بسم الله الرحمن الرحيم

Sudan University of Science and Technology

Collage of Graduate Studies

Diagnosis of Renal Infection using Ultrasonography

تشخيص التهاب الكلي باستخدام الموجات فوق الصوتية

A thesis submitted for partial fulfillment for Master of Science

In diagnostic medical ultrasound

Presented by:

Amal Ahmed Abd Amajed Almahjuob

Supervised by:

Caroline Edward Ayad

2017

الايـه

بسم الله الرحمن الرحيم

قال الله تعالى:

اقْرَأْ بِاسْمِ رَبِّكَ الَّذِي خَلَقَ(١)خَلَقَ الْإِنسَانَ مِنْ عَلَقٍ(٢)اقْرَأْ وَرَبُّكَ الْأَكْرَمُ(٣) الَّذِي عَلَّمَ بِالْقَلَمِ(٤)عَلَمَ الْإِنسَانَ مَا لَمْ يَعْلَمْ(٥)

﴿صدق الله العظيم﴾

سورة العلق)الايات 1-5)

Dedication

To those who were the cause of my being come into existence

My Mother….

&

My Father….

To

myHusband ….

&

my sisters,brothers

whom always support and helped me all the time.

ACKNOWLEDGEMENT

First I am grateful to Allah as he helped me to gain knowledge to finish this research. He also gave me health and patience to overcome the difficulties. So I am thankful to him all my life.

Secondly my thanks also to my supervisor Dr. Caroline Edward Ayad

who devoted hertime and generously gave her knowledge and experience to me without limits. she opened canals between me and him to contact at any time.

I should not forget Dr.Mamoun Elbashir who helped in data collection and introduce me to Elmick Nimir University Hospital.He also had taken my first 27 samples.

My thanks extended to Elmic Nimir University Hospital which is the place where I took all my samples.

At last I thank my colleagues who helped me to finished my research.

Abstract

The objective of this study was to characterize the kidney's appearance in patients with uncountable pus cells in the laboratory test. This study was done on 50 patients suffering from symptoms of renal infection with positive laboratory findings..The study was obtained at ElmickNimirUniversity Hospital during the period between 3-12-2016 to29-1 2017.

All patients with uncountable puss cells were included in the study and those with normal laboratory tests were excluded. All patients' kidneys were scanned in sagital coronal, and cross section. The length width and depth were registered. Each exam was documented in thermal image. All patients were evaluated sonographically using FukISDAmodd:Uf870 machine with convex low frequency transducer 3.5MHz. Data was collected using the following variables: Age, gender, kidney volume,Renal cortex echogenicity (normal or echogenic), corticomedullary differentiation (good or poor). Patient's age included in the study was between 25-65years old. The results of renal scanning were that there is significant relation between the diagnosis finding/ with renal cortex echotexture for Both kidneys at p=0.059/ and 0.059.

As well as corticomedullary differentiation at p=0.020 for the Rt kidney and also there is significant relation with the amout finding for both kidneys.

The renal volume increased significant at p=0.000 in pyleonephritis for both Rt and Lt kidneys.

المستخلص

ان الغرض من هذه الدراسه هو تمييز مقدار صدى الكلى في المرضي الذين توجد لديهم خلايا صديدية غير معدودة وفقا للفحص المعملي. وقد اجريت هذه الدراسه علي 50 مريضا يعانون من اعراض التهاب الكلي ولديهم نتيجة فحص معملية موجبة (خلايا صديدية غير معدودة) بمستشفي المك نمر الجامعي في الفترةبين 3-12-2016 الي 2017/1/29م. وشملت الدراسه كل المرضي الذين لديهم خلايا صديدية غير معدودة. واستثني منها كل الذين يبين الفحص المعملي ان نتيجتهم طبيعية. تم فحص كلي جميع المرضي طوليا وعرضيا ومقطعيا. وسجل الطول والعرض والعمق ووثق كل فحص في صورة.وتم تقويم حالات جميع المرضي بالموجات فوق الصوتيه بماكينه(FUAKISDAmodd:UF870) باستخدام مجس محدب ذات تردد منخفض 3.5 ميقا هيرتز. جمعت البيانات باستخدام المتغيرات الاتية: اعمار المرضى ، وحجم الكلي ، ومقدار الصدى الراجع من الكلى ، وحالة اللحاء (عادي او لامع)، ومقدار تميز اللحاء والنخاع (جيد او ضعيف). المرضى الذين شملوا في الدراسة كانت اعمارهم بين 25. 65 عاماً.وتبين هذه الدراسه فقدان التمييز بين اللحاء والنخاع ولمعان اللحاء لبعض مرضي التهاب الكلي الحاد. ولا يوجد تغير يذكر حجم كلي المرضى المتأثرين.

Table of Contents

Chapter Four : Results

Chapter five : Discussion , Conclusion and Recommendations

List of Tables

List of Figures

List of Abbreviations

SMA	Superior mesenteric artery
RRA	Right renal artery
RRV	Right renal vein
LRA	Left renal artery
LRV	Left renal vein
IVC	Inferior vena cava
JGA	Juxta glomeruter apparatus
UTIs	Upper urinary trace infection
UTI	Urinary trace infection
WBCs	White blood cells
CT	Computer-tomography
CMD	Corticomedullary differentiation
LK	Left kidney
RK	Right kidney

Chapter One

Chapter One

1- Introduction

Bacterial infections of urinary tract are very common. The organism may reach the kidneys ascending from the lower tract (usually) or seldom with blood. Ascending infections are common, especially in females. They are generally promoted by obstruction or reflux.

Common types are: acute pylonephritis, chronic pylonephritis, anthgranul-omatous, emphysematous pylonephritis, and tuberculosis of the kidney Predisposing factors for this are:

Recent sexual intercourse, use of Intrauterine Contraceptive Device, pregnancy. Lack of estrogen (whether menopausal, surgical, or congenital). Obstruction of the urinary tract, such as that resulting from benign prostatic hyperplasia, tumors, or use of cholinergic drugs. Ultrasound adds information to the radiographic evaluation of infants after a febrile urinary tract infection. This information alters treatment and parental counseling in a significant number of patients (LOUIS et al., 2005).

1.1 The problem of the study:

Renal infection is acommon cause of morbidity, chronic renal failure, and even ends stage renal disease.

Renal infection should be investigated thoroughly, and managed early as it is curable cause of renal failure.

In some cases the laboratory finding are positive while the ultra sound result were negative.there fore this study was obtained to evaluate the ultra sonographic result for the patients with positive laboratory tests

Characterization of kidneys in patient with renal infection using ultrasonography in order finds connotative value to be able to differentiation between renal infections objectively and give accurate diagnosis

1.2 Objectives of the study

1.2.1 General objective:

- Diagnosis of Renal Infection Using Ultrasonography

1.2.2 Specific objective:

- To measure (length, width and volume) of kidneys.
- To evaluate the corticomedullary differentiation. (Good, poor).
- To evaluate parenchymal echogenicity (normal, increase, decrease)
- To correlate the final diagnosis with CMD and renal volume.

1.3 Overview of the study:

Chapter one: deal with introduction,background information, previous studies Basic description of the problem under study.Chapter two included literature review Anatomy of the kidneys, Physiology of the kidneys, Pathology of the kidneys Ultrasound appearance of the kidneys, Chapter three: deal with material and method.Chapter four:deal with result and analysis.Chapter five:.discussion Conclusion, Recommendation, References,and appendices

Chapter Two

Literature Review

Chapter Two

2.Literature Review and Theoretical Background

2.1 Anatomy Of The Kidneys:

As early as the third week of embryonic development, the kidneys begin to form from the columns of mesoderm (Intermediate mesoderm). At successive intervals, three pairs of kidneys differentiate: the pronephros, the mesonephros, and the metanephros and paramesonephric ducts.(Michael S,2010)

The pronephros (forekidney) is a transitory, nonfunctional structure that appears early in the fourth week of gestation. It degenerates rapidly, leaving nothing more than a duct to be utilized by the next kidney. Late in the fourth week, the mesonephros (midkidney) forms just caudad to the pronephros. This structure provides partial function while the permanent kidney continues to develop. By the end of the embryonic period and prior to degeneration, the mesonephros claims the pronephric duct and becomes known as the *mesonephric duct*. In the male, the mesonephric duct (wolffian) persists and develops into the male epididymis, the ductus deferens, and the ejaculatory duct. In the female, the mesonephric duct develops into the paramesonephric duct (müllerian), and eventually into the uterus and vagina. During the fifth week of gestation, the metanephros (permanent kidney) appears as hollow ureteric buds that push upward from the mesonephric duct. The expanded distal ends form the renal pelvis, associated calyces, and collecting tubules; the mesonephric duct, the unexpanded proximal portion, forms the ureters.:Michael S,2010)

The nephrons, the functional units of the kidney, arise from the intermediate mesoderm around each ureteric bud. Nephron function begins at approximately 8 weeks. With fetal growth, the kidneys appear to migrate from their pelvic location to the abdomen. These results from the rapid growth of the caudad part of the kidneys. As this so-called migration is not complete until 5 or 6 years of life, the kidneys in infants and young children are located more caudad.(Michael S,2010) The kidneys are about the size of approximately 10- to 12-cm long, 5- to 7.5-cm wide and 2- to 3-cm thick and weigh approximately 130 to 150 g. The kidneys are typically within 2 cm of each other in length. The paired kidneys are reddish brown organs with convex lateral borders and concave medial borders. On the medial border is an indentation or cleft, the renal hilus, which leads into a space called the *renal sinus*. Renal blood vessels, lymphatics, nerves, and the ureter enter or exit the kidney at the hilus and occupy the sinus. Both kidneys are located in the retro peritoneum, lying along the posterior abdominal wall. Three layers of supportive tissues surround each kidney. The innermost layer is the fibrous renal capsule, which covers the surface, is continuous with the outer layer of the ureter at the hilus, and gives a fresh kidney a glistening appearance. The renal capsule serves as a barrier against physical trauma and infection. The middle layer is a mass of perirenal fat, the adipose capsule, which helps to hold the kidney in place against the posterior trunk muscles and cushions it against blows. The outermost layer, the renal fascia, is also referred to as Gerota fascia. The renal fascia is a dense, fibrous, connective tissue surrounding the kidney, the adipose capsule, and the adrenal gland, completelyenclosing them and anchoring these organs to surrounding structures. (Michael S,2010)

Renal vasculature and the fatty encasement are extremely important in holding the kidneys in their normal position; however, it is normal for both kidneys to demonstrate 3 to 4 cm of excursion when a patient changes from a supine to an erect position. *Ptosis*, an abnormal displacement to a lower position, occurs when the amount of fatty tissue dwindles (owing to rapid weight loss) and may precipitate a kinked ureter, resulting in hydronephrosis. ((Michael S,2010))

2.1.1 General Structure Of The Kidneys:

A fibrous tissue capsule: Which is adherent to the renal parenchyma. The capsule provides a specular interface and is well demonstrated on the portions of the kidneys which are located at right angles to the central axis of the sound beam.

The renal parenchyma: Is divided into the cortex and the medulla. The renal cortex is the outer portion of the parenchyma and contains the functional units of the kidney called the nephrons. Columns of renal parenchyma extend centrally between the renal pyramids. The renal columns are also known as the septal cortex or the columns of Bertin. The columns contain the interlobar arteries and veins.

