

Common Findings in Urinary System Ultrasound Scan in Port Harcourt Metropolis

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ABSTRACT

Background of study: Recent studies show persistent upward trend in the incidence and prevalence of urinary system diseases. Urinary system ultrasound is versatile, accessible, useful and inexpensive. It serves as first line imaging modality in assessment of urinary system pathologies.

Objective of study: To identify the common findings in urinary system ultrasound scan.

Materials and Methods: Records from existing pool of results of patients who had abdominopelvic ultrasound scan at Intercontinental Diagnostic Centre, Port Harcourt, and Rivers State, Nigeria was used for this study. Data from 1,597 ultrasound scan reports for the year 2021 were collected and analyzed using descriptive statistics.

Results: Four hundred and twenty-two (422) sonographic findings distributed among 23 pathological entities were revealed. Among the 23 entities, 12 showed significantly higher frequency of occurrence. They are, in order of occurrence, simple renal cyst, hydronephrosis, diffuse hyperechoic kidney, renal calculus, cystitis, enlarged kidney, bladder outlet obstruction, pyelonephritis, small kidney, polycystic kidney, ectopic kidney and renal agenesis. Overall prevalence was 26%. The male to female ratio of prevalence was 1.4:1 and adults to paediatrics ratio was 83.4:1. The renal findings showed patterns of occurrence i.e., predominantly bilateral, unilateral, bilateral or unilateral.

Conclusion: There are 12 common findings with the male population showing higher prevalence than the female. In addition, there is a preponderance of hyperechoic parenchyma of the right kidney.

Keywords

Urinary system ultrasound, Sonographic findings, Pathological entities, Prevalence, Abdominopelvic ultrasound scan.

Introduction

Global incidence of diseases of the urinary system has been reported by several authors to be on the increase. Ayodele and Alebiosu¹ reported 928,000 deaths and 14,754,000 disability adjusted life years due to diseases of the urinary system. This was attributed to the global increase in the incidence of Diabetes mellitus,

hypertension, obesity and aging. In addition, the increase in the prevalence of infectious diseases has significantly increased the incidence of urinary system [1]. Innocent et al. [2], in a systematic review of seven population based cross sectional studies in Nigeria established a prevalence of chronic kidney disease of about 26%.

These reported unusual increases demand an epidemiologic review of urinary system disorders and their assessment protocols. The urinary system comprises of the kidneys, ureters, urinary bladder and urethra. The kidneys, the main organs of the urinary system

are made up of millions of nephrons that act as filtering units. The urinary system helps maintain homeostasis by regulating water balance by removing harmful substances from the kidneys through the ureters to the bladder for storage until it is expelled through the urethra.

The four major disturbances responsible for most clinical manifestations of renal diseases are:

- Impaired blood flow through the kidneys.
- Diseases that injure the glomerular capillaries resulting to edema.
- Glomerular injuries resulting to hematuria, accompanied by hypertension and oliguria.
- Renal failures [3,4].

Methods of investigation of the urinary system include: blood test to determine plasma concentration of urea and creatinine; urine examination to determine urine appearance, presence of nitrogenous substances, cells, urinary cast chemical analysis to determine urine pH and specific gravity histological examinations and urinary system imaging [5,6].

Several imaging modalities could be used for radiological assessment of the urinary system, these include Ultrasonography (USS), Intravenous Urography (IVU), Computed Tomography (CT), Magnetic Resonance Imaging (MRI) and Radionuclide Imaging. Though many imaging modalities are evolving for improved assessment of the urinary system, ultrasound remains the most common imaging technique for this purpose.

Diseases of the urinary system are commonly seen in clinical practice. Most often, they require performance of urinary system ultrasound examinations. However, the spectrum of urinary system ultrasound abnormalities and disorders has not been thoroughly addressed within the African setting and various searches (both manual and electronic) show that adequate studies have not been carried out on the range of sonographic findings from urinary system ultrasound within Port Harcourt, South-south geo-political zone in Nigeria. This research was therefore carried out to fill this gap in the literature.

The main objective of this study was to identify the common radiological findings in urinary system ultrasound among individuals in Port Harcourt metropolis. The specific objectives are:

- To correlate the findings to demographic factors
- To compare the findings from this study with those obtained in other zones as reported in the literature.

