

Estimation of Serum Uric Acid, Urea and Creatinine in Essential Hypertensive Patients

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Abstract

Hypertension is one of the most common world disease, which caused many effects on human body. Renal dysfunction is one of the most important adverse effects of the hypertension, which can be studied by measurement of clinical biochemical parameters in blood. In the current study serum uric acid, urea and creatinine had been measured in blood of 82 hypertensive patients including (45 males & 37 females), and 43 apparently healthy volunteers as control group, in order to identify the effect of hypertension on some renal function test such as serum uric acid, urea and creatinine in comparison with control group and compared these parameters between male and female hypertensive patients. From the data collected it found there are a significant increase in the mean values of serum urea and creatinine in hypertensive patients compared with control , while no significant difference in serum uric acid between hypertensive patients and control group. The results of comparison between male and female hypertensive patients for serum uric acid , urea and creatinine showed that there was a significant increase in mean value of serum uric acid in male than that in female hypertensive patients and no significant change was found in the mean values of serum urea and creatinine between male and female hypertensive patients.

Introduction

Hypertension in adults is defined by systolic pressure greater than 140 mmHg and diastolic pressure greater than 90 mmHg .(1) Hypertension that is a result of (secondary to) known disease processes as a disease of the kidneys and arteriosclerosis of the renal arteries, is logically called secondary hypertension because of high blood volume (2). Hypertension that is the result of complex and poorly understood processes is not so logically called primary or essential hypertension (2),(3). The adverse effects of hypertension principally involve the blood vessels, the central nervous system, the retina, the heart and the kidney, and can often be detected by simple clinical means(4) . The hypertension is the most important modifiable risk factor for coronary heart disease, stroke, congestive heart failure, peripheral vascular disease and end-stage renal disease(5),(6). The clinical investigations of renal function such as uric acid, urea and creatinine are important to identify renal dysfunction, to diagnosis renal disease, to monitor disease progress and to monitor response to treatment(7). Uric acid is the major product of the catabolism of the

purine nucleosides, adenosine and guanosine. Using enzymatic method, the reference intervals for serum uric acid has been reported to be 3.5 – 7.2 mg/ dl (208-428 μ mol/l) for males and 2.6 – 6 mg / dl (155 – 357 μ mol/l) for females(8). Urea is formed in the liver from ammonia released by deamination of amino acids(9). Over 75% of non- protein nitrogen is excreted as urea mainly by the kidneys, small amounts are lost through the skin and gastrointestinal (GI) tract (10). Urea measurements are widely available, and have come to be accepted as giving a measure of renal function(8),(10) . The reference intervals using an enzymatic method is 15 – 40 mg/ dl (2.5 – 6.6 mmol/l)(4),(8) . Measurements of the plasma concentration of creatinine are often used clinically as an index of kidney function. Creatinine produced as a waste product of muscle creatine, about 1-2 % of the total muscle creatine pool is converted daily to creatinine through the spontaneous, non-enzymatic loss of water (2),(10). Since it is released into the blood at a constant rate, and since its excretion is closely matched to the glomerular filtration rate (GFR), an abnormal decrease in GFR causes increase

the plasma creatinine concentration (2),(11). Thus, a simple measurement of blood creatinine concentration can indicate whether the GFR is normal and provide information about the health of the kidneys(2). The reference intervals for serum creatinine, measured by Jaffe method are 0.9 – 1.3 mg/dl (80-115 μ mol/l) in men and 0.6 – 1.1 mg/dl (53 – 97 μ mol/l) in women (8).

Materials and Methods

The subjects who were participated in this study involved 82 hypertensive patients including (45 males & 37 females), aged between (28-61) years with a mean of 45 years, their weight were between (62-103) Kg with a mean 85 Kg and their blood pressure was \geq 140/ 90 mmHg. Since all the patients have got hypertension for (3-13) years. In this study excluded the patients who have history of renal, heart diseases and diabetes mellitus (secondary hypertension). The control group included 43 apparently healthy normotensive subjects aged between (27-58) years with a mean of age 43 years, their weight were between (59-96) Kg with a mean 80 Kg and the mean of their blood pressure was 120/ 80 mmHg. Complete information was obtained from each subjects. This information includes name, age, sex, weight, blood pressure, occupation, duration of hypertension, family history and any drug intake. 5 ml of venous blood were obtained from patients and controls subjects by anticubital venous puncture. The blood samples were collected in plain plastic tubes, then left on the bench at room temperature for 30 minutes. The samples were obtained by a centrifugation at 3000 rpm for 10 minutes. The serum sample were transferred into the other plain tubes to used for the following tests: serum uric acid, urea and creatinine. Serum uric acid was determined by an enzymatic method (uricase) using a kit provided by (bioMerieux/ France)(12). Serum urea was determined by an enzymatic method (urease- modified Berthelot reaction) using kit provided by (bioMerieux/ France) (13). The determination of creatinine was based upon the colorimetric method with