The renal medulla: Consists of conical masses of tissue called renal pyramids. The bases of the pyramids are directed toward the cortex and the apices of the pyramids converge toward the renal sinus. The apices form pointed processes called papillae. The papillae project into minor calyces which are cup-shaped structures that drain into a major calyx. Several major calyces drain into the renal pelvis. The pyramids consist of collecting tubules which convey urine from the nephrons into the minor calyces. Each lobe of a kidney will consist of a pyramid capped by cortical substance. The number of lobes is variable. (Richard D,2009)

The collecting system: consists of the renal pelvis which divides within the renal sinus into 2-3 large branches called major calyces. Each major calyx divides into several short branches called minor calyces. The expanded end of each minor calyx is molded around 1-3 renal papillae. The major calyces are demonstrated on Scans as fine extensions from the pelvis which end in cup-shaped structures near the apices of the pyramids. (Richard D,2009)

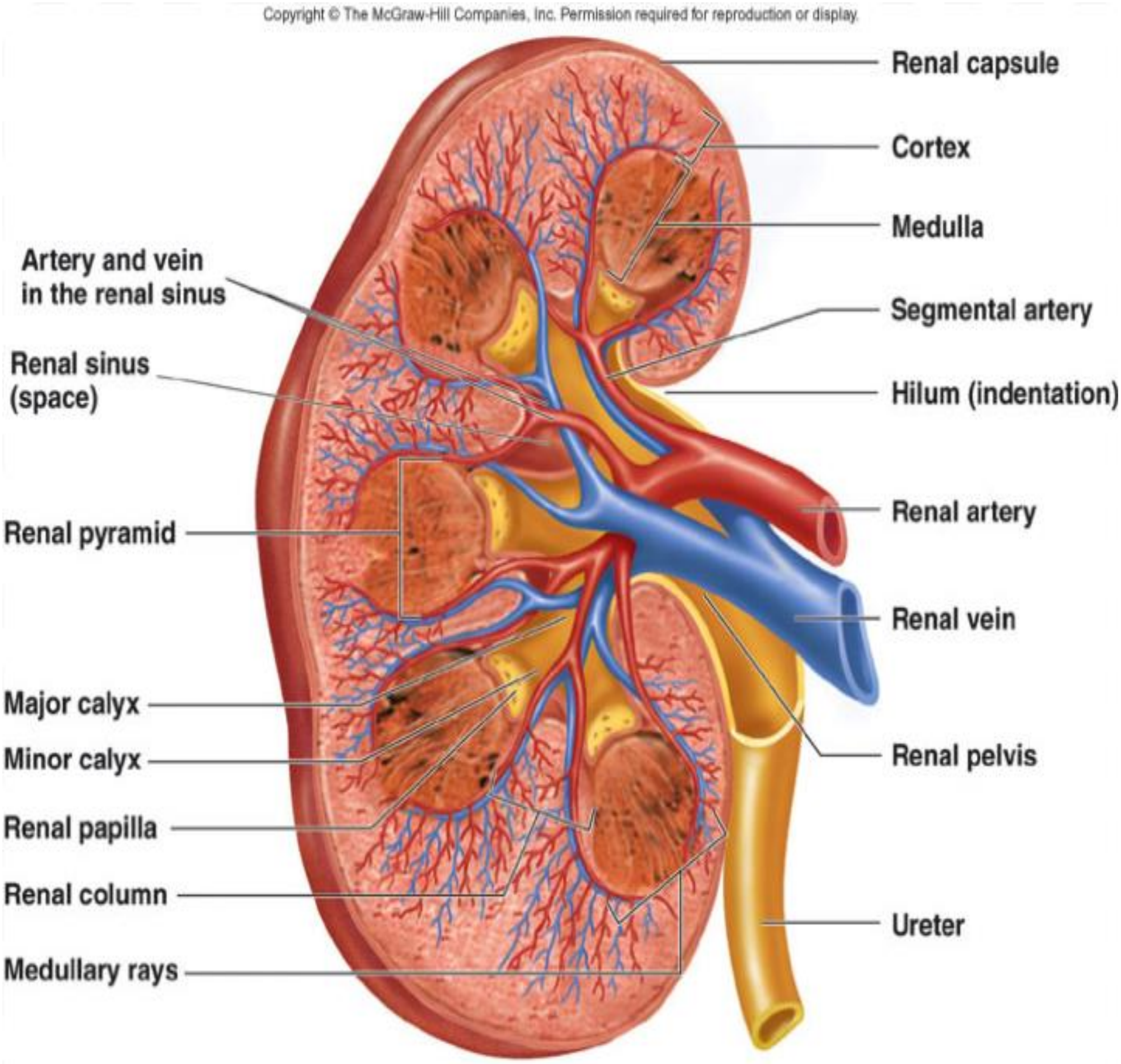


Figure (2-1) Renal Anatomy (www.e.medicine.com)

2.1.2 Relation Anatomy:

Anterior Surface:In most patients, the right kidney is 2 to 8 cm lower than the left owing to the presence of the liver. A narrow portion of the right anterior superior surface is in relation to the right adrenal gland. Inferior to this, approximately 75% of the anterior surface comes in contact with the renal impression on the visceral surface of the liver. The remaining right anterior surface is in contact with the descending portion of the duodenum. Laterally, the right superior anterior surface is in contact with the hepatic flexure and medially with the small intestine. The areas in contact with the liver and small intestine are covered by peritoneum; the adrenal, duodenal, and colic areas are devoid of peritoneum.The left anterior superior surface of the medial border is in proximity to the left adrenal gland. Close to the left anterior lateral border, a long strip is in contact with the renal impression on the spleen. At approximately the middle of the anterior surface lies a somewhat quadrilateral field marking the site of contact with the body of the pancreas. Superior to this is a small triangular portion, between the adrenal and splenic areas, marking the site of contact with the posterior surface of the stomach. Inferior to the pancreatic area, its lateral part is in relation to the colon's splenic flexure and its medial part lies in relation to the small intestine. The areas in contact with the stomach andSpleen is covered by the omental bursa type of peritoneum, whereas the area in relation to the small intestine is covered by the peritoneum of the greater sac. (Richard D,2009)

The adrenal, pancreatic, and colic areas are devoid of peritoneum. Kidney surfaces in direct contact with other organs devoid of peritoneum are frequently referred to as bare areas.(Richard D,2009)

Posterior Surface:The posterior surface of both kidneys lies on the diaphragm, the medial and lateral lumbocostal arches, and the anterior surfaces of the psoas major, the quadrates Lumborum and the tendon of the transversus-abdominis muscles.

Lateral and Medial Borders:The lateral convex border is directed toward the posterolateral wall of the abdomen. On the left side, it is in contact superiorly with the spleen. The median border is directed somewhat anteriorly and inferiorly. The superior and inferior extremities of the medial border are convex. The middle medial border is concave, presenting a deep longitudinal fissure, the renal hilus. Above the hilus, the medial border is in relation to the adrenal gland, below the hilus, with the ureter. The relative position of the main structures in the hilus is as follows: the renal vein is anterior, the artery is in the middle, and the ureter is posterior and directed inferiorly. (Richard D,2009)

Superior and Inferior Extremities:

The superior extremity of the kidney is thick and rounded, closer to the midline than the inferior extremity, and is topped by the adrenal gland, which also covers a small portion of the anterior surface. The inferior extremity is smaller, thinner, is farther lateral, and extends to within 5 cm of the iliac crest. (Richard D,2009)

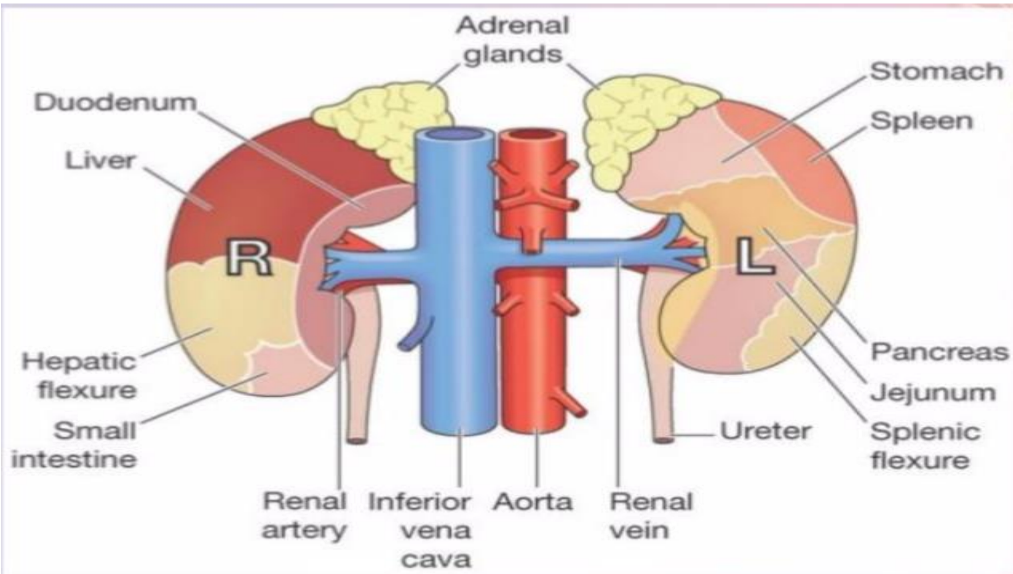
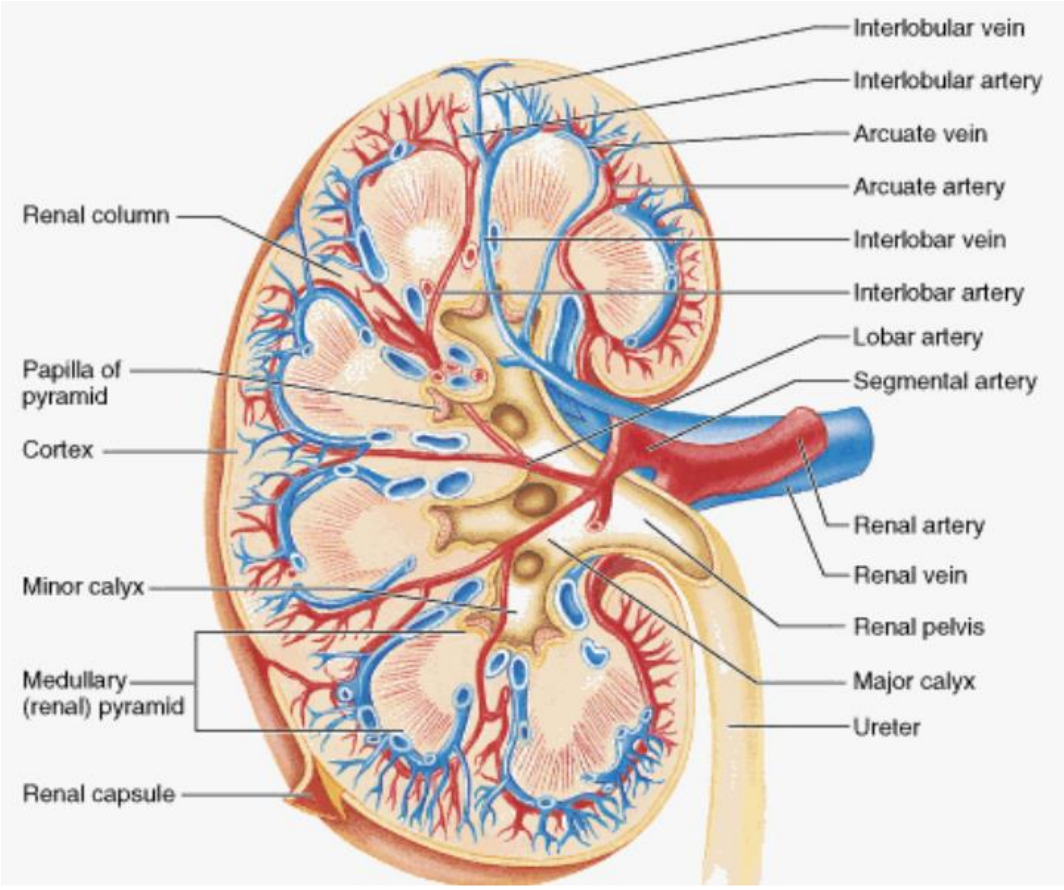


Figure (2-2) Renal Blood Supply(www.e.medicine.com)

2.1.3 Vascular Anatomy:

Just inferior to the superior mesenteric artery (SMA), the renal arteries arise from the lateral aspects of the abdominal aorta. Because the aorta lies to the left of the midline, the right renal artery (RRA) is typically longer than the left. It courses transversely across the crus of the diaphragm posterior to the inferior vena cava (IVC), the right renal vein (RRV), the head of the pancreas, and the inferior portion of the duodenum. The left renal artery (LRA) courses posterior to the left renal vein (LRV), the splenic vein, and the body of the pancreas. The RRV courses anterior to the RRA and enters the right lateral aspect of the IVC at a slightly lower transverse plane than the LRV. Because the IVC is situated to the right of the midline, the RRV is shorter than the left. The LRV courses from the left kidney hilus, passes anterior to the LRA, crosses over the aorta anteriorly, and passes posterior to the SMA before entering the medial aspect of the IVC. (Richard D,2009)

Renal artery: Before or immediately after entering hilus, divides into five segmental (lobar) branches: (1) superior (apical) segmental artery, (2) anterior superior segmental artery, (3) posterior segmental artery, (4) anterior inferior segmental artery, and (5) posterior segmental artery.Segmental (lobar) arteries: Within renal sinus, each segmental artery branches to form interlobar arteries. Interlobar arteries: Pass between pyramids and branch into arcuate arteries at the base of pyramid.Arcuate arteries: Arching branches coursing between medulla and cortex parallel to kidney’s surface.Interlobular arteries: Divisions of arcuate arteries produce a series of interlobular arteries, which travel through cortex toward kidney surface.Afferent arterioles: Interlobular arteries divide into several afferent arterioles, each of which supplies a renal corpuscle and forms a glomerulus, a tangled capillary network.Glomerulus: Blood comes in close contact with cells of glomerular capsule.Efferent arterioles: Reunited glomerular capillaries lead away from glomerular capsule, are smaller in diameter than afferent arterioles, and are unique, as blood usually flows out of capillaries into venules and not into other arterioles Peritubular capillaries Each efferent arteriole of a cortical nephron divides to form a network of capillaries around convoluted tubules called peritubular capillaries.Vasa recta: Efferent arterioles of a juxtamedullary nephron form straight, specialized portions from peritubular capillaries, called vasa recta, and course with loops of Henle into medulla Interlobular veins Peritubular capillaries unite to form interlobular veins, which unite to form arcuate veins. Arcuate veins: Follow same course as arcuate arteries and drain into interlobar veins. Interlobar veins: Course between pyramids and unite to form single renal vein Renal veins: Exit kidney hilus. (Richard D,2009)



Figure(2-3) Renal Vasculature,artries and veins(www.e.medicine.com)

