

Evaluation Cystatin C Levels and Some Factors of Renal Function in Hypertensive Patients

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ABSTRACT

The aim of the study is to valuation some biomarker biochemical parameters that play important role in evaluating functions renal for hypertensive. The study was obtained. Included ninety-one. 35(38.46 %) of the subjects were males and 56 (61.54 %) were females. forty-two (42) subjects were selected as control and forty nine (49) suffered only from essential hypertension with high mean body mass index (Mean 35.70±3.38 S.E) (Kg/m²). The data of the study indicate a significant ($p \leq 0.05$) raise in the rate of age (Mean 49.89±10.36) (years), body mass index (Mean 35.70± 3.38 S.E) (Kg/m²), SBP(Mean 14.77±0.75 S.E) (mmHg) and DBP(Mean 9.69±0.72 S.E) (mmHg) for patients with hypertensive compared with healthy people. As for the biochemical parameters the results showed a significant ($p \leq 0.05$) increase in concentration serum Cystatin C (Mean 1.21 ± 0.44 S.E) (mg/L) , Creatinine(Mean 1.062±0.36 S.E) (mg/dl) , urea (Mean 7.76±0.55 S.E) (mmol/l) and uric acid(Mean 4.77±0.82 S.E) (mg/dl). As for the Correlation coefficient of linear regression analysis of diastolic blood pressure with the biochemical parameters did not show any significant correlation, while the results linear regression analysis showed positive correlation between systolic blood pressure with cystatin C ($y = 0.38 * x - 4.38 * SBP$), Creatinine($y = 0.37 * x - 4.37 * SBP$) and uric acid ($y = 0.1 * x - 10 * SBP$).

Keywords: *cystatinC , uric acid , creatinine, urea, hypertensive.*

INTRODUCTION

Hypertensive which the cases that estimated number about a world more than 1.1 billion¹. It is a state that be finically to define over years, So many organizations were interested in defining hypertensive of them “a recent lancet commission report “classify individual as hypertensive (when they continuous cross the blood pressure threshold. also Guideline committees and scientific societies have proposed definition that are depend on blood pressure value, prolonged risk , and treatment effects ². Hypertensive has increased in adult from 594 million in 1975 to 1.13 billion in 2015 ³ where considerably disappearing no symptomatology

approximately half of patient with hypertensive reside undiagnosed for this referred to as “(the silent killer)⁴. Hypertensive considerable a indication of chronic kidney disease (CKD) and independent threat factor for progression cardiovascular diseases ⁵ also elevated body mass index is one of the robust danger factors for CKD .the occurrence of obesity attached glomerulopathy has rise 10 fold in recent where a compensative hyperfiltration take place to meet the raise metabolic demand of the higher body weight the excess in intraglomerular pressure can injury the kidney and increase the hazard of evolution CKD in the long term ⁶. There are some biochemical biomarker play an important role in diagnosis of renal function like uric acid , creatinine and urea ⁷ ,also cystatin C is a useful investigation the hypertensive renal target organ damage since reflect glomerular filtration rate (GFR)⁸. Uric acid is form by the liver ,it is the end output of endogenous and dietary purine metabolism in human an mainly excreted by intestines (25%- 35%) and kidney

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(65%-75%)⁹. while urea is produced in the liver too from ammonia emitted by deamination of amino acid¹⁰. non protein nitrogen is excreted as urea majorly by the kidney in proportion over 75% small amount are lost through the skin and gastrointestinal¹¹. whereas, creatinine is product in muscle by break down of creatine phosphate⁷ with a weight of 113 Da¹² measurement the amount of creatinine and blood urea are points main of a normal functioning kidney and increment in the serum are indication of kidney dysfunction¹³ As for Cystatin C is produced by all the nucleate cell, its production rate is persistent and autonomous of gender, age, diet and weight¹⁴.

