

Characterization of Renal Function and Morphology in Hypertensive Patients Using Renal Ultrasonography

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Abstract

The aim of research to evaluate renal morphology in adult patients with essential hypertension and correlate it with age, sex, body mass index, body surface area and duration of hypertension. A total of 75 patients (33 males, 42 females) with essential hypertension were evaluated sonographically in this prospective study and 25 healthy individuals (12 males, 13 females) without hypertension were also evaluated as control groups. Renal volume was then calculated from the kidney's length, width and antero-posterior diameter using formula ($L \times W \times AP \times 0.53$). The range of renal volume 46.65 to 105.02 cm³ for the left kidney and 42.59 to 102.33 cm³ for the right kidney. In control group, (mean \pm SD) volumes of the right and left kidneys in males (80.7 cm³ \pm 36 and 75.3 \pm 33 respectively), in females (78.2 cm³ \pm 33 and 70.4, \pm 29 respectively). The (mean \pm SD) kidney length was (9.35 \pm 1.3 cm). It was (9.15 \pm 1.1 cm) on the right side and (9.27 \pm 1.3 cm) on the left side. The hypertensive kidneys volume

slightly in lower limit in relation to control group. The (mean \pm SD) kidney width was (4.45 \pm 1.1cm) and the cortical thickness 1.46 \pm 0.5 cm, consider with in normal range.

Renal volume correlated significantly with BMI in hypertensive patients ($r = 0.35$ and 0.31 $p < 0.005$ for right and left kidney, respectively), There was no significant correlation between renal volume and duration of hypertension ($r = 0.9$ and 0.8 ; $p > 0.005$ for left and right kidneys, respectively).

Key words: renal function, hypertensive patients, renal ultrasonography

INTRODUCTION:

Hypertension is one of the most common diseases worldwide especially essential hypertension which is a multi-factorial disorder. Bp is the force of blood pushing against blood vessel walls as the heart pumps out blood. The high blood pressure, also called hypertension, is an increase in the amount of force that blood places on blood vessels as it moves through the body. High blood pressure can damage blood vessels in the kidneys, reducing their ability to work properly. ⁽¹⁾

The kidney plays a major role in the regulation of blood pressure (BP) and is one of the main organs affected by high BP, makes it important to study the effect on the renal morphology using ultrasound. ⁽²⁾

Renal ultrasound scan is a simple non-invasive method for estimating the kidney size. Renal length and volume, cortical thickness C/M differentiation.

The main objective of this study to evaluate the renal morphology (renal size and shape) on long standing hypertension using ultrasound. And find correlation between onset of disease and renal volume.

MATERIAL AND METHODS:

This study was carried out in Khartoum state during the period from January up to December 2018. A total of 75 adult patients with essential hypertension and 25 control group attending the outpatient clinic were examined sonographically after informed consent was obtained. The ultrasound system used Fukuda denshi UF-850XTD. Using the 3.5–5 MHz curvilinear probe. The patients' age, gender and duration of disease obtain before ultrasound examination. The height (in meters) and weight (in kilograms) of the patients are measure. The BMI and BSA well calculate using the formula $\text{weight}/\text{height}^2$ and $\text{weight}^{0.425} \times \text{height}^{0.725} \times 71.84$, respectively. A systematic abdominal sonographic examination was performed on all patients. The examination was performed the length, width and thickness were measured using US. Kidney volume well calculate using the formula $\text{length} \times \text{thickness} \times \text{width} \times 0.523$ were obtained.

Inclusion criteria:

- Patient with different age group included
- All patients suffered from longstanding hypertension and have request ultrasound scan

Exclusion criteria:

- All pregnant women.
- All women who had given birth in the last 12 months.
- All Patients with congenital anomalies such as a horse shoe-shaped or ectopic kidney.

RESULT:

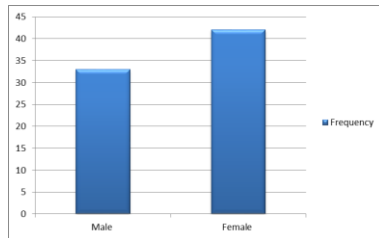


Fig (1): Represents the gender of hypertensive patient

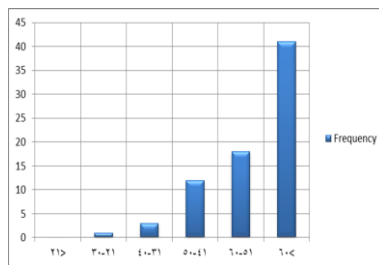


Fig (2): Represent the common age affected by hypertension.