2.1.4 Anatomic Variations:

Dromedary Hump: A common renal variation, called a dromedary hump, is a local bulge of the lateral border of the kidney. The alteration in contour may mimic renal neoplasms. To distinguish bulges from an abnormal mass, document The location along the lateral renal border and demonstrate that the echogenicity of the focal widening is similar to that of the remaining cortex. Usually, a projection from the renal sinus can be identified pointing toward the dromedary hump. (Devin D,2005)

FIGURE (2.4) Dromedary hump Is a prominent bulge on the superolateral border of the left kidney. A hump may look like a renal mass. Careful scanning can usually solve the dilemma as the cortex remains constant in thickness. Lateral kidney bulge, has same echogenicity as the cortex. (Devin D,2005)

Junctional Parenchymal Defect:

The junctional cortical defect (junctional parenchymal defect or interpeduncular junction defect) is a common, normal variant that produces a wedge-shaped, hyperechoic defect in the anterior aspect near the junction of the upper and middle thirds of the kidney. It is frequently classified as a fetal lobulation anomaly but the term lobation is more correct, as the renal lobule is a microscopic unit. The anomaly is a remnant of the junction of reniculi, an incomplete embryologic fusion of the upper and lower poles, which occurs most often on the right kidney but can also occur on the left. A lobation appears as fine linear demarcations indenting the renal surface, separating normal lobes, and consists of a central pyramid and surrounding cortex. To distinguish it from a scar or mass, its typical sonographic appearance is its location and triangular shape, whereas a scar is wider, less well defined, and associated with loss of renal cortex. Lobations typically overlie the space between the pyramids as compared with true renal scars, which are located overlying the medullary pyramids. (DevinD,2005)

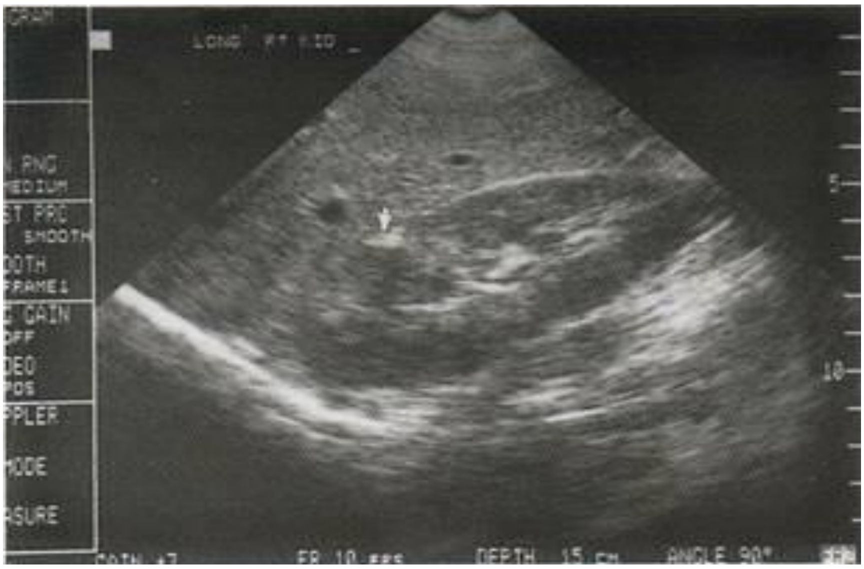


FIGURE (2.5) Junctional fat defect. The highly echogenic wedge shaped area (arrow) represents perirenal fat intervening between two former cortical lobes (DevinD,2005)

Hypertrophied Column of Bertin:

A mass effect may be produced by hypertrophy of the renal column of Bertin. This common anatomic variant occurs when a double layer of renal cortex is folded toward the center of the kidney. They are usually located in the middle third of the kidney, more commonly on the left kidney than the right. If it is suspected, a coronal sonographic image of the renal column should be obtained. The image should have the following characteristics: (1) it indents the renal sinus laterally; (2) it is clearly defined from the renal sinus; (3) its largest dimension is less than 3 cm; (4) it is continuous or contiguous with the renal cortex; and (5) its echogenicity is close to that of the cortex. (DevinD,2005)

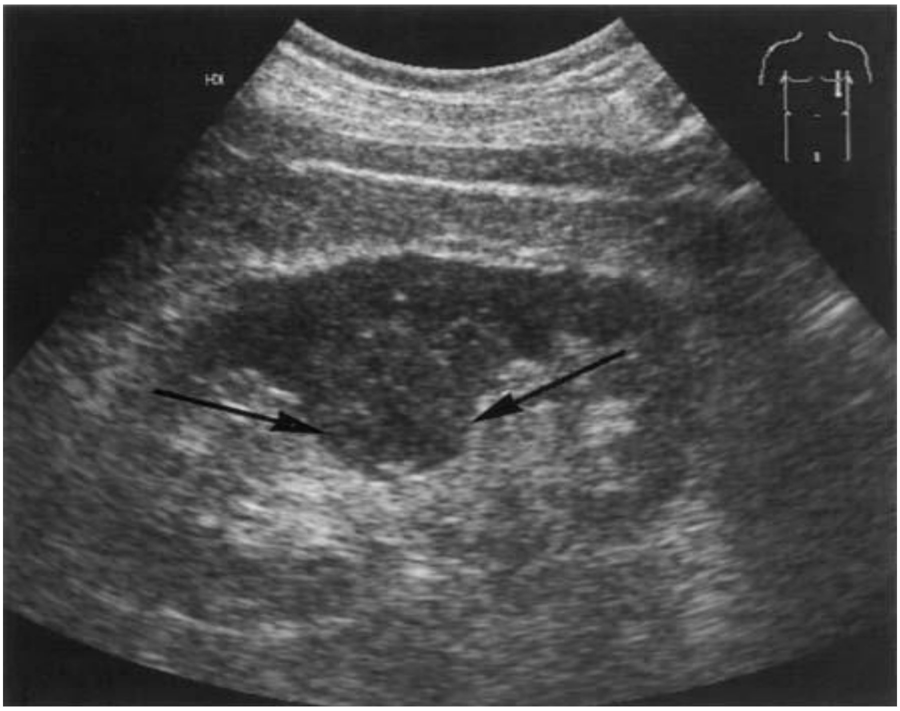


FIGURE (2.6) A double layer of renal cortex that is folded toward the center of the kidney, displacing a portion of the renal sinus. Echogenicity similar to renal cortex. (DevinD,2005)

Renal Sinus Lipomatosis:

Renal sinus lipomatosis (fibrolipomatosis), excessive fatty infiltration of the renal pelvis, can be seen as an anatomic variant due to aging common in the sixth and seventh decades of life, associated with obesity, or a disease process associated with parenchymal atrophy or destruction. Often, it begins with renal calculi, which are found in 70% of cases. Nephrolithiasis is one of the predisposing factors for hydronephrosis, leading to associated infection that results in renal parenchymal atrophy. The void created by ongoing parenchymal atrophy may be filled by an abundant amount of fatty tissue. Thus, replacement lipomatosis can be seen as a sequela of atrophy, chronic calculous disease, and inflammation. Sonographically, lipomatosis may present as an enlarged, well-maintained reniform kidney that is outlined by the hypoechoic rim representing the residual parenchyma, renal capsule,and thick renal fascia. The sinus echo appearances are variable: (1) an enlarged central echogenic complex; (2) adipose tissue that may be relatively anechoic to hypoechoic, giving the impression of mass lesions; or (3) adipose tissue that may be densely echogenic. (DevinD,2005)

FIGURE (2.7) Sinus lipomatosis. Normal renal sonogram on an 87 year old male. The kidney measured 10.2 cm. The cortex appears thinned and the sinus area is more extensive than in a young adult's kidneys (DevinD,2005)

Extra renal Pelvis:

Sonographically, the normal renal pelvis appears as a triangular structure lying within the renal sinus, and its axis is pointed inferiorly and medially. An intrarenal pelvis lies almost completely within the confines of the central renal sinus and is usually small and foreshortened. The extra renal pelvis lies outside the renal sinus and tends to be larger, with long major calyces. On sonography, the extra renal pelvis appears as a central cystic area located partially or entirely outside the kidney. Because it may mimic a pathologic condition, a transverse section should be made to document its continuity with the renal sinus. (DevinD,2005)

FIGURE (2.8) The renal pelvis normally is small. Sometimes it is enlarged and protrudes out from the kidney and called an extrarenal pelvis (DevinD,2005)

2.1.5 Microscopic Anatomy:

Nephron:The cortex and renal pyramids together constitute the renal parenchyma containing the kidney's basic histologic and functional unit, the nephron. Each kidney contains more than 1 million nephrons. Each nephron consists of (1) a renal corpuscle, an enlarged terminal end consisting of the glomerular capsule and its enclosed glomerulus; (2) a renal tubule divided into a proximal convoluted tubule, a perinephric loop (the loop of Henle), and a distal convoluted tubule; and (3) a vascular component. Nephrons are frequently classify ed into two types. A cortical nephron's glomerulus is located in the outer cortical zone, and the remainder of the nephron rarely penetrates the medulla. A juxtamedullary nephron's glomerulus is usually closer to the corticomedullary junction, with longer loops of Henle extending farther into the medulla.. (Richard D,2009)

Juxtaglomerular Apparatus: The nuclei of the smooth muscle cells adjacent to the afferent (and sometimes efferent) arteriole are rounded instead of elongated. These modified cells are called juxtaglomerular cells, and in response to lowered blood pressure, they are thought to secrete an enzyme called renin. Adjacent to the afferent and efferent arterioles, the cells of the distal convoluted tubule become narrower and taller. Collectively, these cells are called the macula densa and are thought to be chemoreceptors or osmoreceptors that respond to changes in the solute concentration of the filtrate. Each nephron's juxtaglomerular apparatus (JGA) is formed from these juxtaglomerular cells and the macula densa.. (Richard D,2009)

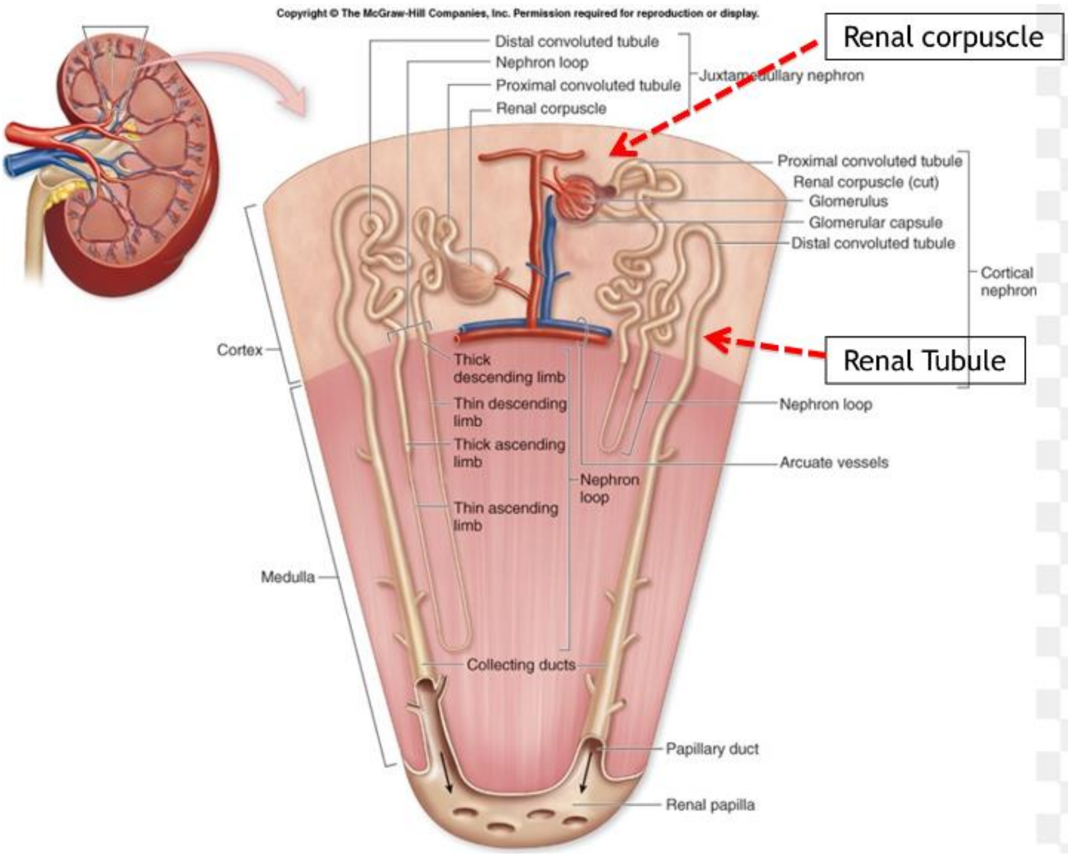


FIGURE (2-9) The Nephrone (www.e.medicine.com)

