NORMAL KIDNEY SIZE IN NEPALESE FEMALES AT KMCTH

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ABSTRACT

INTRODUCTION

Baseline knowledge of normal kidney size is essential when evaluating patients with possible renal disease. This study was done to assess normal kidney size in Nepalese females at Kathmandu Medical College Teaching Hospital.

MATERIAL AND METHODS

Prospective hospital based cross sectional study was conducted including 231 adult females without any known renal diseases from November 2018 to February 2019. Renal length was measured as longest pole to pole distance. Renal width was measured as the maximum dimension in the cross section at the level of the renal hilum. Cortical thickness was measured between outer renal margin and renal sinus in transverse plane.

RESULTS

The mean length of right and left kidneys were 96.53±8.29 mm and 100.47±9.15 mm respectively with a range of 76-120 mm and 78-120 mm respectively. The mean renal width was 46.80±6.87 mm for right kidneys and 48.61±6.64 mm for left kidneys. The mean cortical thickness were 17.03±3.58 mm for right kidneys and 17.43±3.73 mm for left kidneys. There was significant correlation between length of right and left kidney, however there was no significant correlation between kidney length with kidney width and kidney length with cortical thickness. There was no significant correlation of renal parameters with age, height, weight and body mass index.

CONCLUSION

Normal kidney size of Nepalese females visiting Kathmandu Medical College was comparable to the previous studies. This will help as future reference to evaluate abnormal kidney sizes.

KEYWORDS Cortical thickness, Renal length, Renal ultrasound, Renal width.

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INTRODUCTION

Knowledge of normal kidney size by ultrasonography is essential when evaluating patients with possible renal diseases.[1] Many renal disorders are associated with changes in the sizes of the kidneys. The information available in other parts of world may not be applicable in our context. The renal size may differ between ethnic groups and correlation of kidney size with age, height and weight has shown variable results.[2,3]

Ultrasound is a useful, accessible, non-invasive, inexpensive method to reliably measure renal size.[3] Estimation of renal size by sonography can be performed by measuring renal length, renal width, cortical volume or thickness.[4] This study was designed to see the normal renal dimensions among female subjects and to see its correlation with variables like age, height, weight and body mass index (BMI). This will help as a reference for evaluation of renal pathology among them. We considered female participants only as female are often considered less privileged in various context including health sector in our part of world.

MATERIAL AND METHODS

Prospective hospital based cross sectional study was conducted in Kathmandu Medical College and Teaching Hospital from November 2018 to January 2019. A total of 231 adult female patients with age18 years and above referred to radiology department for ultrasound without any known renal diseases were included consecutively. Pregnant females, diabetic patients, hypertensive patients, patients who had history of previous surgery or trauma in their kidneys, any renal congenital anomalies or pathologies and other systemic diseases observed during ultrasound examination were excluded from the study. The study was done after getting approval from institution review committee. Informed consent was obtained from all the participants. Those who didn't give consent were excluded from the study.

Gray scale real time examinations were performed using Toshiba Xario and Aplio 400 with 3.5 MHz convex array transducer. Patients were asked to empty their bladder before the examination to prevent hydration associated increase in renal length. Renal length was measured as longest pole to pole distance. Renal width was measured as the maximum dimension in the transverse cross section at the level of the renal hilum. The central echogenic region was included in measurements. Cortical thickness was measured between outer renal margin and renal sinus in transverse plane. Patients age, height, weight and BMI were noted.

Statistical analysis was done using SPSS version 20 and graphs and tables were generated using Microsoft word and excel. Pearson's correlation analysis was used for analyzing various parameters. Statistical tests with p value <0.05 was considered statistically significant.

RESULTS

A total of 462 renal units in 231 female subjects were studied. The mean age was 37.34 ±16.012 years. The age ranged from 18-83 years. Mean height and weight were 1.55 ±0.43 meters and 53.13±7.52 Kg respectively. Mean BMI was 21.86±2.74 Kg/m^2. The baseline characteristics of the enrolled subjects is shown in Table 1.

