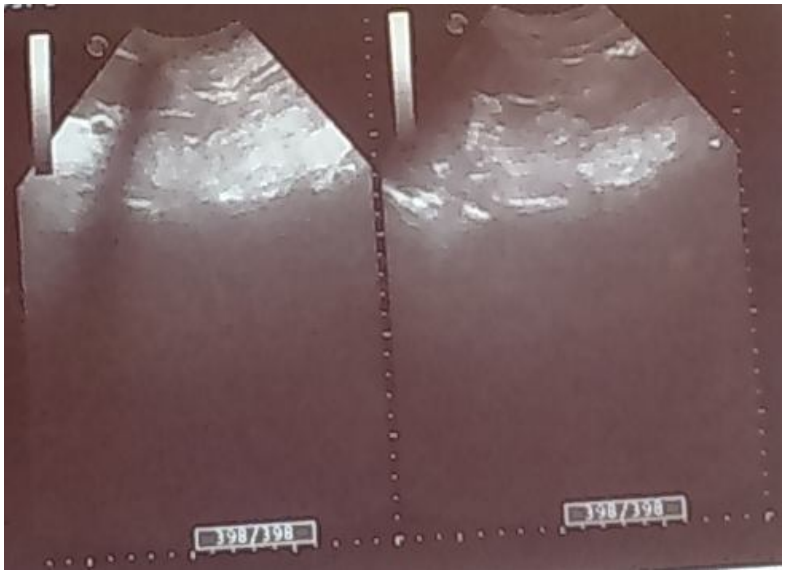
Appendex(5): U/S image of female 47years old had CRF shows hyper echoic ,irregular out line and loss of CMD.



Appendex(6): U/S image of female 47years old had CRF shows small kidney, irregular out line and hyper echoic.



Appendex(7): U/S image of female60 years old had CRF shows small kidney, hyper echoic, irregular out line .



Appendex(8) U/S image of female 60 years old had CRF shows small, hyper echoic ,irregular out line kidney with small stone.