deproteinization using kit (Syrbio / France)(14) .

Data were analysed using unpaired t – test . The results were expressed as mean \pm standard deviation (SD), $P < 0.05$ was considered as statistically significant (15) .

Results

Certain renal function test used in this study including serum uric acid, urea and creatinine ; as represented in table (1) , a non significant increase in the mean value of serum uric acid concentration is observed in the hypertensive patients (276.0 \pm 70.4) in comparison to control group (269.8 \pm 70.7),($P > 0.05$) ; as in Figure (1). While the mean value of serum urea concentration was significantly higher in the hypertensive patients (5.96 \pm 1.32) compared with (4.72 \pm 1.13) in the control group ($P < 0.001$); as in Figure (2). However, there was a significant rise in the mean value of serum creatinine concentration in the hypertensive patients (90.6 \pm 15.3) as compared with (68.37 \pm 9.22) in the control group ($P < 0.001$) ; as in Figure (3). A comparison of the mean values of serum uric acid, urea and creatinine concentration in both sex of hypertensive patients as shown in table (2); there was a significant difference in the mean value of serum uric acid concentration between male hypertensive patients (300.2 \pm 68.1) and female hypertensive patients (246.4 \pm 62.0) with higher mean value in males with ($P < 0.001$) as in Figure (4). While there was not significant difference in the mean values of serum urea concentration between male hypertensive patients (6.03 \pm 1.40) and female hypertensive patients (5.87 \pm 1.22) with ($P > 0.05$); as in Figure (5), on other hand, the mean value of serum creatinine concentration show a non significant difference between male hypertensive patients (91.1 \pm 16.7) and female hypertensive patients (90.1 \pm 13.7) with ($P > 0.05$) as in Figure (6).

Discussion

In present study shows a significant increase in the mean values of serum urea and creatinine concentration in

hypertensive patients in comparison to control group ($P < 0.001$), while no significant difference in the mean value of serum uric acid concentration between hypertensive patients and control groups; Table (1) and Figure (1), (2), (3). These result in agreement with Jabary et al., 2006(16), Vupputuri et al., 2003(17) and Bulpitt 1973(18). This elevation may be relevant to the decrease GFR as a result of hypertension effect on renal function (decrease in renal blood flow as a sequence of increasing renal vascular resistance). A reduction in renal blood flow leads to a decrease of GFR, (8), (19) this is lead to a decrease distal tubular flow rate which lead to increase of urea reabsorption and decreased secretion which may be the reason for elevated serum urea concentration (8), (1). The elevation of serum creatinine concentration may be attributed to the decrease in creatinine clearance due to the decrease in the GFR (2).

A comparison between male and female hypertensive patients for serum uric acid, urea and creatinine results showed that there is no significant difference in the mean values of serum urea and creatinine concentration between male and female hypertensive patients, as in Figure (4), (5). However, there was a significant difference in mean value of serum uric acid between male and female hypertensive patients with higher mean value in males ($P < 0.001$) as in Figure (6). The elevation of serum uric acid concentration may be attributed to the urinary excretion is slightly lower in males than in females (it may be that renal excretion of urate is affected by sex hormone levels) (20).

It concluded from the above finding that there is adverse effect of the hypertension on renal function.

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Table (1): Comparison of serum uric acid, urea and creatinine between hypertensive patients and control groups.

