Original Article

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SONOGRAPHIC EVALUATION OF NORMAL RENAL VARIANTS IN POPULATION OF LAHORE

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ABSTRACT

Background and Objectives: Congenital renal diseases consist of a variety of entities. The age of presentation and clinical examination narrow down the differential diagnosis; however, imaging is essential for accurate diagnosis and pretreatment planning. Ultrasound is often used for initial evaluation. To evaluate the normal renal variants on ultrasound in population of Lahore.

METHODOLOGY: A cross sectional analytical study was conduct at university ultrasound clinic township University of Lahore. Total sample size was 258. SPSS version 21.0 was used for data analysis.

RESULTS: Out of total number of 258 patients, 98 (38 %) were females and 160 (62%) were males, normal variants of kidneys in which 45 (17.4 %) patients had Lobulation variant, 114 (44.1%) had column of bertin, 55 (21.3%) had dromedary hump, 23 (8.9%) had duplex collecting system and 21(8.1%) had junctional parenchymal defect. Cross tabulation shows between gender and variant, column of bertin is most frequent variant in both genders.

CONCLUSION: Study concluded that normal variants are commonly encountered on ultrasound imaging. In this study the most common normal renal varient was colomn of bertine and least common was junctional parenchymal defect. Sonography continues to occupy a central role in the evaluation and detection of different congenital normal anatomical variants due to its advantage of rapid scanning time, lack of radiation exposure, cost effective and easy feasibility

KEYWORDS: Ultrasound, Dromedary Hump, Column of Bertine, junctional parenchymal defect, cortical thickness, renal length.Introduction.

INTRODUCTION

Kidneys are the vital regulatory organs of the vertebrates and play an important role in excretion of bodily waste and regulation of water and electrolytes.1 The kidney is the paired retroperitoneal organ that is symmetrically placed in the abdominal region. This organ is consisting of various dimensions (RD) such as renal length, renal volume, cortical volume or thickness which can be obtained with the help of ultrasound in evaluation of kidney size.2

Sonography recognized renal thickness, length as well as echogenicity of renal parenchyma separately as of its significance to detail widen collecting system.15 These details help out to identify degree of renal parenchymal harm as well as prospect of reversibility, furthermore verdict for performing renal biopsy.1

Ultrasound is a primary imaging modality that has shown its usefulness as an essential tool in the evaluation of renal dimension. The normal renal dimensions can be demonstrated by ultrasonography, plain radiography and contrast Urographic studies. It is also employed in the diagnosis of renal diseases. The renal contour was always smooth. There was no acoustic enhancement behind a large column of Bertin. nephrotomography. The kidney is viewed in several planes and from several directions on sonography. We found the axillary view especially revealing in our search for large columns of Bertin.2

In the past few decades, ultrasonography evaluation of has emerged as a useful technique for in vivo assessment of renal size with high reliability and accuracy.

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Ultrasonographic measurement of the kidney dimensions is important in evaluation of renal disease in preterm infants who have multiple comorbidities that effect the renal function.3

Renal size is also important parameter for assessment in kidney transplant candidates. Renal sizes also facilitate differentiation between chronic and acute renal failure.11The changes in renal size can be very suggestive evidence of disease. The deviation of renal parameters from established normal values is an important criterion in diagnosing kidney disease. The renal parenchyma thickness also was found to be one of the ultrasonography renal parameters that can offer prognostic information at the end stage kidney disease. Imaging of the kidney is mainly based on morphologic evaluation of parenchyma excretory system and renal vasculature using ultrasonography, computed tomography (CT) and magnetic resonance imaging.4

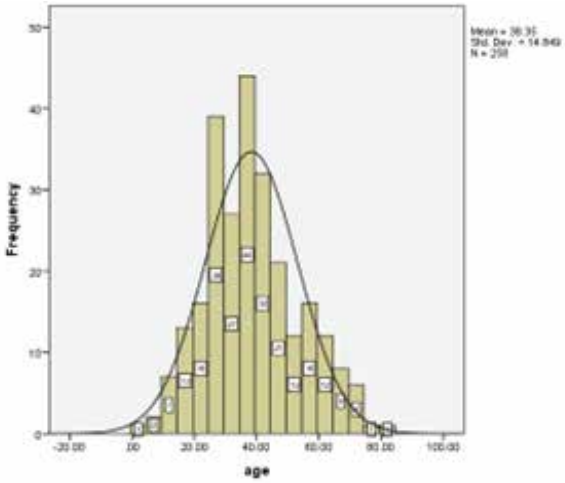
Ultrasound has shown to have good accuracy as well as inter-observer and intra-observer reproducibility for renal dimension measurement. There are a lot of benefits of ultrasonography in renal dimension determination as it is cheap, non-invasive, easily available, fast as well as portable and includes neither ionizing radiations exposure nor radiographic magnification and has no contrast related adverse effects as compared to the other imaging modailities.13Ultrasound is the first line imaging modality used to assess the kidneys and renal tract due to its easy accessibility, lack of radiation and low cost.5 The aim of the study to create a normative database of variants in normal renal morphology in population of Lahore.