2.2 Physiology:

To carry out the normal kidney functions of removing wastes from the blood and regulating its fluid and electrolyte content, approximately 1,100 to 1,200 mL of blood passes through the kidneys every minute. This represents 20% to 25% of the total cardiac output transported by the RRA and LRA. The enormous blood flow is related to the fact that, for the kidneys tomaintain blood homeostasis, a considerable amount of blood must pass through the kidneys. More than 90%of the blood entering the kidney perfuses the cortex, containing the nephron, and only a small amount of the blood supplies the kidney's nutritive needs. The kidneys, which process about 180 L (45 gal) of blood-derived fluid daily, are involved in both excretory and regulatory activities. Of the total amount of blood-derived fluid circulated through the kidneys, 99% is filtered and returned for circulation, where as only about 1% is eliminated from the body as urine. The body depends on the efficient functioning of the glomeruli and the renal tubules (nephrons and collecting tubes) to filter the entire plasma volume approximately 60 times a day. As the smallest structural unit capable of producing urine, the nephron is so important that one-third of the nephrons must function simply to ensure survival. Three important nephron functions are: (1) Controlling blood concentration and volume by removing selected amounts of water and solutes. (2) Helping to regulate blood pH. (3) Removing toxic wastes from the blood.Anti diuretic hormone (ADH), secreted by the posterior pituitary, increases the water permeability of the collecting tubule segments (facultative reabsorption)by enlarging the pores, so that water passes easily into the interstitial spaces. (M.Y.Sukkar,2000)

Responsible for maintaining the body's fluid balance, ADH secretion increases in the event of increased water loss (sweating or diarrhea) or reduced blood volume or blood pressure. Aldosterone, secreted by the adrenal cortex, increases the rate of tubular resorption of sodium and produces a concurrent loss of potassium. Extracellular excess of potassium promotes aldosterone secretion, which in turn produces an increase in potassium excretion and sodium retention by the kidneys. Aldosterone secretion is also controlled by the renin-angiotensin system. Renin, secreted by the JGA, increases in response to decreased blood pressure in the afferent arteriole secondary to sodium depletion or to a change from the supine to the upright position. Renin acts as a catalyst on certain plasma proteins to produce angiotensin I, which is converted to angiotensin II by proteolytic enzymes. Angiotensin II increases systemic blood pressure. By acting as a potent vasoconstrictor, it increases peripheral resistance and causes increased blood pressure, and by increasing the rate of aldosterone secretion and tubular reabsorption of sodium, it increases the kidney's ability to retain water and to produce a small volume of concentrated urine. In response to the increased volume of filtrate and increased sodium chloride passing through the JGA, rennin secretion decreases(M.Y.Sukkar,2000)

2.3 Normal Sonographic Appearance:

Although the position varies from patient to patient, the kidneys are normally located between the lower ribs and the iliac crest. For proper localization, surrounding structures should be identified. In relative scanning planes, the liver, gallbladder, second portion of the duodenum, right adrenal gland, and IVC can be identified on the right. On the left, potentially identifiable structures include the spleen, pancreas, fourth portion of the duodenum, left adrenal gland, and aorta. The crus of the diaphragm, psoas muscle, and quadratus lumborum can be identifi ed bilaterally. Once the normal position and location of the kidneys have been established, the contour and internal architecture are observed. The shape and contour of a normal kidney appear smooth. Internally, the kidneys have lobes without the lobular appearance seen in the lung. Each lobe is part of the collecting system and consists of a calyx, a conical medullary pyramid, cortical tissue, and vessels. In the adult there may be 8 to 18 minor calyces, but the average is 9. The minor calyces drain approximately 11 pyramids, and it is normal to have compound calyces draining more than one pyramid. This internal renal architecture presents specific echo amplitudes.(Devin D,2005)

2.3.1 Renal Capsule:

The renal capsule is closely applied but not adherent to the renal parenchyma and appears sonographically as a strong, continuous, linear, secular reflector surrounding the cortex. Sparse perinephric fat, such as in infants, makes this line difficult to visualize. Fetal lobulation can persist into adulthood and give the kidney contour a scalloped appearance that should not be confused with scarring or cystic disease..(Devin D,2005)

2.3.2 Renal Parenchyma:

A coronal section of a kidney reveals three distinct regions: the cortex, the medulla, and the pelvis. The granular-looking outer region, the renal cortex, extends from the renal capsule to the bases of the pyramids and into the spaces between them. The cortical extensions passing between the renal pyramids are called renal columns or columns of Bertin. Deep to the cortex, the renal medulla exhibits triangular or cone-shaped tissue masses called medullary (or renal) pyramids. The broader base of each pyramid faces the cortical area its apex or papilla points are directed toward the center of the kidney. The striated (striped) appearance of the pyramids is due to the presence of straight tubules and blood vessels Surrounding the renal sinus, the two distinct areas of the kidney parenchyma, the cortex and medulla, can be separately distinguished sonographically Differentiation between cortex and medulla is clearest in thin patients and in children. The corticomedullary junction is recognized by discrete, high-level, commashaped, specular echoes from the arcuate vessels and the inward extensions of the column of Bertin. The arcuate arteries are identified arching over the tops of the pyramids..(Devin D,2005)

2.3.3 Renal Cortex:

The normal adult renal cortex is homogeneously echogenic. In the traditional classification, echogenicity of the cortex is less than that of the liver, spleen, and renal sinus, although studies have shown that the cortex may appear isoechoic with the liver in adults with normal renal function. In neonates, the renal cortex is normally isoechoic or hyperechoic compared to the adjacent liver and spleen. In older children, the echo pattern of the cortex should be similar to that of adults. The echogenic comparison can only be made at the same depth and is valid only in the absence of hepatic or splenic disease. Scanning through a bile filled gallbladder lying anterior to the kidney should be avoided, as it may artificially enhance the cortical echogenicity..(Devin D,2005)

2.3.4 Renal Medulla:

The inner portion of the renal parenchyma, called the medulla, contains the medullary pyramids separated by the columns of Bertin described previously. Sonographically, the medullary pyramids are cone-shaped or heart-shaped and are hypoechoic relative to the cortex..(Devin D,2005)

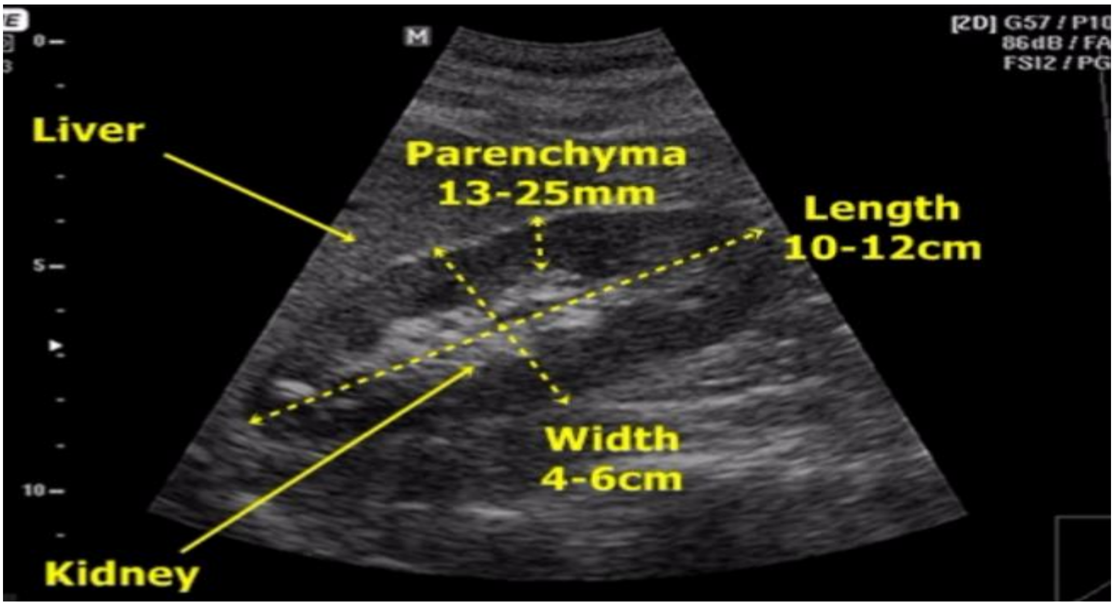


FIGURE (2-10)Normal Sonographic Anatomy.(Devin D,2005)

2.4 Pathology 2.4.1 Renal Infection And Inflammatory Diseases:

Upper urinary tract infections (UTIs) and inflammatory diseases cover a wide spectrum. UTIs cause significant morbidity they are second only to respiratory infections in prevalence. Bacterial infections may remain asymptomatic or localized to the bladder but carry the potential for spread to the kidneys. Their incidence is higher in women: approximately 20% develop at least one UTI during their lifetime. Among all patients receiving dialysis to sustain life, infections are responsible for 13% to 22% of disease. *Escherichia coli* and *Enterobacter, Klebsiella, Pseudomonas,* and *Proteusvulgaris* species are the gramnegative bacilli responsible for 85% of UTIs. Any interference with normal voiding, incomplete emptying, stasis, or instrumentation leaves residual urine in the bladder and enhances bacterial multiplication. The bacteria ascend the urinary tract through the urethra (urogenous ascending route) or along the lymphatics (lymphogenous). It is believed that lymphogenous spread is facilitated by lymphatic connections between the upper and lower urinary tracts along the adjacent mucosa of the collecting system, and there may be lymphatic channels between the colon and the right kidney. The incidence of these infections is greatest in women 15 to 24 years of age, suggesting that the shorter female urethra located close to the vagina and rectum, together with associated hormonal and anatomic changes, contribute to the higher incidence. Sexual activity may contribute in predisposed women, but the association with the development of urethritis and cystitis is controversial. The higher incidence during pregnancy is believed to be related to anatomic and physiologic changes and to the fact that estrogen and progesterone(Devin D,2005).

play a part in smooth muscle relaxation affecting the normal peristalsis in the ureters. In men, the length of the urethra and the antibacterial properties of prostatic fluid provide some protection from urogenous spread until age 50 years. After this age, prostatic hypertrophy becomes more common, and with it may come obstruction and UTI. The second pathway for UTI is hematogenous dissemination. Staphylococcus aurous organisms from skin furuncles, skin infections, osteomyelitis, or endocarditis can reach the renal and perirenal tissues from remote sites months after initial exposure by hematogenous dissemination. Lymphogenous seeding of S. aureus is believed to be responsible for some UTIs. Once bacteria have gained access to the kidney, the virulence of the infecting organism, host immunity, and other factors determine the extent of UTI involvement. Persons with diabetes and other states of immune compromise are more likely to develop infections than patients with normal immunity. Laboratory function tests vary with the different renal infections and inflammatory diseases. Most patients have neutrophilic leukocytosis with varying degrees of hematuria, pyuria, bacteriuria, with or without WBC casts. Patients may appear asymptomatic but usually have malaise, tenderness or pain at the costovertebral angle on palpation, and varying degrees of flank pain. Lower urinary tract symptoms may include urinary frequency and urgent urination, with or without dysuria. CT is the imaging modality of choice for acute renal infections. (Devin D,2005).

Sonography provides an excellent modality for assessing the internal renal architecture, but is less sensitive in demonstrating the presence of acute renal pathology, localizing the site of infection (intrarenal, perinephric, pararenal, intraperitoneal, etc.), and determining an etiology. Abnormalities can be recognize early in the course of the disease, diffuse renal inflammatory disease can be differentiated from focal lesions, and extension into the retroperitoneum may be demonstrated. Sonography is an important examination for patients with urosepsis resulting from pyelonephritis, pyonephrosis, or a large renal or perirenal abscess. Urosepsis represents a true urologic emergency and requires urgent drainage. Serial examinations are easily performed to define different phases of the disease when there is an inadequate clinical response to antibiotic therapy or suspicion of an underlying lesion that predisposes to infection, such as obstruction by a urinary tract anomaly. Sonography does not depend on renal function or expose the patient to the risk of allergic reactions to contrast media. For women of childbearing age, its greatest advantage is its use of non ionizing radiation.(Devin D,2005).

2.5 Previous Studies:

In study done by Mohamed Elfadil Mohamed Gar-elnabi, et al(2015)about Characterization of Glomerulonephritis and Pyelonephritis using Ultrasonography, A total of 234 patients were included in thier study 106 were normal cases (22.6% male and 77.4% female) 128 patients had renal infections; 68 diagnosed with glomerulonephritis (38.2% males and 61.8% females) 60 with pyelonephritis (33.3% males and 66.7 females); the number of female were higher than that of male with a male to female ratio for glomerulonephritis and pyelonephritis of 1:1.6 and 1:2 respectively; which mean that females were more susceptible for renal infection than males. The patient age ranged from (11 to 80) years also indicates that infection appears in a wide spectrum of range which might be attributed to hygiene problem. The common presenting symptoms were flank pain which appear more in patients with glomerulonephritis.

In study done by Mohamed Elfadil Mohamed Gar-elnabi, about Charact-erization of renal Infection in Ultrasound B-mode Images Using Texture Analysis, The result of the classification concerning the textural feature extracted from the first set (medulla) showed that, the normal kidneys, and those with glomerulonephritis and pyelonephritis were classified with an accuracy of 94.9%, 97.3% and 99.5%; which means there is a heir sensitivity in classification of pyelonephritis, where it make the medulla texture look very different than the result of the groups followed by glomerulonephritis which in some cases falsely classified as pyelonephritis (2.7%), with an overall classification accuracy of 98%. The most discriminate were mean, signal to noise ratio and entropy. The textural feature mean discriminant between the normal and abnormal medulla in the kidney; where the mean signal intensity in the normal medulla were lower than that of the abnormal one; since complexity of the texture were less. Similar essence were exist in case of signal to noise ratio and entropy for the normal medulla while glomerulonephritis scored the higher textual values than that pyelonephritis; which means glomerulonephritis affected medulla more than pyelonephritis hence the textural feature of the glomerulonephritis were different than the rest of the tissue.