MATERIALS AND METHOD

The project was conducted in Hilla Specialized Education Hospital with the Health Center at Babylon University in Babil province/Iraq for the period from September to November 2017 (The approval of the institutional research ethics committee and signed written consent of every patient. the study was obtained. Included ninety-one, all of them were above 22 to 65 years of age. 35(38.46%) of the subjects were males and 56 (61.54%) were females. forty-two¹⁴ subjects were selected as control and forty nine[49] suffered only from essential hypertension with high mean body mass index (Mean 35.70±3.38 S.E) (Kg/m²). (Body mass index (BMI) was calculated using the formula BMI= weight (kg)/ height² (m)² and classifying normal weight (BMI 18.5- 24.9)Kg/M², obesity (BMI 30-39.9) Kg/M² and morbid obesity (BMI > 40) Kg/M² (40). "Hypertension was defined as systolic blood pressure (SBP)≥140 mmHg and/or diastolic blood pressure (DBP)≥90 mmHg without the use of anti-hypertensive drugs, Blood pressure in the right arm was measured twice in the supine position, using a manual sphygmomanometer after at least 10 min of rest. About five milliliters of venous blood were collected from each subject, serum urea concentration was measured by the enzyme methodology employed in this reagent is based on the reaction first described by Talke and Schubert¹⁵. To shorten and simplify the assay, the calculations are based on the discovery of Tiffany et al¹⁶. That urea concentration is proportional to absorbance change over a fixed time interval, using parameters for photometers assay Erba kit. The DetectX® Serum Creatinine kits are measure creatinine present in serum samples by using the absorbance of the colored product is read after 1 minute in a microtiter plate reader capable of measuring 490nm wavelength.

The statistical analysis of the study was accomplished by using SPSS program (Version 18.0) and the data are expressed as the Means and the correlation coefficient and Linear regression was made with the calculators the BMI and estimated biochemical parameters. Values were considered statistically significant if the associated P values were lower than 0.05.

RESULTS AND DISCUSSION

The results of the study indicate a significant ($p \leq 0.05$) increase in the rate of age (Mean 49.89±10.36 (years)), body mass index (Mean 35.70± 3.38 S.E) (Kg/m²), SBP (Mean 14.77±0.75 S.E) (mmHg) and DBP (Mean 9.69±0.72 S.E) (mmHg) for patients with hypertensive compared with healthy people, as shown in table (1). As for the biochemical parameters the results showed a significant ($p \leq 0.05$) increase in concentration serum Cystatin C (Mean 1.21 ± 0.44 S.E) (mg/L), Creatinine (Mean 1.062±0.36 S.E) (mg/dl), urea (Mean 7.76±0.55 S.E) (mmol/l) and uric acid (Mean 4.77±0.82 S.E) (mg/dl), as shown in table (2). As for the Correlation coefficient of linear regression analysis of diastolic blood pressure with the biochemical parameters did not show any significant correlation, as shown in table (3), while the results linear regression analysis showed a strong correlation between systolic blood pressure with cystatin C ($y = 0.38 * x - 4.38 * SBP$) (P value ≤ 0.008), Creatinine ($y = 0.37 * x - 4.37 * SBP$) (P value ≤ 0.009) and uric acid ($y = 0.1 * x - 10 * SBP$) (P value ≤ 0.03) as in Fig (1, 3 and 4). while the results showed no significant correlation between systolic blood pressure with urea as revealed in Fig (2). Hypertensive remains incompletely understood, in spite of decades of research in clinical practice the pathogenesis (17) The outcome of the present study showed a significant increase in the rate of body mass index for patients with hypertensive, compared with healthy, this is agree to study Hall ME and et al in 2014 where obesity can lead by various mechanisms, such as hypertension to renal dysfunction (18) on the other hand obesity may lead to a number of the harmful renal result of mediated by accompanying status such as hypertension or diabetes mellitus (19) Accordingly, the diagnosis Chronic kidney disease, is established chiefly on biomarkers that estimate kidney function. Glomerular filtration rate (GFR) the typical marker of kidney function (20) Our present data display a significant excess in the concentration of both serum cystatin C, serum creatinine, serum urea and serum uric acid for hypertensive patients compared to