METHODOLOGY

A cross sectional analytical study was conducted after approval of Ethical Review Board at university of Lahore faculty of Allied Health sciences, Lahore. On the basis of diagnosis inclusion criteria were included adult patients of both genders for abdominal ultrasound. And patients who are willing to participate. In exclusion Criteria excluded the Patient present with any known renal pathologies. Data were collected with help of convenient sampling technique according to the age, gender and normal variants such as lobulation, dromedary hump, column of bertin and duplex collecting system. Total sample size was 258. After collection data were managed in Microsoft excel sheet and were analysed SPSS version 21 was used for data analysis.

RESULTS

Out of total number of 258 patients, 98 (38 %) were females and 160 (62%) were males, normal variants of kidneys in which 45 (17.4 %) patients had Lobulation variant, 114 (44.1%) had column of bertin, 55 (21.3%) had dromedary hump, 23 (8.9%) had duplex collecting system and 21(8.1%) had junctional parenchymal defect. Cross tabulation shows between gender and variant, column of bertin is most frequent variant in both genders. In frequency of age group, out of total number of 258 the age group between 31-40 had frequent variants.



Graph No 1

This table shows the descriptive statistics of age in which maximum age group were 84, mean 38 and standard deviation 14

Table No 1: Comparison between Gender and Variants.

		Gender		Total
		F	M	
Lobulation	Count	9	36	45
	% within Variant	20.0%	80.0%	100.0%
Column of Bertin	Count	51	62	113
	% within Variant	45.1%	54.9%	100.0%
Dromedary Hump	Count	20	35	55
	% within Variant	36.4%	63.6%	100.0%
Duplex collecting system	Count	11	12	23
	% within Variant	47.8%	52.2%	100.0%
Junctional parenchymal defect	Count	7	14	21
	% within Variant	33.3%	66.7%	100.0%
Total	Count	98	160	258
	% within Variant	38.0%	62.0%	100.0%

Cross tabulation shows between gender and variant, column of bertin is most frequent variant in both genders.

Table No 3: Comparison between Age group and variants.

		Variant					Total
		Lobulation	Column of Bertin	Dromedary Hump	Duplex collecting system	Junctional parenchymal defect	
2-10	Count	0	4	3	0	0	7
	% within AG	0.0%	57.1%	42.9%	0.0%	0.0%	100.0%
11-20	Count	5	7	4	2	1	19
	% within AG	26.3%	36.8%	21.1%	10.5%	5.3%	100.0%
21-30	Count	7	20	15	8	7	57
	% within AG	12.3%	35.1%	26.3%	14.0%	12.3%	100.0%
31-40	Count	18	35	20	4	6	84
	% within AG	21.4%	41.7%	23.8%	4.8%	7.1%	100.0%
41-50	Count	8	16	6	5	6	41
	% within AG	19.5%	39.0%	14.6%	12.2%	14.6%	100.0%
51-60	Count	4	14	4	3	1	26
	% within AG	15.4%	53.8%	15.4%	11.5%	3.8%	100.0%
61-70	Count	3	15	3	0	0	21
	% within AG	14.3%	71.4%	14.3%	0.0%	0.0%	100.0%
71—80	Count	0	1	0	1	0	2
	% within AG	0.0%	50.0%	0.0%	50.0%	0.0%	100.0%
81-90	Count	0	1	0	0	0	1
	% within AG	0.0%	100.0%	0.0%	0.0%	0.0%	100.0%
Total	Count	45	113	55	23	21	258
	% within AG	17.4%	43.8%	21.3%	8.9%	8.1%	100.0%

Cross tabulation shows the more frequent normal renal variants were found in age group between 31-40 years.

DISCUSSION

Ultrasound is most reliable methods for measurement of normal variant in different patients.

