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Levels of Serum Lipid profile and Kidney Function Tests in Iraqi Hypertensive Patients: Duration Effect Study

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Abstract:

Hypertension is one of the leading causes of the global burden of disease, which causes serious health problems. The aim of this study is to investigate the lipid profile levels in sera of Iraqi hypertensive patients by measuring Total cholesterol (TC), triglyceride (TG) and low density lipoproteins (LDL) and kidney function levels by measuring uric acid, urea and creatinine. Seventy five individuals of Iraqi adults (Males) were divided into three groups: 25 hypertensive patients with duration of disease (1-10) year (group 1), 25 hypertensive patients with duration of disease (11-30) year (group 2) and 25 normal individuals as control group (group3). The findings indicate that serum (TC, TG and LDL) levels were significantly elevated ($p \leq 0.05$) compared with healthy group and the values of them were significantly higher in group 2 than in group 1.This study also shows significant positive correlations between TC and TG, LDL ($p \leq 0.01$), ($p \leq 0.05$)respectively. From collected data, a significant increase was found in the mean value of serum uric acid, urea and creatinine in hypertensive patients in two groups (1, 2) compared with control group and the levels of them were significantly higher in group2 than in group1 ($p \leq 0.01$).The results also indicate strong correlations between parameters studied of kidney function tests ($p \leq 0.01$). This study has shown that lipid profile and renal function levels abnormalities are highly prevalent among Iraqi hypertensive patients and also the effect of duration of disease on parameters was studied.

Key words: Hypertension**,** lipid profile**,** Renal function tests.

Introduction:

High blood pressure is one of the most common world disorders which cause many effects on human body [1]. Hypertension was defined by systolic pressure larger than 140 mmHg and diastolic pressure larger than 90 mmHg [2]. It is the main risk factor for cardiovascular disease, congestive cardiac failure, stroke and end-stage of kidney disease [3]. Hypertension is one of manifestation of metabolic syndrome [4]. High blood pressure and dyslipidemia are main risk factors for coronary heart disease and account for more than 80% of death disability in low and middle –income countries [5]. Dyslipidemia is more common in untreated hypertensive patients than healthy individuals and lipid profile values were increased as blood pressure

in pattern of dyslipidemia and has been consistently reported among hypertensive patients [6]. Also hypertension is known to be related with change of lipid metabolism which causes increase of lipid levels and progression of cardiovascular disease (CVD)[7].

The clinical investigations of kidney function such as uric acid, urea and creatinine are important to identify renal dysfunction. High uric acid level reduced renal perfusion [8]. Serum urea measurements are widely available to measure renal function and there is a strong relation between hypertension and chronic kidney disease [9]. Plasma creatinine level is often used as an index of renal function and the normal value does not necessarily reflect a normal (GFR) because mild and moderate kidney injury is poorly inferred from serum creatinine alone [10]. All other creatinine –based on estimation equations, suffer from physiologic limitation of creatinine as filtration markers and all estimates of glomerular filtration are based on serum creatinine [11]. A number of filtered substances may be measured to evaluate of GFR such as blood urea nitrogen level and creatinine level [12].The purpose of this study is to estimate lipid profile levels and renal function levels in hypertensive patients and control subjects and study the effect of the duration of disease on studied parameters.

Materials and Methods:

This study was done in Al- Yarmouk Hospital Iraq – Baghdad .The subjects that were included in this study involved 50 hypertensive patients (Males),they were divided into two groups: each group includes 25 subjects as follows: group1, hypertensive patients with duration of disease (1-10) year, age range(38-70)year ,group 2, hypertensive patients with duration of disease (11-30) year, age range(44-72) year and 25 males persons were taken as control group, group3, age range (32-65) year. Patients were included in this study took medications for lowering blood pressure such as (Amlodipin, Candesartane, Atenolol) and their blood pressure reading range was (150/90 mmHg - 180/100 mmHg). Samples were drawn from all subjects to measure kidney functions such as (uric acid, urea and creatinine) levels and to measure lipid profile tests such as Total .cholesterol (TC), triglyceride (TG) and low density lipoproteins (LDL). Five milliliters of venous blood was obtained from patients and control subjects. The samples were collected in plain plastic tubes and were left it at room temperature for 15mins to clot and then centrifuged at 3000 rpm for 10 min to obtain serum sample. The separated serum sample was analyzed for lipid profile tests by different reagent kits depending on the manufactured procedure. Measurement of TC was done using enzymatic (cholsterase) kinetic method and triglyceride was done by using enzymatic (lipoprotein Lipase) kinetic method. Serum LDL was determined using the Friedwald method [13].Serum uric acid was determined by uricase method and urea was done using enzymatic (urease) kinetic method and for the estimation of serum creatinine Jaff kinetic method was used.