healthy. This finding is consistent with the finding of several recent studies such as glomerular filtration rate (GFR) estimation based on cystatin C or creatinine has been recommended to assess GFR in CKD patients²¹. Also a study of Salvador Lopez-Giacoman & Magdalena Madero in 2015 showed GFR is commonly evaluated from that take into account endogenous filtration markers serum cystatin C (CysC) and creatinine (SCr)²⁰.

The studies suggested that increase serum cystatin C concentration in hypertensive patients, is connected with stiffness of large arteries in older adults, and also with cardiac functional and structural variation^{22,23}. Nevertheless, recent studies reported that CysC levels could be affected by gender and age^{24,25} and obesity (26). As for Serum uric acid is consistent with the finding of several studies which Serum uric acid has shown to be a predictor of renal disease advancement in generality but not all studies²⁷. While our results are not

consistent with the study (Isra'a H. AL-Hamdani) 2010 no significant difference in serum uric acid between hypertensive patients and control group²⁸, as well as the Correlation between some Biochemical parameters and DBP (mmHg) in Hypertensive group no significant correlation was shown, however of systolic blood pressure (SBP) mmHg with Cystatin C, Uric acid and Creatinine for hypertensive group a significant positive correlation was observed, the results of urea were the opposite of the other criteria, showing no significant association with of systolic blood pressure (SBP) (mmHg) for hypertension patients. While observed in his study The result of multivariate analysis showed that the incidence of serum uric acid in patients with primary hypertension had significant relationships with diastolic blood pressure and systolic blood pressure²⁹. In the same way, high levels of serum uric acid (SUA) is reported to be an indicator for lower renal function³⁰ and a risk factor for hypertension^{32,33}.

Table 1. Comparison the baseline of study participants

General characters	Hypertensive group (n=49)	Control group (n=42)	P value
Age (years)	49.89±10.36	30.14±7.33	0.03* ^a
BMI (Kg/m ²)	35.70±3.38	23.64±2.53	0.018* ^a
SBP (mmHg)	14.77±0.75	10.84±0.51	0.013** ^a
DBP (mmHg)	9.69±0.72	7.13±0.83	0.001** ^a

Table 2. Serum concentrations of some Biochemical parameters for renal function in both Hypertensive and control groups.

Biochemical parameters	Hypertensive group (n=49)	Control group (n=42)	P value
Serum Cystatin C (mg/L)	1.210±0.44	0.73±0.18	0.001** ^a
Serum urea (mmol/l)	7.76±0.55	6.11±0.77	0.02* ^a
Serum uric acid (mg/dl)	4.77±0.82	3.70±0.89	0.04* ^a
Serum Creatinine (mg/dl)	1.062±0.66	0.68±0.21	0.001** ^a

Table 3. The Correlation coefficient of linear regression analysis with the ANOVA table between some Biochemical parameters and DBP(mmHg) in Hypertensive group

Biochemical parameters	Hypertensive group(n=49)	
	DBP(mmHg)	
	r ^a	P value
Serum Cystatin C (mg/L)	0.13	0.38
Serum urea (mmol/l)	0.08	0.57
Serum uric acid(mg/dl)	0.07	0.65
Serum Creatinine(mg/dl)	0.03	0.82