Table 1. Baseline characteristics

Mean age (years) ± SD	37.34 ±16.012
Mean height (m) ± SD	1.55 ±0.43
Mean weight (kg) ± SD	53.13±7.52
Mean BMI (Kg/ m) ± SD	21.86±2.74

Length of left kidney was longer than right. The mean length of right kidneys were 96.53±8.29 mm and that of left kidneys were 100.47±9.15 mm with a range of 76-120 mm and 78-120 mm respectively. The mean renal width was 46.80±6.87 mm for right kidneys and 48.61±6.64 mm for left kidneys. The mean cortical thickness were 17.03±3.58 mm for right kidneys and 17.43±3.73 mm for left kidneys. Distribution of renal dimensions is shown in Table 2.

Table 2. Distribution of renal dimensions

	Right kidney	Left kidney
Length	96.53±8.29 mm	100.47±9.15 mm
Width	46.80±6.87 mm	48.61±6.64 mm
Cortical thickness	17.03±3.58 mm	17.43±3.73 mm

There was significant correlation between length of right and left kidney (r:0.809, p<0.00) which is shown in figure 1. There was no significant correlation between kidney length with kidney width(r: 0.077, p>0.05) and kidney length with cortical thickness (r: -0.014, p> 0.05).

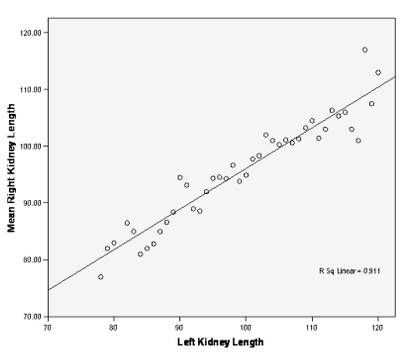

Figure 1. Correlation between right and left kidney length

No correlation was seen between renal length, width and cortical thickness with age, height, weight and BMI which is shown in Table 3.

Table 3. Correlation between age, height, weight and BMI with kidney length, width and cortical thickness.

Renal dimensions	Age	Height	Weight	BMI
Length	r: 0.050, p> 0.05	r: 0.037, p>0.05	r: 0.002, p > 0.05	r: 0.007, p> 0.05
Width	r:0.001, p> 0.05	r:-0.089, p> 0.05	r:0.095, p> 0.05	r:0.063, p> 0.05
Cortical thickness	r:-0.060, p> 0.05	r:-0.031, p> 0.05	r:0.078, p> 0.05	r:0.082, p> 0.05

DISCUSSION

Renal length, width and cortical thickness are important parameters in evaluation of kidneys. Specifically, renal length measurement is valuable in adults due to its reproducibility and accuracy. Therefore knowledge of normal limits is essential in patient management.

In our study of 231 healthy females, the normal length of right kidney was 96.53±8.29 mm and left kidney was 100.47±9.15 mm. Left kidney was slightly longer than left. Our study matched with the study done by Maajiand colleague and Muthusami and colleague.[2,5] The overall mean length for right kidney and left kidney was 10.6 cm and 10.3 cm in study done by Okoye and colleague whose values are slightly higher than ours.[6] Similarly, study done by Emamian and colleague also showed slightly longer kidney size than ours.[7] The study done by Okoye and Emamian was among whole population and our study included only adult females.

There was significant correlation between right and left kidney length which contradicted with the study done by Muthusami et al.[5] When age, height, weight and BMI was correlated using Pearson's correlation, no significant correlation was found which again contradicted with studies done by Carrasco and Muthusami colleagues.[3,5] Some studies found that renal length decreases with increase in age, however we didn't find such findings.[3,8]

The width is 46.80±6.87 mm for right kidney and 48.61±6.64 mm for left kidney. We didn't find significant correlation between renal width and renal length. Similarly, cortical thickness also didn't match with renal width.

The cortical thickness was 17.03±3.58 mm and 17.43±3.73 mm for right kidney and left kidney respectively which is slightly higher than cortical thickness found in a study done by O'Neil et al and Reshaid et al.[9,1] There was no significant difference in cortical thickness in comparison to renal length or renal width.

Although, this study was done prospectively to know the normal renal dimensions, all sonograms were done by the same operator. Intra observer variability was reduced by averaging multiple readings. Single center study with study period of only three months duration and focusing only on linear renal parameters were our limitations. Large sample size and calculation of renal volume would have been more appropriate.

CONCLUSION

The study showed the measurements of normal length, width and cortical thickness of kidney in Nepalese females. Length of left kidney was slightly longer than right and there was significant correlation between right and left kidney length. However, there was no significant changes of renal parameters with age, height, weight and BMI.

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