Urinary system diseases are important component of chronic non-communicable diseases that are now of pandemic proportion and are the major cause of morbidity and mortality worldwide. Unfortunately, available literatures on the spectrum of renal pathological lesions and their demographic patterns are scarce in this part of the world. A work of this nature is therefore necessary to establish incidence and pattern of occurrence of urinary system

disorders and their distributions among the sexes and age groups. This will increase clinical personnel's critical mass of knowledge and enhance their coping abilities in patient management. It will also enhance proper planning within the radiology department of hospitals.

Review of Literature

Methods of urinary system investigation

Methods of examining the urinary system for pathology include Blood test to determine plasma concentration of urea and creatinine; Urine examination to determine its appearance, presence of nitrogenous substances, cells, urinary cast; Chemical analysis to determine urine pH and specific gravity, substances, cells, urinary cast; Histological examinations to determine cellular alterations and Urinary system imaging [4].

Ultrasound Scan is the initial protocol for assessment of the urinary system. It reveals renal size (small in chronic renal failure, large in renal masses, benign cyst, hypertrophy [if other kidney is missing], polycystic kidney diseases and rarities e.g. amyloid), hydronephrosis which may indicate renal obstruction or reflux, polynephric collections (trauma, post renal biopsy), transplanted kidneys collections, obstructions, perfusions), and bladder residual volume. Advantage of USS is that it is cheap, independent of renal function and does not require the use of contrast medium. However, intraluminal masses such as Transitional Cell Carcinoma (TCC) in the upper tract may not be revealed [4].

Non-contrast media CT has 97% sensitivity for calculi; it allows detailed characterization of masses (solid or cystic, contrast enhancement, calcification, local distant extension, renal vein involvement); renal trauma (two kidneys, hemorrhage, de-vascularization, laceration, urine leaks) retroperitoneal lesions. With contrast media, CT reveals kidney functions [7].

The right kidney can be seen best with the patient supine, using the liver as acoustic window. Longitudinal and transverse scans are obtained. The left kidney is best assessed with the patient in the right lateral decubitus position. Scanning through the intercostal spaces and with the patient in prone position may provide additional acoustic windows to properly view the kidneys [8].

It is difficult to assess the normal ureters, in pathological dilatations using sonography however; they are easily seen, particularly near the kidneys or bladder.

A full bladder is required for transabdominal assessment of the bladder. A 3.5MHz transducer is used for adults and 5MHz for children or small adults. Patient lies supine, may need oblique rotation. Scan longitudinally and transversely from one side of the abdomen to the other and from pubis symphysis to umbilicus⁹.

The spectrum of sonographic findings often encountered in urinary system ultrasound includes the following: renal anomalies/malformations (Aplasia, Hypoplasia, Cystic malformations, Anomaly of number, Anomaly of position or rotation, Fusion

anomaly, Collecting system anomaly and Vascular anomaly); diffuse renal changes (Large kidney, Small kidney, Hypoechoic structure, Hyperechoic structure and Irregular structure); circumscribed changes (Anechoic structure, Hypoechoic or isoechoic structure, Complex structure, Hyperechoic structure and Echogenic structure); enlargement (Anechoic structure, Hypoechoic structure, Complex echoic structure and Hyperechoic structure); ureteral malformation (Duplication anomaly, Dilatation and stenosis); dilated renal pelvis and ureter (Hypo/Hyperechoic dilatation); renal pelvis/ureteral mass (Hypoechoic/Hyperechoic mass); changes in bladder size or shape (Large bladder, Small bladder and Altered bladder shape); Intra-cavity bladder mass (Hyperechoic/Hypoechoic mass and Echogenic mass) and bladder avail chances (Diffuse wall thickening, Circumscribed wall thickening and Concavity/Convexity) [10].

Empirical Review

A significant number of empirical studies have been done on the diseases affecting the urinary system. The incidence of renal diseases in the world has been on the increase. It was revealed that renal diseases accounted for a great majority of the morbidities and mortalities, with an annual death toll exceeding 35,000 in the U.S alone [11]. Fabian and Naicker, showed that a wide range of renal diseases affect individuals with the Human Immunodeficiency Virus (HIV). The study showed that a broader spectrum of histopathological lesions in HIV associated kidney diseases exist in African population than previously thought. The authors also ranked Nigeria first (with 38%) on the incidence of HIV-associated renal lesions among the population studied in Africa, Sub Sahara [12]. Barsourn [13] also concluded that chronic kidney diseases have assumed a pandemic proportion in Nigeria, the study noted that certain individuals with specific socio-demographic and clinical factors were at risk of chronic renal diseases and recommended that all individual be assessed as part of routine health encounters to determine whether they are at increased risk of developing chronic renal disease based on clinical and socio-demographic factors. Ayodele and Alebiosu, reported diseases of the genitourinary system as being responsible for 928,000 deaths and 14,754,000 disability-adjusted life years in 2014.