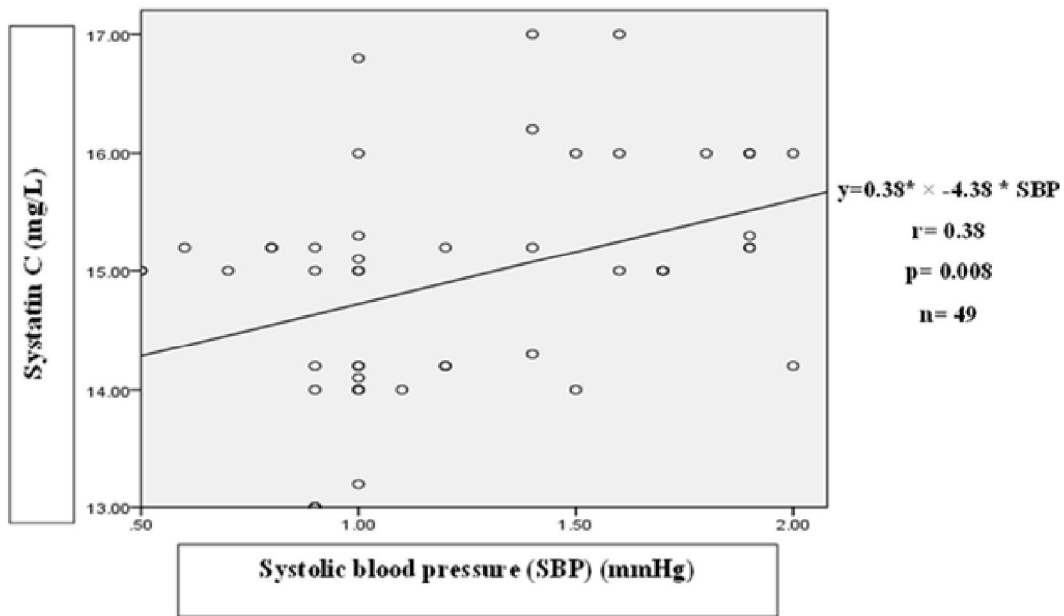


Figure 1. The linear regression analysis of systolic blood pressure (SBP) mmHg with Cystatin C (mg/L) for hypertensive group.

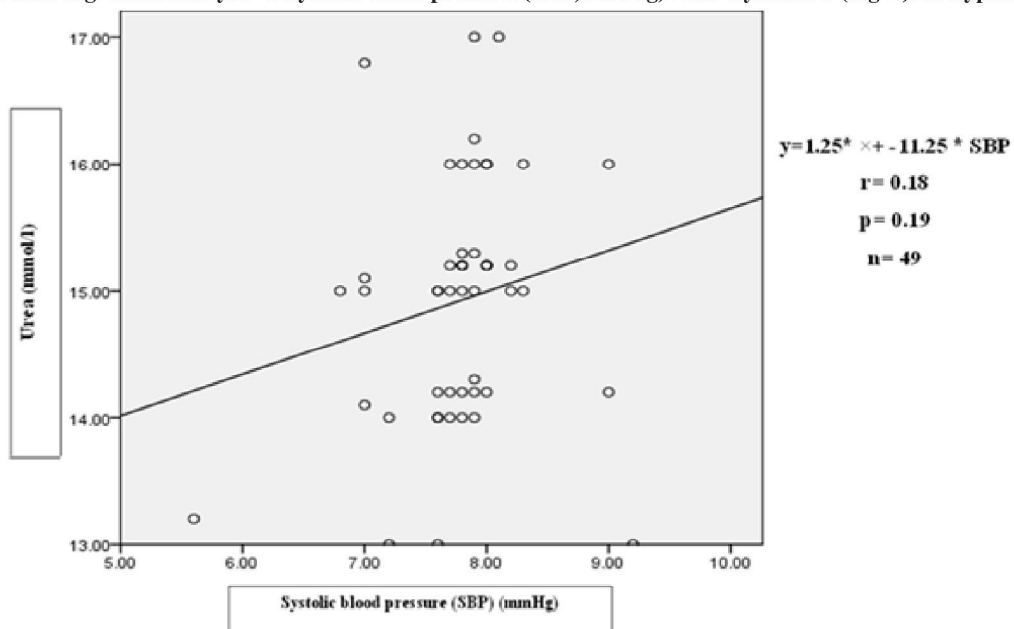


Figure 2. The linear regression analysis of systolic blood pressure (SBP) mmHg with Urea (mmol/L) for hypertensive group.