In study done by Y L Wan, T Y lee, M J Bullard and CC Tsai(1996),about of Acute gas bacterial renal infection: correlation between imaging finding and clinical outcome,was done. To correlate imaging findings of types I and II emphysematous pyelonephritis (EPN) with clinical course and prognosis. The imaging studies and Clinical outcome in 38 patients with EPN were retrospectively studied. The imaging studies Performed included radiography (n=33), computed tomography (n=31), and ultrasonography (n=35).Two types of EPN were identified. Type I EPN was characterized by Parenchymal destruction with it her absence of fluid collection or presence of streaky or Mottle gas. Type II EPN was characterized as either renal or perirenal fluid collections with Bubbly or loculated gas or gas in the collecting system.

In study done by CJ Kay, AT Rosenfiled, KJ Taylor and MA Roseberg(1979) about ultrasonic characteristics of chronic atrophic pylonephritis, American journal of roentgenology. Six cases of chronic atrophic pylonephritis were studied with gray scale ultrasound, the finding are analogous to those seen pathologically, namely a focal or multi focal process with loss of renal parenchyma, retraction of one or more calyces, decrease in renal size and increased echo from fibrosis. In proper clinical setting diagnose of chronic atrophic pylonephritis can be made using ultrasound.

Chapter Three

Materials and Methods

Chapter Three

Materials and Methods

3-1 Materials:

50 patients were examined 31of them were female and 19 of them were male. Their ages were between 25-65 old age group, children less than 15 years old were excluded. All patients had clinical symptoms suggestive of renal infection.using ultrasound machine **Fuk ISDAmodd:UF870 as convex** transducer low frequency (3.5 MHZ).

A structured data collection sheet containing the patient name, age, gender and data about the ultrasound scan findings including: the volume of the right and left kidneys, presence of corticomedullary differentiation (well or poor),cortex echogeicity (normal or hyperechoic), and presence of any other finding associated with renal infection. Data collection were started on 3 December 2016and complete on29 junery2017. The study had been done in MICK NIMIR UNIVERSTY HOSPITAL **and** ultra sound clinics.

Urine analysis was performed by lab technicians for all patients included in the study.The data was performed statistically using computerized (spss).

3.2 methods

3.2.1 Ultrasound scanning technique:

- Investigation protocols: The following technique was applied to allow visualization of both kidneys and proximal ureters.
- Patient preparation: None
- Transducer: convex low frequency transducer 3.5MHZ.
- Patient positioning: supine left lateral oblique and right lateral decubitus.

Initial approach for right kidney, longitudinal section pt. supine transducer position directly below the costal margin in the midclavicular line,beams pointingslightly cephalic.

Respiratory maneuver:deep inspiration protrusion of abdominal wall. Scanning procedure: spread out gel with transducer face. With patient in quite respiration,s urvey the area. Return to initial scanning position and initiated respiratory maneuver.

Transducer moved smoothly along the costal margin, angling slightly towards the lateral edge of the liver.

Some time respiratory maneuver or pt. position (oblique or decubitus) changed.

Locate the upper pole of the kidneys top look.

Rotate the trans due to join the upper and lower poles. the transducer moved cephalic to caudal to position the kidney in the centre of the screen. Beam angled slightly side to side sweeping through the long of the kidney.

The last step was repeated two or three times, focusing central collecting system. image was appeared in longitudinal section and was measured by bipolar distance.

Second approach:

Transverse section: angulation and position of the transducer in long section. Transducer rotated 90, maintaining angulations.

Scanning procedure: Transduser swept cephalic caudal assess central collecting system Image was appeared in transverse section of mid portion of kidney.

3-2-2 Methods of image interpretation:

Kidneys were scanned in longitudinal axis,The cortex was evaluated as hyper,hypo or iso echoic to the liver.

The renal volume was measured by measuring long axis *width in longitudinal as well the depth in the cross section * 0. 52

(L*W*H*0.52)

Chapter Four

Results

Chapter Four

Results

Table No (4.1) Distribution of study sample according to Participant's age

Age	Frequency	Percent (%)
25-34	14	28.0
35-44	15	30.0
45-54	12	24.0
55-65	9	18.0
Total	50	100.0 (%)

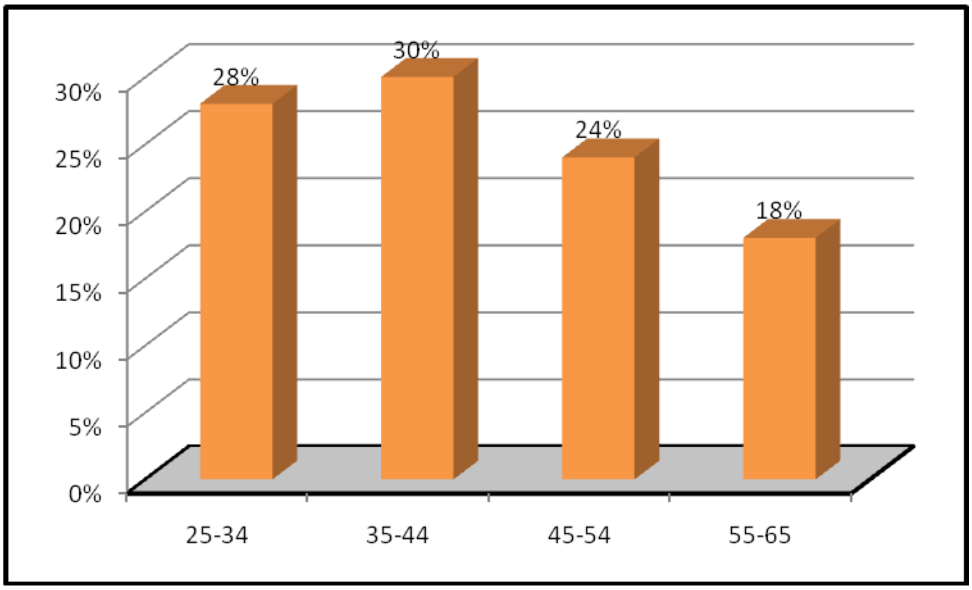


Figure No (4.1) Distribution of study sample according to Participant's age

Table No (4.2) Distribution of study sample according to Participant's gender

	Frequency	Percent (%)
Female	31	62.0
Male	19	38.0
Total	50	100.0 (%)

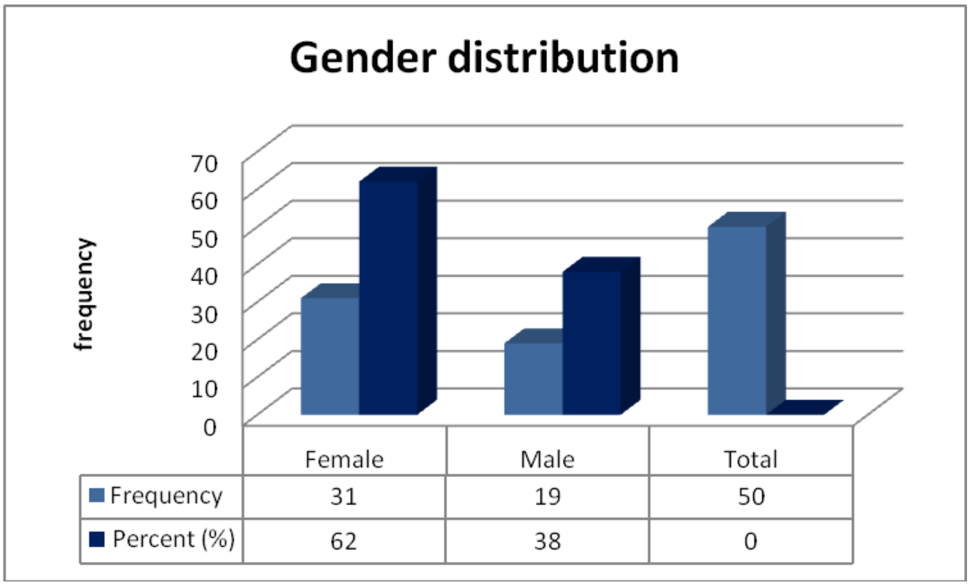


Figure No (4.2) Distribution of study sample according to Participant's gender

Table No (4.3) Descriptive Statistics of the variables

	N	Minimum	Maximum	Mean	Std. Deviation
Age	50	25.00	65.00	41.820	11.48
RT kidney (Volume)cm3	50	51.80	164.00	110.86	33.26
LT kidney (Volume)cm3	49	30.90	166.50	114.12	30.17

Table No (4.4) Distribution of study sample according to Participant's Cortex (Right Kidney)

	Frequency	Percent (%)
Normal echogenic	30	60.0
Hyper echogenic	20	40.0
Total	50	100.0 (%)

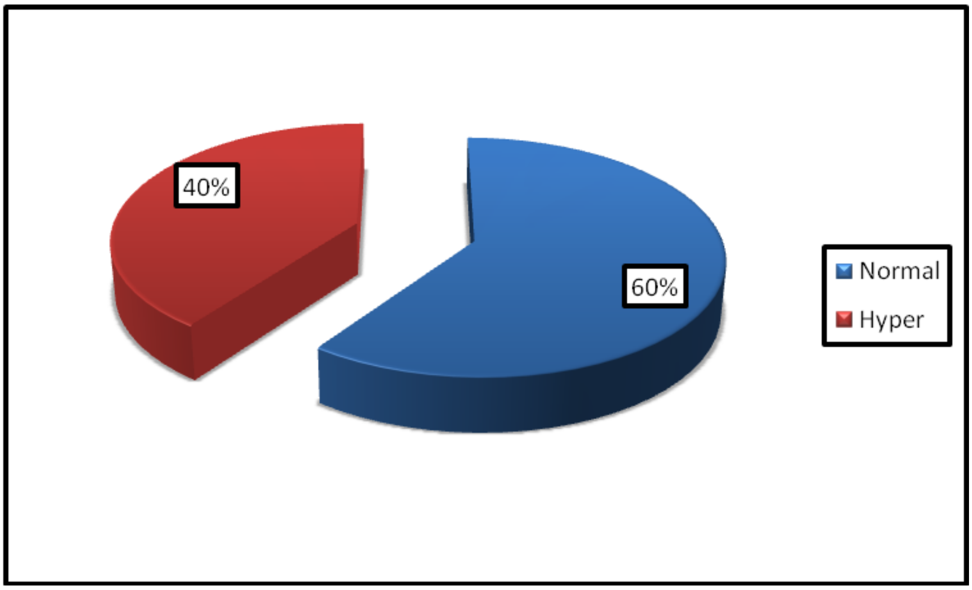


Figure No (4.3) Distribution of study sample according to Participant's Cortex (Right Kidney)

Table No (4.5) Distribution of study sample according to Participant's Cortex (Lift Kidney)

	Frequency	Percent (%)
Normal echogenic	29	58.0
Hype echogenic r	21	42.0
Total	50	100.0 (%)

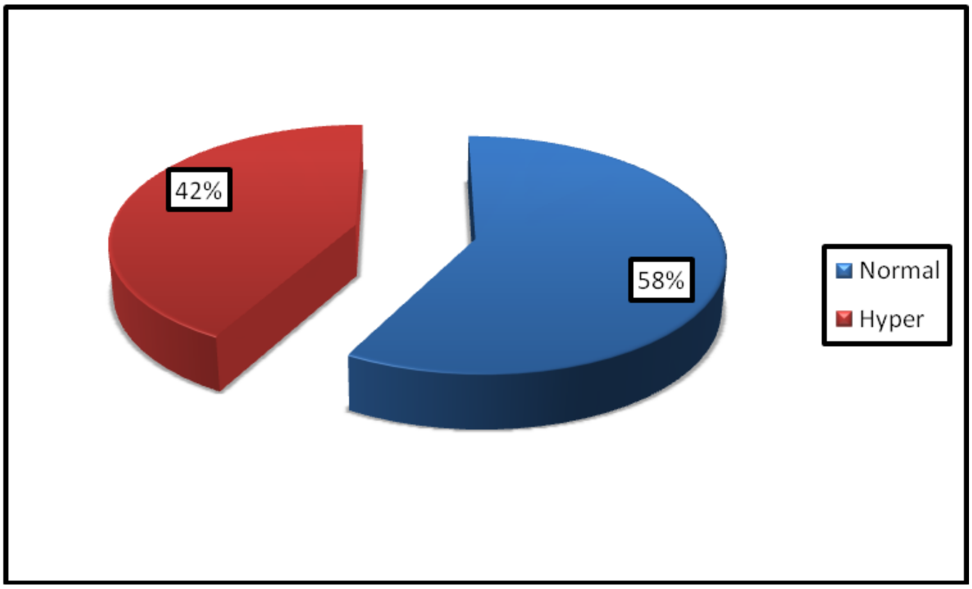


Figure No (4.4) Distribution of study sample according to Participant's Cortex (Lift Kidney)

Table No (4.6) Distribution of study sample according to Participant's corticomedullary differentiation C.M.D (Right kidney)