Renal measurements by sonography are important in studying renal function and its disorders, which offers the advantage of a non-invasive method. The obtained inter-observer and intra-observer variations in renal length and parenchymal thickness measurements showed that the degree of variation is similar whether the left or right kidney is measured or the measurements are made by one or multiple sonographers. This suggests that determining renal length and parenchymal thickness by sonography of normal adult kidneys are reasonably reliable. Assessment of kidney size should also be made individually because many factors like BMI, height, gender, and age affect the measurements. There are metric and non-metric differences in body components among populations and these variations relate to genetic and environmental factors. The anthropometric profile, such as body weight and height of the samples showed a significant difference between genders, and it has shown that these data are typical of the population. 6,7

In current study, attempt was made to evaluate the normal renal variants on ultrasound in population of Lahore. Data was collected according to the variable of the age, gender, height, weight, renal length and normal renal variants was observed and recorded. we analyzed renal size in terms of length and parenchymal thickness, in Lahore population by using ultrasound. The evaluations of these parameters are simple, reproducible, reliable, and objective. Data of out of total number of 258 patients, 98 were females and 160 were males.7,8,9

The age-related changes of the renal length are well known. In another study, an increase in renal length was found from 18-29 years old up to the fourth decade of life (P=0.007). The increase in the renal length in men up to their fifties has already been documented. Both right and left kidneys length decrease significantly after 50 (P=0.008). Previous study reported that kidney's length decreases after age 60. 10,11 The normal ranges of kidney lengths are wide. Within the standard deviation of renal length, there are values less than 100 mm in slim youngest and oldest women and up to 120 mm for both men and women in their thirties and forties. The influencing factors for renal length such as height and BMI must be viewed individually to arrive at relevant conclusions. The mean (SD) parenchymal thickness was found to be 1.76(0.16) cm (range=1.30-2.30 cm) as against 1.89(0.36) cm (range=1.10–2.90 cm) was reported. This implies that the lower normal limit for parenchymal thickness in our study group is 1.30 cm. Values less than 1.30 cm indicate reduced parenchymal thickness as against less than 1.10 cm. According to result of our study, frequency of age group, out of total number of 258 the age group between 31-40 had frequent variant. 12

A study was conduct that bertin column is mostly located on the left side, in the middle 1/3 section and is observed bilaterally in 18% of the cases. The most significant types of Bertin column are the normal variant and the pseudo-lesion aspect mimicking the renal mass. However, it is characterized by 5 types according to its shape and type 3 is related with a double collecting system. In the proportion of the Bertin column was 30%, the segmented-shaped kidney and the double collecting system were calculated as 4% and 26% respectively. In 495 Bertin column patients, 16% of double collecting system was detected and this is less than in the normal population. Observations of hypoechoic thick cystic areas in the US, cambering in the contour of the kidney, and irregularity were accepted as suspicious findings in favor of the Bertin column. According to the result of our study, out of total number of 258 patients, kidneys shows variant in which 45 patients had cobulation variant in their kidenys, 114 had column of bertin, 55 had dromedary hump, 23 had duplex collecting system, 21 had junctional parenchymal defect. 13,14

Dalla Palma et al measured the obliquity of the junction between the two reniculi. Marked obliquity of the right was noted in 42% and of the left in only 1 0% of cases. This marked obliquity between the superior and inferior reniculi probably accounts for the ease of its demonstration on the right. When no or only a slight obliquity is present, the fusion of the superior reniculus to the inferior reniculus is probably more complete, and the JPD and IRS are not as apparent. 15,16 In the series of Dalla Palma et al,. an interface was noted between the two reniculi in 57% of right kidneys, as compared with 46% in our series, and in 29% of left kidneys, as compared with i 9% in our series. The higher detection rate of the interradicular junction by their data could be explained by the different imaging techniques or perhaps by the different age groups. Adults often have more echogenic perinephnc and hilar tissue than infants or children. 17 Dromedary hump appears as a focal bulge on the lateral border of the left kidney (Fig. 2). It forms as a result of the adaptation of the kidney to the adjacent spleen. It can usually

be easily diagnosed on sonography and has the same perfusion as the surrounding renal parenchyma on contrast-enhanced sonography. 18,19 Out of total number of 258 patients, kidneys shows variant in which 45 patients had Lobulation variant in their kidneys, 114 had column of bertin, 55 had dromedary hump, 23 had duplex collecting system, 21 had junctional parenchymal defect.

CONCLUSION

Study concluded that normal variants are commonly encountered on ultrasound imaging. In this study the most common normal renal varient was colomn of bertine and least common was junctional parenchymal defect. Sonography continues to occupy a central role in the evaluation and detection of different congenital normal anatomical variants due to its advantage of rapid scanning time, lack of radiation exposure, cost effective and easy feasibility.

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Authors Contributions:

Muhammad Shafiq, Zeeshan Haider, Naveed Asad: Substantial contributions to the conception and design of the work.

Amjad Iqbal, Muhammad Shakeel, Imdadullah, Marwah Khadim Hussain: Design of the work and the acquisition. Drafting the work.

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