The authors noted that the absence of kidney registries in many low- and middle-income countries makes it difficult to ascertain the true burden of chronic kidney disease (CKD) in these countries. The study further revealed that global increase in the incidence and prevalence of CKD is driven by the global increase in the prevalence of diabetes mellitus, hypertension, obesity and aging [1]. Another study implicated fibroblast factor 23 as risk factor in end stage renal failure and mortality [14].

A retrospective study carried out in Calabar, Nigeria to establish the prevalence of acute glomerulonephritis (AGN) among children, established glomerulonephritis prevalence of 1.3% among the study population. The study also established a correlation between the incidence of AGN and low socio-economic status [15].

Donoghue, McSweeney & Jhawar, reviewed current and emerging techniques in urinary tract imaging modalities and asserted that all imaging modalities were evolving to improve disease detection. The study concluded that CT and MRI urography were emerging to the demise of plain film studies, Intravenous urography [7].

Andrew *et al.* (cited in Laradi *et al.*, 1984) [16] concluded that Ultrasonography combined with plain abdominal radiography have almost the same diagnostic value with Intravenous urography in urinary tract examination, the authors went further to recommend USS, plain abdominal radiography and determination of urinary flow rate as the investigations of choice in patients presenting with symptomatic urinary disorders. Although emerging imaging modalities such as CT, USS, and MRI are being used with increased frequency, they have some limitations. IVU remains the most important imaging modality in the diagnosis of urinary tract disease processes [17]. Some other authors have observed that renal parenchymal thickness was a more reliable parameter for assessment of chronic liver disease than renal length. They established 1cm as the minimum normal mean renal parenchymal thickness [18]. Similarly, Schmidt *et al.* [19], posited that the mean renal-cortical sinus ratio is a better parameter for assessment of chronic renal pathology.

Chen, Zagoria and Dyer [20], reviewed radiological findings in acute urinary tract obstruction. Of the 380 patients reviewed by the study, 53 (14%: 39 males, 14 females, average age 43years) had acute urinary tract obstruction, the study observed that all obstruction except one were located in the lower one-third of the ureter. The study also observed the following radiological findings as causes of the obstruction ureteral stones (34-64%), Ureteral edema or lucent stones (16-30%), neoplasms (2-4%), and inflammatory diseases (1-2%). Equally, Waingankar *et al.* reported the presence of renal stone associated with pelvic diverticula [21].

Other works reviewed include Sevitt [22]. Pathogenesis of traumatic uraemia, Okunola *et al.* [23]. Acute renal failure in the intensive care unit, Vourganti *et al.* [24]. Ultrasonographic evaluation of renal infections, Demertzis and Menias [25]. State of the art: Imaging of renal infections, Chandan *et al.* [26]. Multimodality imaging of renal inflammatory lesions, Patino *et al.* [27]. Review of imaging findings in urinary tract infections, Massimo and Sonia [28]. Cross-sectional imaging of complicated urinary infections, and Cheng *et al.* [29]. Urinary imaging findings in young infants with bacteremic urinary tract infections.

Materials and methods

This is a retrospective study carried out over a period of one year between January and December 2021 at the Intercontinental Diagnostics Center, a major private radiological facility in Port Harcourt, Rivers state, Nigeria. This diagnostic facility was chosen because it receives referrals from hospitals all around the Port Harcourt metropolis and it is very active in Abdominopelvic Ultrasound Examinations.

Port Harcourt is the capital and largest city in Rivers state, Nigeria. It lies along the Bonny River and is located in the Niger delta,

between latitudes 4.7774 and 7.01, with elevation of 16meters above sea level. Ijaw and Ikwerre people traditionally inhabit it. The area is metropolitan, with a mixed population of about 1.9million people [30].