CMD	Frequency	Percent (%)
Differentiated	35	70.0
Non Differentiated	15	30.0
Total	50	100.0 (%)

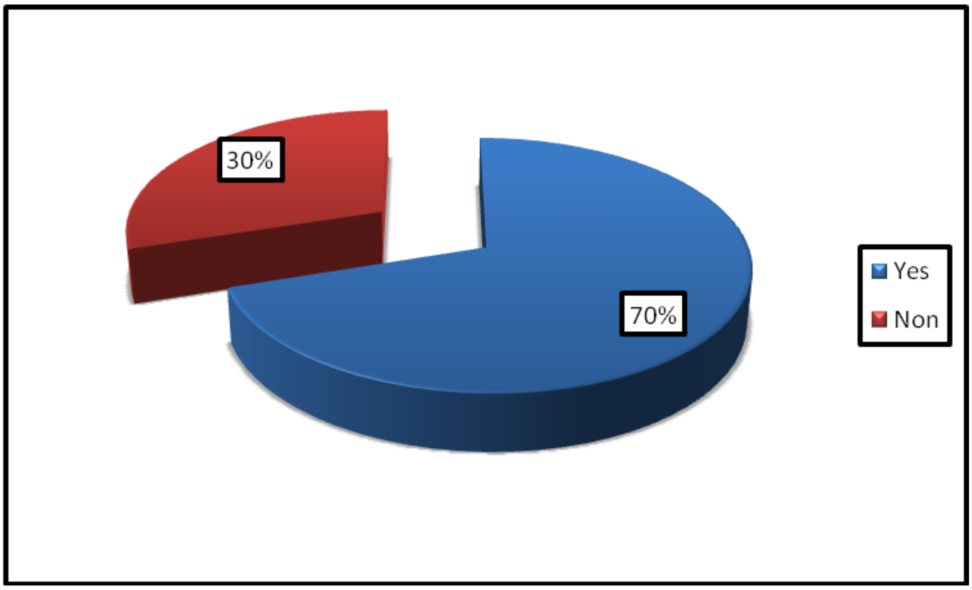


Figure No (4.5) Distribution of study sample according to Participant's corticomedullary differentiation C.M.D (Right kidney)

Table No (4.7) Distribution of study sample according to Participant's corticomedullary differentiation C.M.D (Lift kidney)

CMD	Frequency	Percent (%)
Differentiated	31	62.0
Non Differentiated	19	38.0
	50	100.0 (%)

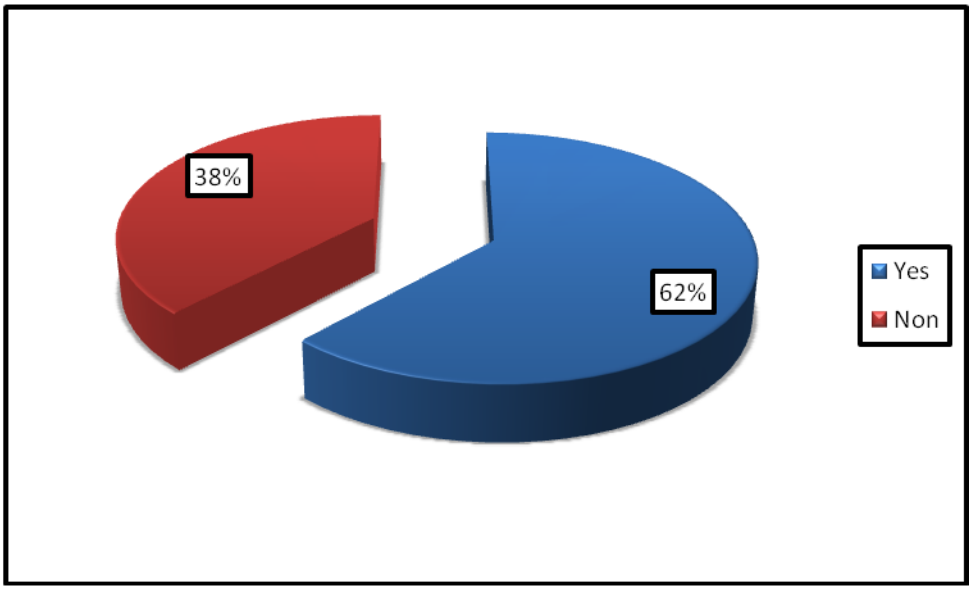


Figure No (4.6) Distribution of study sample according to Participant's corticomedullary differentiation C.M.D (Lift kidney)

Table No (4.8) Distribution of study sample according to Participant's Other findings (Right kidney)

	Frequency	Percent (%)
Cysts	1	2.0
No concurrent pathology	48	96.0
Stone	1	2.0
Total	50	100.0 (%)

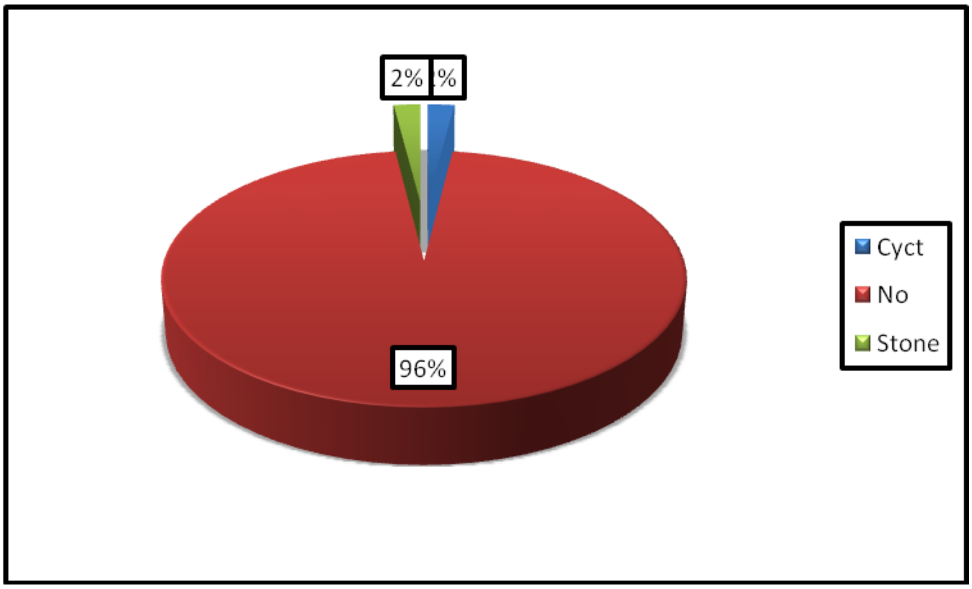


Figure No (4.7) Distribution of study sample according to Participant's Other findings (Right kidney)

Table No (4.9) Distribution of study sample according to Participant's Other findings (Lift kidney)

	Frequency	Percent (%)
Cysts	3	6.0
No concurrent pathology	47	94.0
Total	50	100.0 (%)

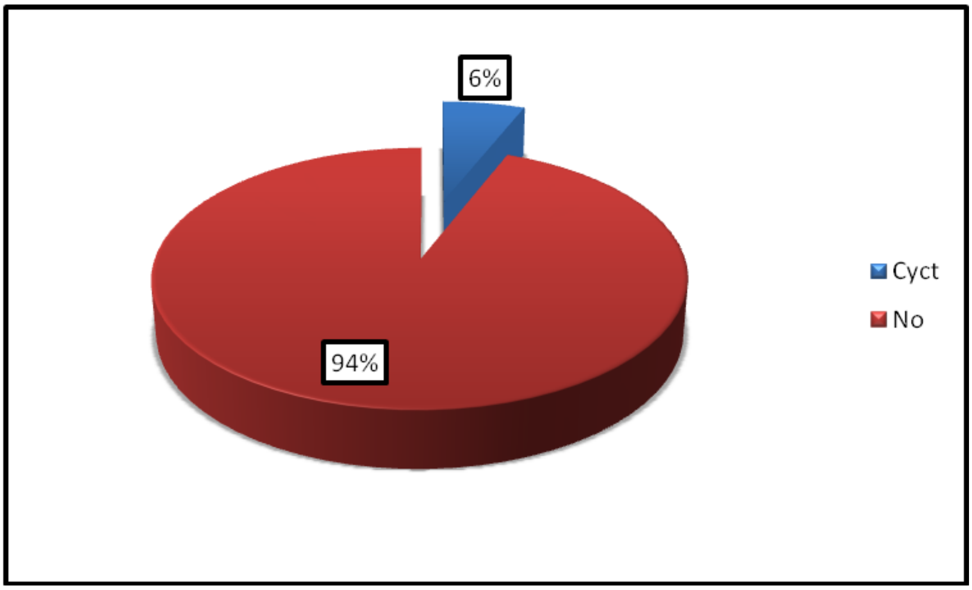


Figure No (4,8) Distribution of study sample according to Participant's Other findings (Lift kidney)

Table No (4.10) Distribution of study sample according to Participant's Final diagnosis (Right kidney)

	Frequency	Percent (%)
Pylonephritis	21	42.0
Glomerul-nephritis	25	50.0
Hydronephrosis	1	2.0
Chronic glomerulonephritis	2	4.0
Focal glomerulonephritis	1	2.0
Total	50	100.0 (%)

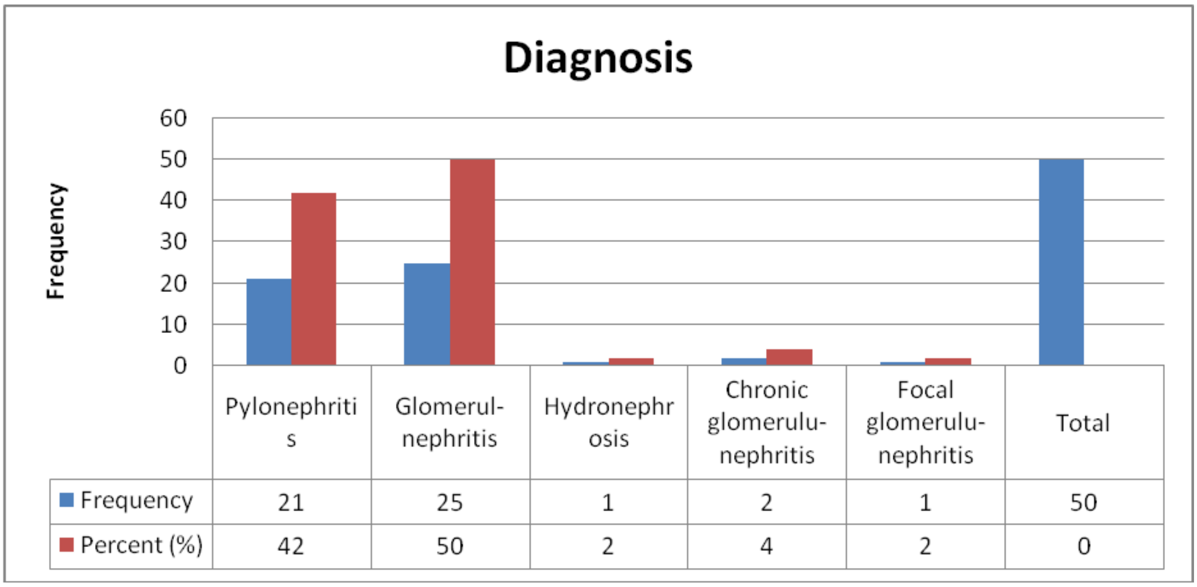


Figure No (4.9) Distribution of study sample according to Participant's Final diagnosis (Right kidney)

Table No (4.11) Distribution of study sample according to Participant's Final diagnosis (Lift Kidney)

	Frequency	Percent (%)
Pylonephritis	32	64.0
Glom-nephritis	18	36.0
Total	50	100.0 (%)

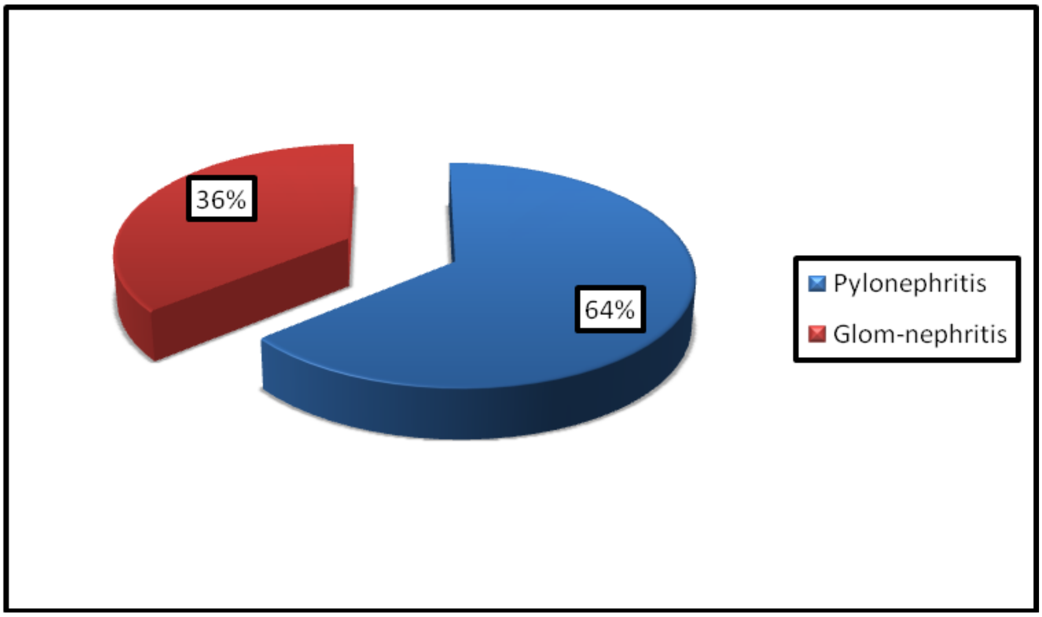


Figure No (4.10) Distribution of study sample according to Participant's Final diagnosis(Lift kidney)