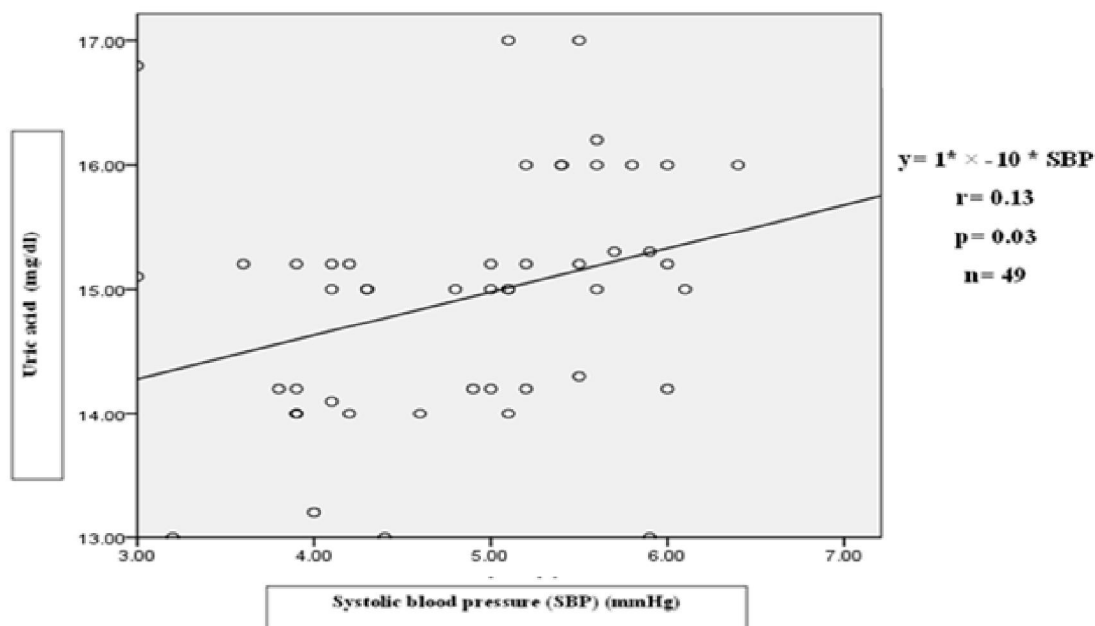


Figure 3. The linear regression analysis of systolic blood pressure (SBP) mmHg with Uric acid (mg/dl) for hypertensive group.

CONCLUSION

Serum creatinine (Cr) is a perfect biomarker of early phase CKD be a generally used indicator for detecting little changes in glomerular filtration rate (GFR) (33) Another study showed serum creatinine and urea levels were significantly increase in CKD subjects of hypertensive (34) this study showed it found there are a significant raise in the mean values of serum creatinine and urea in hypertensive patients compared with control .also the common factors that caused either upper synthesis or lesser excretion of uric acid can marker serum uric acid levels dramatically increase such as big blood cell depletion(35), the consuming of purine-rich foods (36), obesity (37), and renal diseases (38) other research found that SBP was significantly correlated with SUA, and multiple regression analysis also showed that both diastolic and systolic blood pressures were independently associated with SUA (39).

The current study showed that serum CystatinC , is no less important than Uric acid , Creatinine and Urea In the early renal dysfunction is identified forpatients with hypertensive.We recommend using a larger sample size and studied at the molecular level to know the genes responsible for renal dysfunction with hypertensive.

Financial disclosure

There is no financial disclosure.

Conflict of interest

None to declare.

Ethical Clearance

All experimental protocols were approved under the Environmental Research and studies centers\ Babylon University, and all experiments were carried out in accordance with approved guidelines.

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