The materials used for this study were the ultrasound reports of patients visiting the facility for abdominopelvic examinations, and their request forms. These were obtained from the archives of the Imaging Department of the Center, following the consent and approval of Management of the diagnostic facility.

The study involved collection of data from abdominopelvic ultrasound scan results of all 1,597 patients who presented for abdominopelvic ultrasound examinations in the facility between January and December, 2021 inclusive. The data collected include date of examination, patients' age, sex and the diagnostic findings. The patients' data were presented in tabular form, grouped into categories: adult and pediatric; male and female. Similarly, the kidneys were grouped into the right and left kidneys. Frequencies and percentages were determined from the data and descriptive statistical analysis were done using Microsoft Excel 2016 software for Windows.

Results

Determination of common Sonographic findings

A total of 1,597 patient's Sonographic reports (629 males and 968 females; 90 pediatrics and 1507 adults) were reviewed. Of these, 1,175 (73.6%) were reported as normal studies, without any pathological conditions detected while 422 (26.4%) had pathological conditions detected. These pathological conditions detected are the sonographic findings referred to in this study. Common Sonographic findings, as used in this study, refers to those pathological conditions occurring with the highest frequencies.

Table 1 displays all the 422 Sonographic findings encountered in the study. These were distributed into 23 pathologic or sonographic entities. From the table, the Sonographic findings with the most frequent occurrence are simple renal cysts (5.8%), Hydronephrosis (3.8%), Diffuse Hyperechoic Kidney (3.7%), Renal Calculi (2.5%), Cystitis (2.2%), Enlarged Kidney (1.9%), Bladder outlet obstruction (1.5%), Pyelonephritis (1.5%), small kidneys (1.1%), polycystic kidney (0.5%), Ectopic Kidney and Renal Agenesis (0.4%) respectively, Multicystic Kidney, Ureterocele, complex

Table 1: Frequency of urinary system pathology findings extracted from 2021 abdominopelvic ultrasound reports.

Findings	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	Total	%
Hydronephrosis	10	7	3	2	2	8	7	3	5	3	5	6	61	3.82
Simple renal cyst	1	6	4	7	9	7	8	6	13	8	9	11	89	5.57
Small kidney	6	0	2	0	3	2	1	0	0	3	0	1	18	1.13
Enlarged kidney	1	3	2	1	0	5	8	0	2	1	5	3	31	1.94
Cystitis	4	6	3	2	2	3	0	3	3	3	2	4	35	2.19
Renal calculus	6	4	3	6	4	0	6	0	2	2	3	4	40	2.50
Bladder calculus	0	0	0	0	2	0	0	0	0	0	0	0	2	0.13
Bladder outlet obstruction	3	10	2	1	0	3	0	1	0	0	2	2	24	1.50
Complex renal cyst	0	0	0	0	0	0	0	0	0	1	2	0	3	0.18
Hypoplastic kidney	0	0	0	0	0	0	0	0	0	0	0	1	1	0.06
Renal agenesis	1	0	0	0	0	0	1	0	2	1	0	1	6	0.38
Urinary bladder mass	0	0	0	0	0	0	0	0	0	0	0	1	1	0.06
Ureterocele	0	0	0	0	0	1	0	0	0	1	0	1	3	0.18
Multicystic kidney	0	0	0	0	1	1	0	0	0	0	1	0	3	0.18
Nephroblastoma	0	0	0	0	0	0	0	0	0	1	0	0	1	0.06
Medullary nephrocalcinosis	0	0	0	0	0	0	0	0	0	0	0	1	1	0.06
Pyelonephritis	0	0	3	3	5	3	2	2	2	2	2	0	24	1.50
Diffuse hyperechoic kidney	4	2	4	2	3	8	11	6	7	4	3	5	59	3.69
Hyperechoic renal mass	1	0	0	0	0	0	0	1	0	0	0	1	3	0.18
Renal sinus lipomatosis	0	0	0	0	0	0	0	0	1	0	0	0	1	0.06
Polycystic kidney	0	0	0	0	0	1	2	1	1	1	2	0	8	0.50
Ectopic kidney	0	0	0	0	0	2	1	0	2	0	1	0	6	0.38
Neurogenic bladder	0	0	0	0	0	0	0	0	2	0	0	0	2	0.13
All findings (monthly total)	37	38	26	24	31	44	47	23	42	31	37	42	422	26.38
Normal studies	76	74	89	102	115	106	118	102	121	80	89	103	1175	73.58
Total	113	112	115	126	146	150	165	125	163	111	126	145	1597	100.0
Monthly prevalence (%)	33	34	23	19	21	29	28	18	26	28	29	29		

Table 2: Frequency of renal findings (Pathologies in Kidneys) according to side.

