Section: Anatomy

Original Research Article

CORRELATION BETWEEN SONOGRAPHIC MEASUREMENTS OF RENAL LENGTH AND VOLUME IN ADULTS

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Abstract

Background: Renal size is of great clinical importance for screening, diagnosis, and follow-up of renal diseases, as the basis of clinical decisions. Serial measurements are helpful in determining disease progression or stability. Decreased renal size usually indicates a chronic change, while increased renal size implies an acute change, diabetic condition, or other structural abnormalities. Correlative study between the renal size and volume. **Materials and Methods:** The ultrasonographic measurement of renal length and width are taken in 500 healthy individuals aged 15-80 years who are screened for normal renal dimensions in the department of Radiology in Jawahar Lal Nehru Medical College and associated hospital, Ajmer. **Results:** Out of 500 individuals included 315 were male and 185 were female. The percentage of males was higher (63%) than that of females (37%). In this study measurements of renal dimensions length, width, cortical thickness, renal size, renal volume of right and left kidney has been taken and compared between both genders of various age groups. **Conclusion:** The length of the left kidney is significantly more than the right kidney in both genders. With relevance to gender it is seen that the length of the right and left kidneys is more in males than in females. Kidney length and volume are important parameters in clinical settings, such as in acute and chronic renal disease and recurrent urinary tract infection.

INTRODUCTION

Renal size is of great clinical importance for screening, diagnosis, and follow-up of renal diseases, as the basis of clinical decisions. Serial measurements are helpful in determining disease progression or stability. Decreased renal size usually indicates a chronic change, while increased renal size implies an acute change, diabetic condition, or other structural abnormalities.[1-4] US is useful for diagnostic and prognostic purposes in chronic kidney disease. Whether the underlying pathologic change is glomerular sclerosis, tubular atrophy, interstitial fibrosis or inflammation, the result is often increased echogenicity of the cortex. The echogenicity of the kidney should be related to the echogenicity of either the liver or the spleen. Moreover, decreased renal size and cortical thinning are also often seen and especially when disease progresses. However, kidney size correlates to height, and short persons tend to have small kidneys; thus, kidney size as the only parameter is not reliable.[5]

Renal length and volume are important indicators for the presence or progression of diseases in urology and nephrology practice. They are also important clinical parameters in evaluation and follow up of a kidney transplant recipient, patients with hypertension and renal insufficiency related to renal artery stenosis and patients with recurrent urinary tract infection. Because therapeutic decisions are frequently based on results of these dimensions, accurate and reproducible methods for assessing renal length and volume are of great importance. In addition, an understanding reference values of normal renal metrics is critical to assess alterations from these values.[6]

MATERIALS AND METHODS

The sonographic measurements of dimensions of the kidney were collected from real time ultrasound

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images. Subjects selected for the study were evaluated sonographically for any other pathology unrelated to kidney. The ultrasonographic measurement of renal length and width are taken in 500 healthy individuals aged 15-80 years who are screened for normal renal dimensions in the department of Radiology in Jawahar Lal Nehru Medical College and associated hospital, Ajmer.

Data processing and statistical analysis were carried out using Microsoft Excel. Data results were compared and analyzed for different correlative studies and compared with other scientist studies.

RESULTS

Table 1: Statistical Distribution according to sex

	Both gender	Male	Female
Mean	39.44	39.78	38.87
Median	34.00	35.00	33.00
S.D.	16.66	16.58	16.82
Range			
Minimum	16.00	16.00	17.00
Maximum	80.00	80.00	80.00

Table 2: Distribution according to Length of Right Kidney

Length of Right Kidney	Number of Cases	Male	Female
8.0-8.5	1	0	1
8.6-9.0	34	21	13
9.1-9.5	67	45	22
9.6-10.0	340	212	128
10.1-10.5	56	35	21
10.6-11.0	2	2	0
	500	315	185

Table 3: Distribution of Length of Left Kidney

Length of Left Kidney	Number of Cases	Male	Female
8.0-8.5	2	1	1
8.6-9.0	6	6	0
9.1-9.5	38	25	13
9.6-10.0	299	187	112
10.1-10.5	99	61	38
10.6-11.0	55	35	20
11.1-11.5	1	0	1
	500	315	185

Table 4: Distribution according to Volume of Right Kidney

Volume of Right Kidney	Number of Cases	Male	Female
70-80	67	32	35
81-90	32	24	8
91-100	9	3	6
101-110	197	74	123
111-120	136	123	13
121-130	29	29	0
131-140	30	30	0
	500	315	185

Table 5: Distribution according to Volume of Left Kidney

Volume of left Kidney	Number of Cases	Male	Female
70-80	8	5	3
81-90	69	37	32
91-100	25	18	7
101-110	29	17	12
111-120	227	127	100
121-130	88	65	23
131-140	50	42	8
141-150	4	4	0
	500	315	185