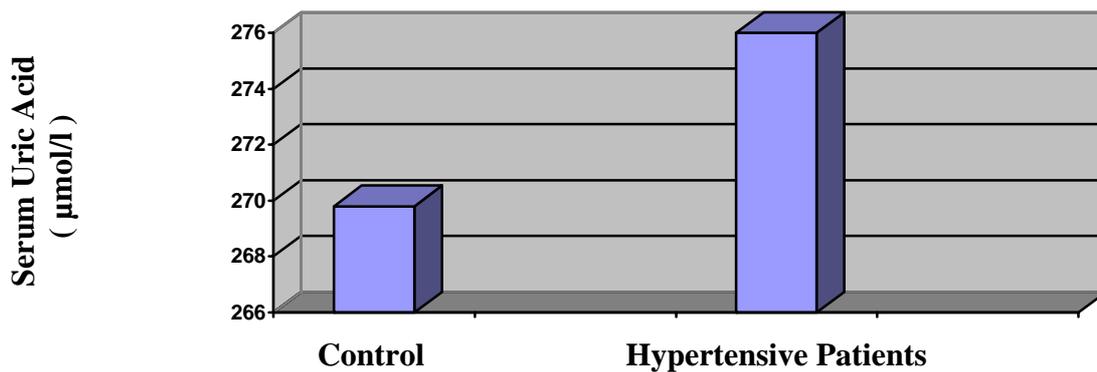
Parameters	Mean \pm SD		T- value	P -value
	Control group (No.= 43)	Patients group (No.= 82)		
Serum uric acid (μ mol/l)	269.8 \pm 70.7	276.0 \pm 70.4	- 0.46	NS
Serum urea (mmol/l)	4.72 \pm 1.13	5.96 \pm 1.32	- 5.23	< 0.001
Serum creatinine (μ mol/l)	68.37 \pm 9.22	90.6 \pm 15.3	- 8.71	< 0.001

NS = No significant difference.

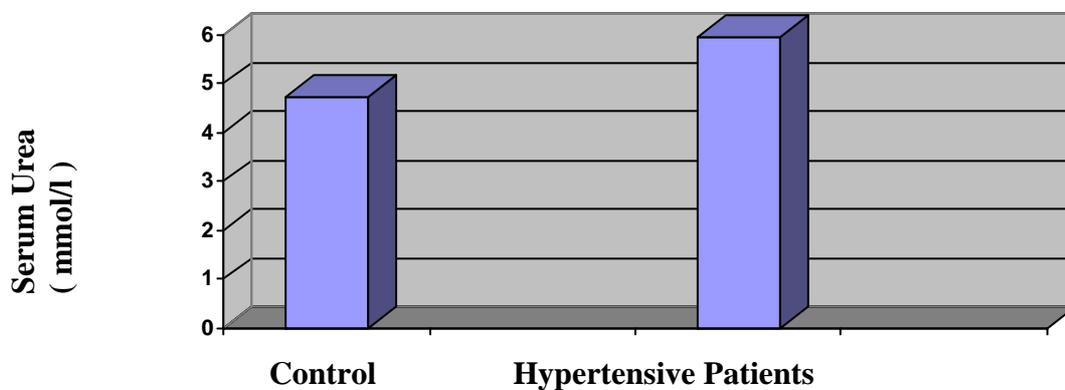
Table (2): Comparison of serum uric acid, urea and creatinine between male and female hypertensive patients.

Parameters	Mean \pm SD		T- value	P -value
	Male patients group (No.= 45)	Female patient group (No. = 37)		
Serum uric acid (μ mol/l)	300.2 \pm 68.1	246.4 \pm 62.0	3.70	<0.001
Serum urea (mmol/l)	6.03 \pm 1.40	5.87 \pm 1.22	0.55	NS
Serum creatinine (μ mol/l)	91.1 \pm 16.7	90.1 \pm 13.7	0.31	NS

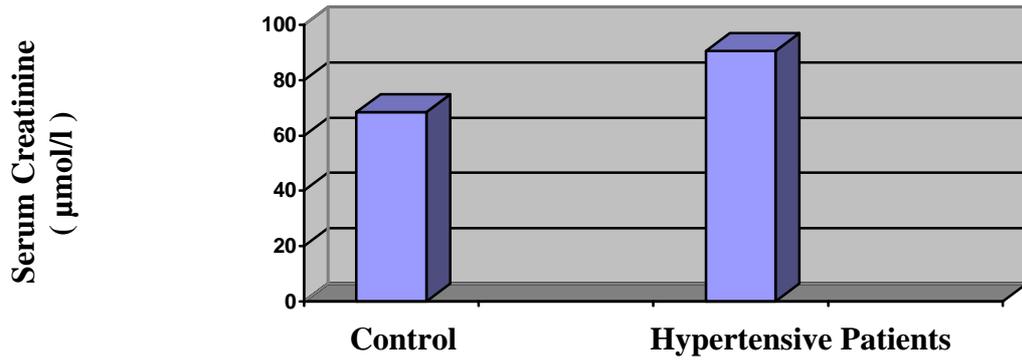
NS = No significant difference.