Findings	Right kidney	Left kidney	Bilateral	Total
Hydronephrosis	19	23	19	61
Simple renal cyst	42	39	8	89
Small kidneys	2	1	15	18
Enlarged kidneys	2	3	26	31
Renal calculus	18	16	6	40
Complex renal cyst	1	1	1	3
Hypoplastic kidney	0	1	0	1
Renal agenesis	3	3	0	6
Ureterocele	1	1	1	3
Multicystic kidney	0	1	2	3
Pyelonephritis	7	7	10	24
Nephroblastoma	1	0	0	1
Diffuse hyperechoic kidney	25	5	29	59
Echogenic renal mass	1	2	0	3
Renal sinus lipomatosis	1	0	0	1
Polycystic kidney	0	0	8	8
Ectopic kidney	3	2	1	6
Total	126	105	126	357

renal cyst and hyperechoic renal mass (0.2% each) respectively. The other findings occurred much less frequently.

The study revealed a prevalence of 3.4% for renal parenchymal diseases and a chronic kidney disease prevalence of 1.0%. Table 1 also shows highest monthly prevalence of urinary system pathologies at three periods of the year: the first two months in the first quarter [January (33%); February (34%)]; middle of the year [June (29%); July (28%)] and the last two months of the year [November (28%) and December (28%)]. Overall incidence of urinary system pathology was 26.4%.

Table 2 compares the frequencies of occurrence of renal pathologies between the left and right kidneys. Renal pathologies constituted 357 (84.6%) of the total findings. Polycystic kidney disease and changes in renal sizes were mostly bilateral. Diffuse Hyperechoic kidney appears to affect either both kidneys or mostly the right kidney. Simple renal cyst and renal calculi, appear to affect either of the kidneys almost equally with a few bilateral incidences. Renal agenesis, echogenic renal mass and hypoplastic kidneys are shown to affect either of the kidneys almost equally too but, with no bilateral incidence. Pyelonephritis, hydronephrosis, and complex renal cyst are shown to affect either of the kidneys, or both kidneys almost equally.

Table 3 depicts frequency of the findings among the sexes. It shows the male gender to be more affected by renal pathologies than the female gender in a ratio of 1.4:1. Neurogenic bladder was seen to an equal proportion among the male and female gender (1:1). Also, hypoplastic kidney, ectopic kidney, and bladder outlet obstruction was seen in an almost equal proportion among the genders. The other findings occurred more among the male gender.

Table 3: Frequency of urinary system pathology amongst the genders.

Findings	Male	Female	Total
Bladder calculus	1	1	2
Hydronephrosis	29	32	61
Small kidney	12	6	18
Enlarged kidney	19	12	31
Cystitis	21	14	35
Urinary bladder mass	0	1	1
Renal calculus	24	16	40
Bladder outlet Obst.	18	6	24
Complex renal cyst	3	0	3
Hypoplastic kidney	0	1	1
Multicystic kidney	1	2	3
Renal agenesis	5	1	6
Ureterocele	1	2	3
Pyelonephritis	16	8	24
Medullary nephrocalcinosis	0	1	1
Nephroblastoma	1	0	1
Diffuse hyperechoic kidney	36	23	59
Renal sinus lipomatosis	0	1	1
Polycystic kidney	5	3	8
Ectopic kidney	3	3	6
Hyerechoic renal mass	2	1	3
Neurogenic bladder	1	1	2
Simple renal cyst	46	43	89
Total	244	178	422

Table 4: Distribution of Findings among paediatrics and adult patients.