DISCUSSION

The objective of this study is to define the mean kidney dimensions in individuals of 15-80 years of age, correlating the measurements with side, age, and gender, and comparing the values with those from earlier studies. Renal dimensional measurements are clinically relevant, serving as surrogates for renal functional reserve. However, it is used frequently as the basis for making clinical decisions. Serial

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measurements can also provide information regarding disease progression or stability. Renal disease can increase or decrease renal size and may or may not be accompanied by changes in the normal organ structure.[7]

The present study was attempted to determine the normal renal dimensions which may help in the diagnosis of kidney disease. The renal measurements play a fundamental role for clinicians to determine the health status and to visualize any abnormalities present in the kidney. Renal size may be an indicator of the loss of kidney mass and kidney function. Out of 500 individuals included 315 were male and 185 were female. The percentage of males was higher (63%) than that of females (37%). In this study measurements of renal dimensions length, width, cortical thickness, renal size, renal volume of right and left kidney has been taken and compared between both genders of various age groups.

Rafat Saeed Mohtasib et al in a study in 2019 showed that the left kidneys were longer than the right kidneys (P<.001). Height had the most significant correlation with kidney length (R2=0.829, P<.001 for right kidney; R2=0.831, P<.001 for left kidney). There was a consistent difference in kidney length by sex. Both kidneys were longer in males than females (P=.031, right kidney, P=.015, left kidney). In terms of renal growth by age, our data showed a statistically significant difference before and after 24 months of age. There was no significant difference between populations from Saudi Arabia, Hong Kong (P=.485) and Australia (P=.99), but the difference between Saudi and American children was significant (P<.001). However, we did not have the data from those studies for direct comparison. The correlation plots of renal length versus age for all four countries were similar.[8]

The study was carried out on 118 patients (51 male & 67 female) taking measurements of 236 kidneys having no radiologic evidence of renal diseases. Renal dimensions of right were compared with the left. The volume of the kidney was correlated with age, sex, height and body surface area. The present study revealed that the volume of left kidney was more than the right in both male and female. The size of kidney in male was larger than female. The volume of kidney showed linear relationship with the body surface area both in male and female. However, volume of kidneys decreased from sixty years of age.[9]

CONCLUSION

The size provides a rough indication of renal function. Also, decrease of size and function are seen with chronic renal failure (Yamaguchi S et al., 1990), renal arterial occlusion, renal artery stenosis (Paul S. Watson et al., 2000), and late-stage renal venous thrombosis (Montague JP et al., 1982).[10] As renal function decreases as is the case in Chronic Renal Disease the renal also decreases significantly. Physiologically renal length decreases 0.5cm per decade after middle age. On the other hand, there is an increase in kidney size in end stage renal thrombosis, end stage diabetes mellitus and renal inflammation.

REFERENCES

1. Ozmen CA, Akin D, Bilek SU, Bayrak AH, Senturk S, Nazaroglu H. Ultrasound as a diagnostic tool to differentiate acute from chronic renal failure. Clin Nephrol. 2010; 74(1): 46–52. Epub 2010/06/19. pmid:20557866.
2. Sanusi AA, Arogundade FA, Famurewa OC, Akintomide AO, Soyinka FO, Ojo OE et al. Relationship of ultrasonographically determined kidney volume with measured GFR, calculated creatinine clearance and other parameters in chronic kidney disease (CKD). Nephrology, dialysis, transplantation. 2009;24(5):1690–4. Epub 2009/03/07.
3. Avram MM, Hurtado H. Renal size and function in diabetic nephropathy. Nephron. 1989;52(3):259–61. Epub 1989/01/01. pmid:2739865.
4. Ming Z, Hong-Ling H, Qing Z. Individual influencing factors of the normal adult kidney size. Chinese Journal of Health Management. 2014;8(4):264–7.
5. Rumack C.M., Wilson S.R., Charboneau J.W. Diagnostic Ultrasound. 3rd ed. Elsevier Health Sciences; St. Louis, MO, USA: 2005.
6. Mustafa J. Musa, Ahmed Abukonna, Sonographic Measurement of Renal Size in Normal High-Altitude Populations, 2017.
7. Dinkel E, Ertel M, Dittrich M, Peters H, Berres M, et al. (1985) Kidney size in childhood. Sonographical growth charts for kidney length and volume. Pediatr Radiol 15: 38-43.
8. Rafat Saeed Mohtasib, Kamal Mostafa Alshamiri, Aman Asad Jobeir, Farida Mohsin Ambo Saidi, Ahmed Mohammed Masawi, Lamya Sami Alabdulaziz, Faisal Zaid Bin Hussain. Sonographic measurements for kidney length in normal Saudi children: correlation with other body parameters, 2019.
9. Jayanta Kumar Sarkar, Turlika Sinha, Abhishek Das, Bijon Chandra Dutta. Ultrasonographic Measurement of Renal Dimensions: It's Correlation with Body Surface Area In Adults, 2018.
10. E N Barton, W M West, L A Sargeant, J F Lindo, N C Iheonunekwu. A sonographic study of kidney dimensions in a sample of healthy Jamaicans, 2000.

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