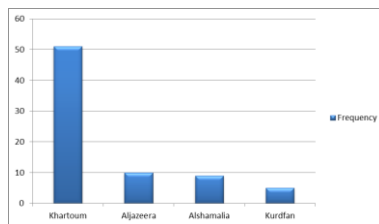


Fig (3): The Residence of hypertensive patients.

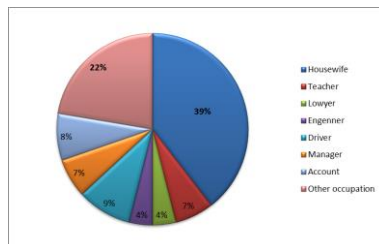


Fig (4): The occupation of hypertensive patients.

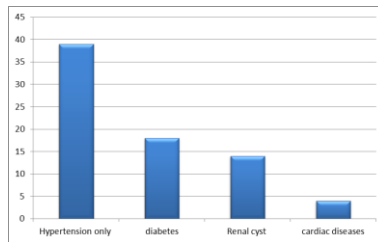


Fig (5): Common disease associated with hypertension.

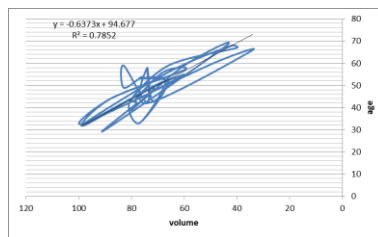


Fig (6): Showing decrease in renal volume as age increases in hypertensive patients.

Also among the patients it was observed that considerable increasing in renal volume as BMI increased (linear relation).

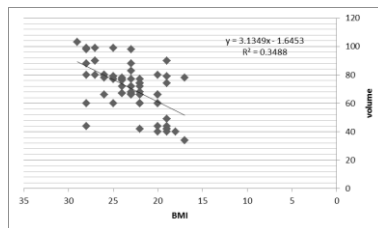


Fig (7): Showing increase in renal volume as BMI increases in hypertensive patients.

DISCUSSION:

A total of 75 participant's hypertensive patient (33 male's and 42 females) were examined shows fig (1).

The age range was 21–89 years, with a mean of 64.6 years. The ages of the control group 12 males and 13 females ranged from 21 to 70 years, with a mean of 40.1 years. Among

the hypertensive patients, 41 (54.6%) were above 60 years fig (2) these result in the present study agree with those reported in the other studies. (2, 3, 4)

Among those patients understudy, 51 (68%) resided in Khartoum followed by Aljazeera 10 (13%), Alshamalia 9 (12%) and 5 (7%) from Kurdfan. fig (3)

According to the patient occupations, 30 (40%) of them were housewives, 5 (6.6%) teachers, 3 (4%) lawyers, 3 (4%) engineers, 7 (9.3) drivers, managers 5(6.6), accountants 6(8%) and 16(21.4%) other occupations, (not mentioned) as shown in fig (4)

In the hypertensive group, the kidney volume ranged from 46.65 to 105.02 cm³ for the left kidney and 42.59 to 102.33 cm³ for the right one. In this group, the mean volumes of the right and left kidneys in males (80.7 and 75.3 cm³, respectively) in females (78.2 and 70.4 cm³, respectively). In the control group, the range of renal volume was 60.51–108.9 cm³ for the left kidney and 59.5–105.01 cm³ for the right one. These result in the present study agree with those reported in the other studies. (, 2, 3&4)

Renal volume as already proven is the most precise measurement of renal size and tends to show the highest correlation with height, weight and BSA (12). Our results are in accordance with this statement because we observed significant correlation between renal volume and BSA, particularly with the left kidney. Significant correlation was also demonstrated between renal volume and BMI. However, right renal volume correlates better with BMI, as reported in other studies (12).

The duration of hypertension in our patients was calculated from the time hypertension was first diagnosed in the hospital in a patient. There was no significant correlation between renal size and duration of hypertension

CONCLUSION:

Renal volume is the most precise measurement of renal size, this study established patients with essential hypertension .Renal volume is higher in the left than the right kidney in hypertensive patients of both sexes and female hypertensive patients have smaller kidney size compared to males. The study also shows that volume of both kidneys decreases with age and positive correlation between renal volume, BSA and BMI. However, there is no correlation between renal size and duration of hypertension.

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