Pathology	Paediatrics	Adults	Total
Small kidney	0	18	18
Hydronephrosis	0	61	61
Simple renal cyst	0	89	89
Enlarged kidney	0	31	31
Cystitis	1	34	35
Renal calculus	0	40	40
Urinary bladder mass	0	1	1
Bladder outlet obs.	0	24	24
Bladder calculus	0	2	2
Complex renal cyst	0	3	3
Renal agenesis	1	5	6
Ureterocele	0	3	3
Medullary nephrocalcinosis	0	1	1
Multicystic kidney	0	3	3
Pyelonephritis	1	23	24
Nephroblastoma	1	0	1
Diffuse hyperechoic kidney	0	59	59
Hyperechoic renal mass	0	3	3
Renal sinus lipomatosis	0	1	1
Polycystic kidney	0	8	8
Ectopic kidney	1	5	6
Neurogenic bladder	0	2	2
Hypoplastic kidney	0	1	1
Total	5	417	422

Table 4 shows a predominance of findings among the adult population. Most findings among the paediatrics appear to be congenital. All the polycystic kidney diseases were recorded among the adult population. This suggests the predominance of adult polycystic kidney disease.

Discussion, conclusion and recommendations

Discussion

The purpose of this study is to determine the common findings in urinary system ultrasound scan in Port Harcourt metropolis, determine the distribution of findings between the male and female gender, between adults and children, and also to compare renal findings between the left and right kidneys.

A total of 1,597 patient's reports comprising 629 males and 968 females (1507 adults and 90 children) were reviewed, among which 422 findings (26.4%) were recorded. This falls within the range of prevalence recorded by previous studies [2,31] conducted in other localities. The findings were distributed among 23 pathological entities. Of these, 12 pathological entities occurred with much greater frequencies than the others. The most frequently occurring findings were simple renal cyst, diffuse Hyperechoic kidney, hydronephrosis and renal calculus. These were followed by cystitis, pyelonephritis, bladder outlet obstruction and enlarged kidneys. The least frequently occurring findings among these 12 pathological entities were small kidneys, polycystic kidneys, renal agenesis and ectopic kidneys. Similar findings were reported by Otieno *et al.* [31] and Chen *et al.* [20].

The study revealed prevalence of 3.4% for renal parenchymal disease, 3.8% for obstructive uropathy, 3.2% for cystic renal

diseases; 1.8% for collecting system diseases; and 0.7% for congenital diseases of urinary system. Chronic kidney damage was recorded at 1.0%. Overall prevalence of urinary system pathology was 26% of which renal pathology was about 25%. This is similar to findings in Innocent *et al.* [2].

The highest prevalence of urinary system pathologies was recorded at three periods of the year: the first two months in the first quarter (January and February); middle of the year (June and July), and the last two months in the last quarter of the year (November and December). This may be connected to the high levels of industrial and commercial activities during these periods.

Comparison between the right and left kidneys shows some patterns of findings:

- Mostly bilateral i.e., polycystic kidney disease, and changes in renal size.
- Mostly unilateral i.e., renal agenesis, solid renal mass, hypoplastic kidney, and simple renal cyst.
- Bilateral or unilateral.

A remarkably higher incidence of diffuse Hyperechoic kidney was noted on the right compared to the left in a ratio of 5:1. This may prompt further studies to determine possible cause.

The study showed more findings of urinary system pathology among the male gender (1.4: 1). this disparity is in agreement with Makusidi *et al.* [32], but contrasts Innocent *et al.* [2]. However, this finding may suggest mostly noninfectious etiological factors of urinary system pathologies within the study population. The reviewed reports assigned ages to patients simply as adults or paediatrics. The findings were predominantly among the adult population (83.4:1). Findings among the paediatric population were mostly congenital urinary system pathologies. This is expected as age is an established factor in renal disease etiology [1,4].

Conclusion

The study showed twelve common findings often encountered in urinary system ultrasound scans, namely: simple renal cyst, hydronephrosis, diffuse hyperechoic kidney, renal calculus, cystitis, enlarged kidney, bladder outlet obstruction, pyelonephritis, small kidney, polycystic kidney diseases, ectopic kidney, and renal agenesis. The estimated prevalence of urinary system pathology was similar to those obtained in many other studies. However, contrary to findings in most studies, the male gender displayed higher frequency of findings than the female gender. In addition, there was an apparent preponderance of right diffuse renal parenchymal hyperechogenicity.

Recommendations

Further studies are recommended to determine:

- The cause(s) of the higher prevalence of urinary system pathologies in the male population than the female.
- The reason for the apparent preponderance of diffuse hyperechoic renal parenchyma of the right kidney.

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