Table No (4.12) Crosstabs Final diagnoses (Rt kidney)with cortex (Right Kidney)

			cortex (Rt Kidney)		Total
			Normal	Hyper	
Final diagnoses (Right kidney)	Pylonephritis	Count	11	10	21
		% of Total	22.0%	20.0%	42.0%
	Glomerulonephritis	Count	15	10	25
		% of Total	30.0%	20.0%	50.0%
	Hydronephrosis	Count	1	0	1
		% of Total	2.0%	.0%	2.0%
	Chronic. Glomerulonephritis	Count	2	0	2
		% of Total	4.0%	.0%	4.0%
	Focal Glomeriolo-nephritis	Count	1	0	1
		% of Total	2.0%	.0%	2.0%
Total		Count	30	20	50
		% of Total	60.0%	40.0%	100.0%
P-value		= 0.059			

Table No (4.13) cross tabulation between Final diagnoses (Right kidney) with corticomedullary differentiation C.M.D (Right kidney)

			C.M.D (RT kidney)		Total
			Differentiated	Non Differentiated	
Final diagnoses (Rightt kidney)	Pylonephritis	Count	14	7	21
		% of Total	28.0%	14.0%	42.0%
	Glomerulonephritis	Count	17	8	25
		% of Total	34.0%	16.0%	50.0%
	Hydronephrosis	Count	1	0	1
		% of Total	2.0%	.0%	2.0%
	Chornic glomerulonephritis	Count	2	0	2
		% of Total	4.0%	.0%	4.0%
	Focal glomerulonephritis	Count	1	0	1
		% of Total	2.0%	.0%	2.0%
Total		Count	35	15	50
		% of Total	70.0%	30.0%	100.0%
P-value		= 0.020			

Table No (4.14) Final diagnoses (Ritgh kidney) with other findings (Right kidney)

			Other findings (RT kidney)			Total
			Cysts	No	Stone	
Final diagnoses (RT kidney)	Pylonephritis	Count	1	20	0	21
		% of Total	2.0%	40.0%	.0%	42.0%
	Glom-nephritis	Count	0	25	0	25
		% of Total	.0%	48.0%	.0%	48.0%
	Hydronephrosis	Count	0	0	1	1
		% of Total	.0%	.0%	2.0%	2.0%
	C.glo-phritis	Count	0	2	0	2
		% of Total	.0%	4.0%	.0%	4.0%
	Focal glomerulonephritis	Count	0	1	0	1
		% of Total	.0%	2.0%	.0%	2.0%
Total		Count	1	48	1	50
		% of Total	2.0%	96.0%	2.0%	100.0%
P-value		= 0.000				

Table No (4.15) Crosstab Final diagnoses (Lift kidney) with cortex (Lift Kidney)

			cortex (Lt Kidney)		Total
			Normal	Hyper	
Final diagnoses (Lt kidney)	Pylonephritis	Count	17	15	32
		% of Total	34.0%	30.0%	64.0%
	Glom-nephritis	Count	12	6	18
		% of Total	24.0%	12.0%	36.0%
Total		Count	29	21	50
		% of Total	58.0%	42.0%	100.0%
P-value		= 0.052			

Table No (4.16) Crosstab Final diagnoses (Lift Kidney) and corticomedullary differentiation C.M.D (Lift Kidney)

			C.M.D (Lift kidney)		Total
			Differentiated	Non Differentiated	
Final diagnoses (Lift kidney)	Pylonephritis	Count	22	10	32
		% of Total	44.0%	20.0%	64.0%
	Glomerulonephritis	Count	9	9	18
		% of Total	18.0%	18.0%	36.0%
Total		Count	31	19	50
		% of Total	62.0%	38.0%	100.0%
P-value		= 0.090			

Table No (4.17) Crosstab Final diagnoses (Lift Kidney) with Other findings (Left kidney)

			Other findings (Lift kidney)		Total
			Cysts	No	
Final diagnoses (Lt kidney)	Pylonephritis	Count	2	30	32
		% of Total	4.0%	60.0%	64.0%
	Glomerulonephritis	Count	1	17	18
		% of Total	2.0%	34.0%	36.0%
Total		Count	3	47	50
		% of Total	6.0%	94.0%	100.0%
P-value		= 0.021			

Table No (4.18) Descriptive statistics of Right kidney volume in different Kidney diseases

Descriptive						
Right kidney (Volume)cm3						
	N	Mean	Std. Deviation	Minimumcm3	Maximumcm3	P-value
Pylonephritis	21	138.24	21.51	99.00	164.00	0.000
Glomerulonephritis	25	181.54	21.55	60.00	144.40	
Hydronephrosis	1	57.00	0.00	57.00	57.00	
Chronic glomerulo nephritis	2	69.80	25.45584	51.80	87.80	
Focalglomnerulonephritis	1	160.00	0.00	160.00	160.00	
Total	50	110.86	33.26	51.80	164.00	

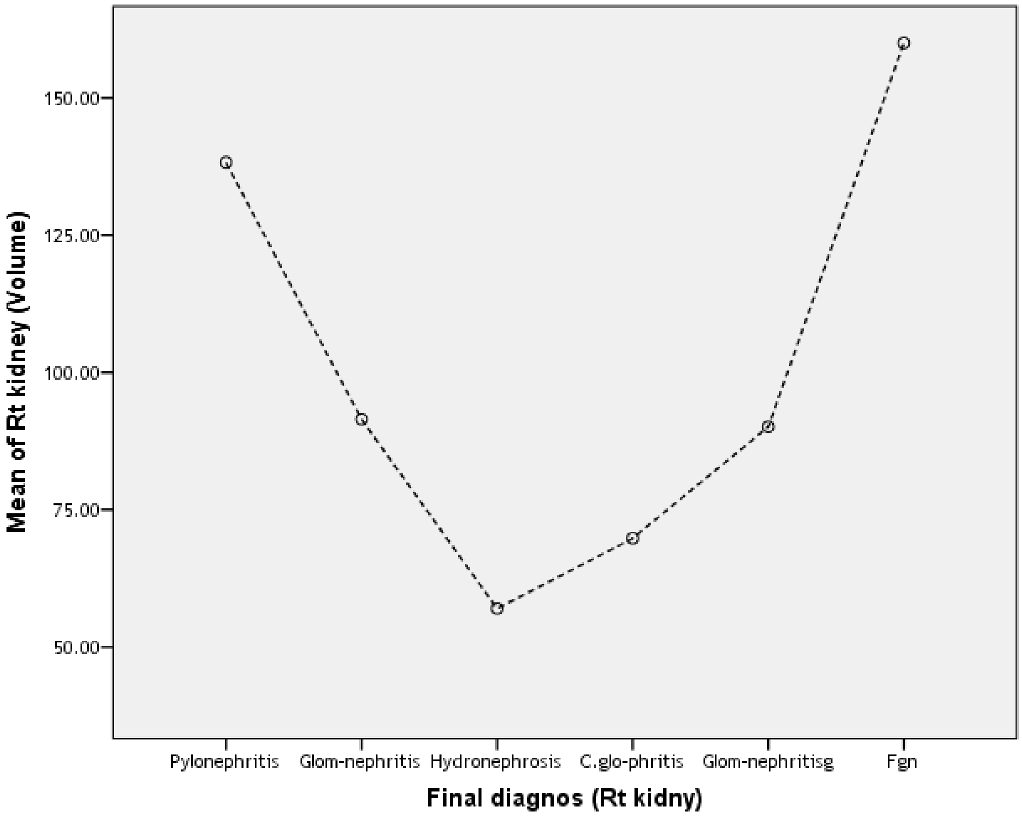


Figure No (4.11) Right kidney volume in different Kidney diseases

Table No (4.19) Descriptive statistics of Lift kidney volume in different Kidney diseases

Descriptive						
Lift kidney (Volume)						
	N	Mean	Std. Deviation	Minimum	Maximum	P-value
Pylonephritis	32	126.87	27.85	30.90	166.50	0.000
Glomerulonephritis	17	90.11	17.000	63.50	134.50	
Total	49	114.12	30.17	30.90	166.50	

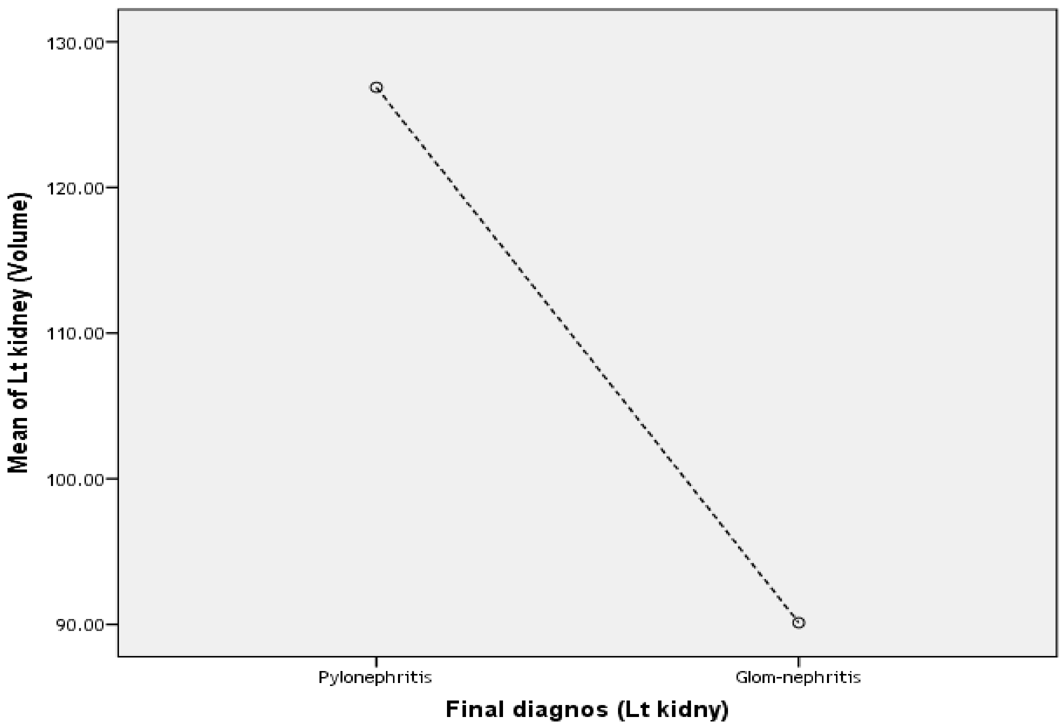


Figure No (4.12) Lift kidney volume in different Kidney diseases

Chapter Five

Discussion, Conclusion and Recommendations

Chapter five

Discussion , Conclusion and Recommendations

5.1 Discussion

According to most affected group with UTI disease were the females constituting 62% and males were 38% this was similar to study done by :EBTISAM.ABD ELRAHMAN et al 2012)that showed that the percentage of females were more than males. The most commonly affected age of renal infection was between 35 years to 44 years (30%)..

Patient with renal infection were with renal cortex hyperechogenicity in most of the cases for both right and left kidneys, as well, the poor CMD was also noticed in most of the cases. These facts were similar to what was mentioned by. (Devin Dean, 2005)

The cases with findings as cyst and stones were also been noticed. This was presented in tables (4.5-4.9).

The study showed that there is significant relation between the final diagnosis for the right and left kidney including pylonephritis, glomerulonephritis, hydronephrosis, chronic glomerulonephritis, focal glomerulonephritis with the sonographic evaluation as hyper or normal renal cortex at p = 0.059and 0.005.

This was not similar to the study Characterization of Glomerulonephritis and Pyelonephritis using Ultrasonography done by (Mohammed Alfadil 2015).

The corticomedullary differentiation was found in most of the cases and the study showed that there is significant relation between the CMD and the ultrasound finding at p=0.020. This was not similar to the study done for diagnostis of renal infection by ultrasound done by (Ebtisam Abdurrahman 2012) who mentioned reverse results, that all were presented in tables (4.12-4.16).The renal volume was also affected in the cases of renal infection. All case showed well differentiated between cortex and medulla because most of infection are acute.

5.2 Conclusion

The study was done and showed the following.

Females are more affected by renal infection and the most disposed age group was between 35-44 years old.

There is a relation between changes in kidney volume,loss of C\M differentiation and increase of cortex echogenicity in some chronic cases, which could be an indication of beginning of renal parenchymal disease.

The results of renal scanning were that there is significant relation between the diagnosis finding/ with renal cortex echotexture for Both kidneys at p=0.059/ and 0.059.