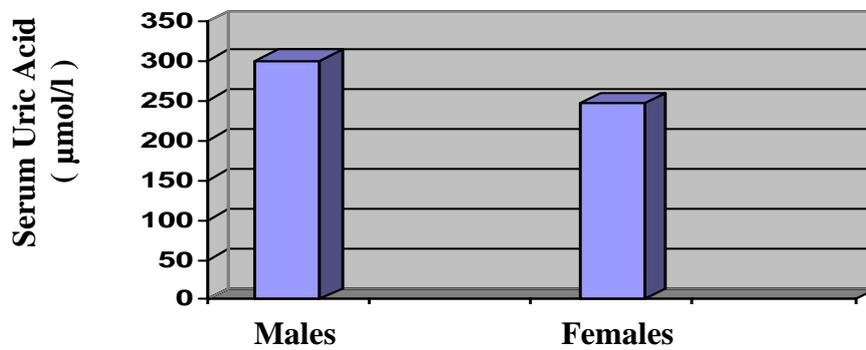
Figure(1): Serum uric acid concentration in hypertensive patients and control groups.



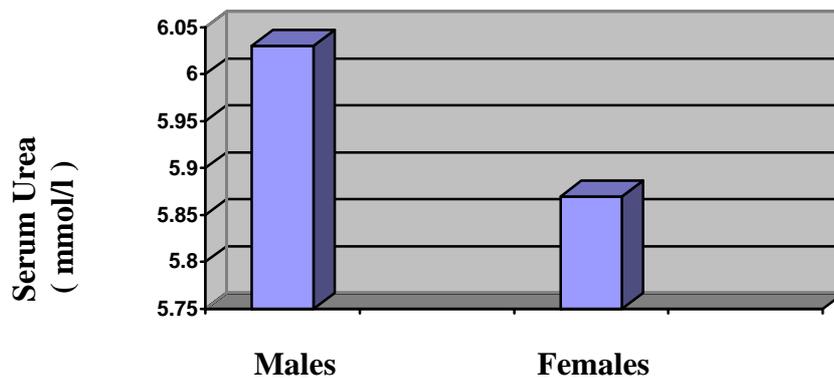
Figure(2): Serum urea concentration in hypertensive patients and control groups.



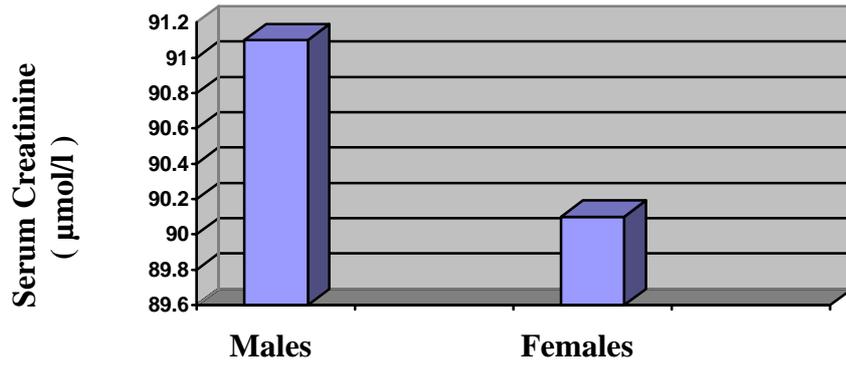
Figure(3): Serum creatinine concentration in hypertensive patients and control groups.



Figure(4): Difference in the mean of serum uric acid between male and female hypertensive patients.



Figure(5): Difference in the mean of serum urea between male and female hypertensive patients.



Figure(6): Difference in the mean of serum creatinine between male and female hypertensive patients.