As well as corticomedullary differentiation at p=0.020 for the Rt kidney and also there is significant relation with the amount finding for both kidneys.

The renal volume increased significant at p=0.000 in pyleonephritis for both Rt and Lt kidneys.

According to the results ultrasound can aid in diagnosis of renal infection and detection any parenchymal changes can result from infection except in early stages of infection.

5-3 Recommendations

1 Renal infection symptoms are vague and can be associated with many other renal disorders. So; careful ultrasound examination associated with other diagnostic and laboratory workup are important for diagnosis of renal infection.

2 Utilization of high resolution ultrasound and tissue harmonic is important for detection of any changes in renal parenchyma as early as possible for early treatment.

3 For further researcher detailed study including changes in pelvicalceayl system and Doppler study for the blood supply of the infected kidney is recommended.

References

- Richard darke, Waynord Androw,2009,Grays anatomy,Mitch, 3th edition..
- Devin Dean2005. Ultrasonography of the abdomen, part one.
- The Burwin2005 institute of diagnostic medical ultrasound ; Lunenburg, Canada
- Michael Schuenke,ErikSchulte,UdoSchumacher,2010,Thieme atlas of anatomy, 3th edition.
- Karol M.Rumack et al, 2011, diagnostic ultrasound, 4th edition Philadelphia.
- Mohamed Elfadil Mohamed Gar-elnabi, 2015 about Characterization of Glomerulonephritis and Pyelonephritis using Ultrasonography
- Ebtisam Abd Elrahman 2012, diagnostic of renal infection using ultrasound
- Richard Snill, 1995, clinical anatomy, 5th edition.
- M.Y.sukkare, prof. of physiology PHD :Edinburg), concise physiology 2nd edition 2000.
- PES.palmer, manual of diagnostic ultrasound, publisher WHO 1995.
- WWW.e medicine.com
- -http://WWW.Kidneyatlas. Orgbook2/adk2-07.Pdf

APPENDICES

gender	Age	Cortex Rt kid	cortex lt kid	C.M.D Rt kid	C,M.D Lt kid	other findings Rt kid	other finding Lt kid	Rt kidney volume	Lt kidney volume	UG	Final diagnose Rt kid	Final diagnosis Lt kid

No(1) Us image of male pt age 25 years Rt and Lt kidneys show Pylonephritis

No(2) Us image of female pt age45years Rt and Lt kidneys show Pylonephritis

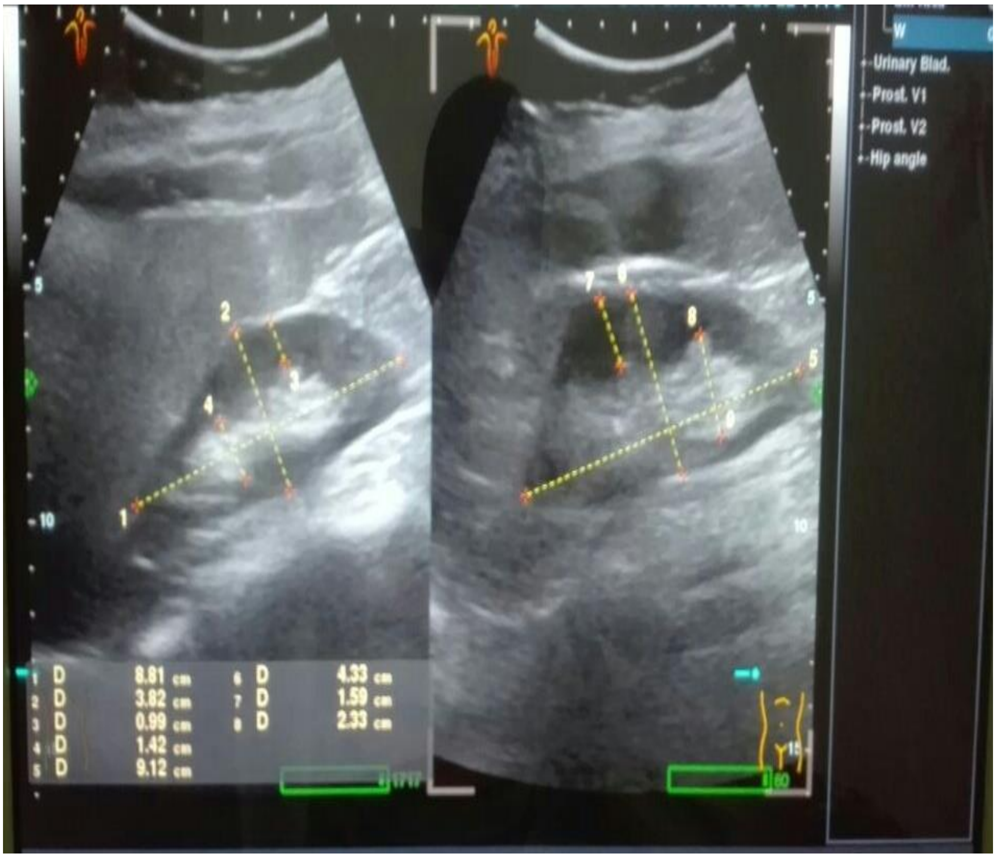
No(3) Us image of male pt age 40years Rt and Lt kidneys Pylonephritis

N0(4)US image of female pt age 32 years Rt and Lt kidneys show pylonephritis

No(5)US image of female pt age 36years Rt kidney show glomerulonephritis and Lt kidney show pylonephritis

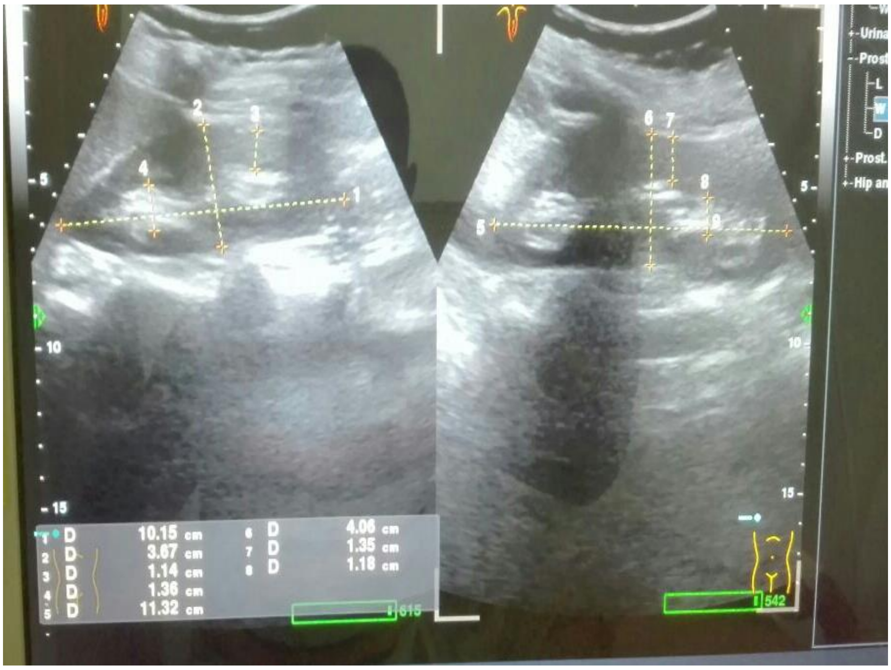
No(6)US image of female pt age 38years Rt and Lt kidneys show glomerulonephritis

No(7)US image of male pt age 43 years Rt and Lt kidneys show glomerulonephritis



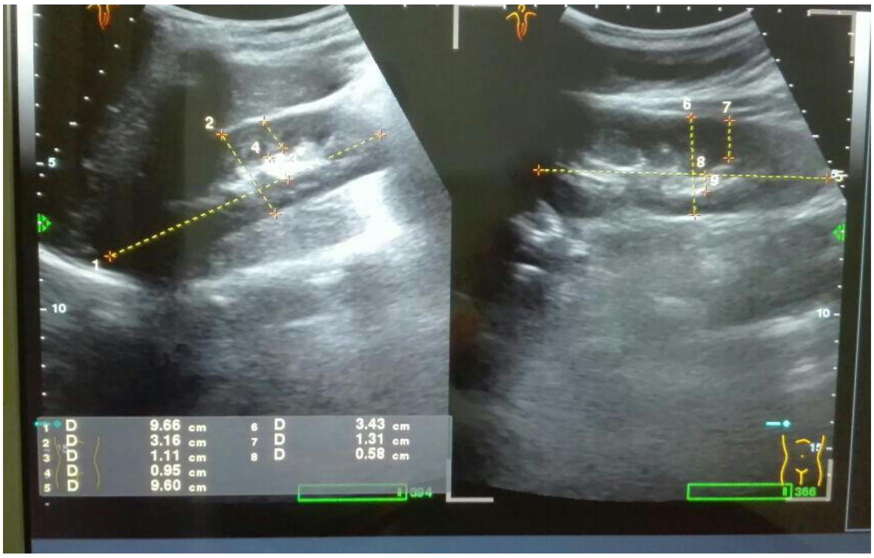
No(8)US image of female pt age 35 years Rt and Lt kidneys show glomerulonephritis

No(9)US image of male pt age 27 years Rt and Lt kidneys show glomerulonephritis

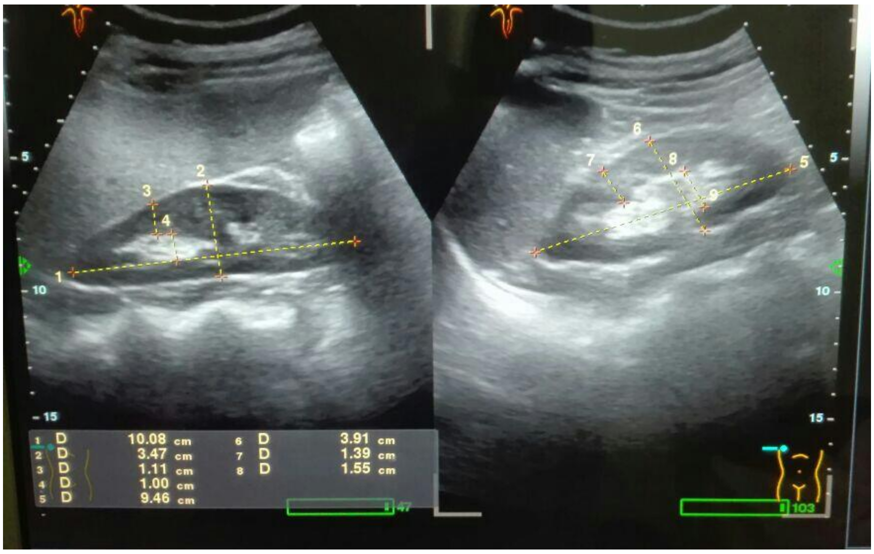


NO(10)US image of female pt age 37 years Rt and Lt kidneys show pylonephritis

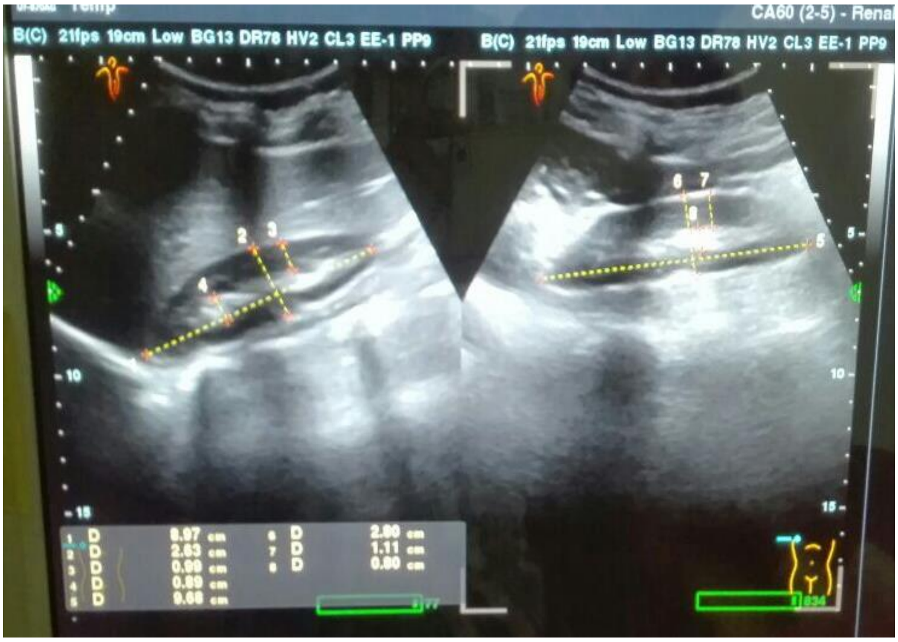
N0(11)US image of female pt age 38 years Rt and Lt kidneys show pylonephritis



No(12)US image of male pt age 27 years Rt and Lt kidneys show glomerulonephritis



No(13)US image of female pt age 33years Rt kidney show glomerulonephritis and Lt kidney show pylonephritis



No(14)US image of female pt age 25 years Rt and Lt kidneys show glomerulonephritis

No(15)US image of female pt age 39 years Rt and Lt kidneys show pylonephritis