Statistical analysis:

The results were analyzed statistically by using statistical analysis system-SAS (2012) program to study the effect of duration of the disease on parameters studied. Least significant difference – LSD test was used to compare amoung the mean values of the parameters in this study [14].

Results and Discussion:

1. Lipid profile tests

Study the effect of duration of disease on lipid profile levels.

As represented in Table (1), there is a significant difference ($p \leq 0.05$) in the mean value of serum Total cholesterol (TC), triglyceride (TG) and low density lipoproteins (LDL) in two duration of disease. The mean value of TC reached to (260.65±14.34) mg/dl in group2 and (232.72±11.85) mg /dl in group1 compared with control (165.91±7.87) mg/dl and the mean value of TG in two patient´s group were (226±19.44, 214.28 ± 22.45) mg/dl respectively compared with the mean value of control(116.04±8.94) mg/dl. The present study shows that, there is a significant difference ($p \leq 0.05$) in the value of LDL between two durations. The mean value reached (163.82±16.50) mg/dl in group 2 and (152.78±11.77)mg/dl in group1 compared with the mean value of control (101.08±6.93) mg/dl

Table (1): Study the Effect of Duration of Disease on TC, TG and LDL Levels in Hypertensive Patients.

Groups / Parameters	Mean ± Standard error (Mean ± SE)		
	TC (mg/dl)	TG (mg/dl)	LDL (mg/dl)
Control healthy group (n=25)	165.91±7.87	116.04±8.94	101.08±6.93
Duration of hypertension(1-10) years (n=25)	332.72±11.85	214.28±22.45	152.78±11.77
Duration of hypertension (11- 30) years (n=25)	260.65±14.34	226.91±19.44	163.82±16.50
LSD value	33.348*	49.041*	35.700*
(P ≤ 0.05)*			

Comparison of TC, TG and LDL levels between hypertensive patients and control group (Healthy group) .

Data in Table (2) shows that there is a significant difference ($P \leq 0.05$) in TC, TG and LDL levels between all patients and control group. The mean value of TC reached (246.83±15.72) mg/dl in hypertensive cases compared with control (165± 7.87) mg/dl and the mean value of TG reached (220.50± 14.82) mg/dl compared with control (116.04±8.94) mg/dl .While the mean value of LDL was 157.63±14.79 mg/dl in all hypertensive patients as compared with control (101.08±6.93) mg/dl.

Table (2): Comparison of Lipid Profile Tests Between all Hypertensive Cases and Control.

Groups	Number of subjects	Mean ± Standard error (Mean±SE)		
		Cholesterol (mg/dl)	TG (mg/dl)	LDL (mg/dl)
Control (Healthy group)	25	165.91±7.87	116.04±8.94	101.08± 6.93
Hypertensive cases	50	246.83±15.72	220.50± 14.82	157.63± 14.79
LSD value	--------	43.277*	61.082*	42.522*
(P ≤ 0.05)*				

The effect of age categories on lipid profile levels in hypertensive patients.

The statistical result in Table (3) shows that, there is no effect of age categories on TC, TG and LDL levels in all hypertensive patients and there are no significant differences between them.

Table (3): Effect of Age Categories on TC, TG and LDL Levels in Hypertensive Patients

Age categories	Number of patients	Mean ± Standard error(Mean ± SE)		
		TC (mg/dl)	TG (mg/dl)	LDL(mg/dl)
38-50 year	12	245.25± 23.82	290.00±44,91	153.50±30.99
51-60 year	17	248.50±16.11	200.30 ± 28.05	167.10±16.67
61-72 year	21	248.26±15.58	208.86±19.08	153.86±16.63
LSD value	------	NS 69.852	NS 94.332	NS 75.029
NS (No Significant)				

The correlation between TC, TG and LDL levels in hypertensive patients.

As shown in Table (4), there is a strong positive correlation between LDL and cholesterol (r=0.81**, P≤0.01), also there is a positive correlation between cholesterol and TG(r =0.22**, P≤ 0.05). While there was a negative correlation between LDL and TG in hypertensive patients.

Table (4): The Correlation Between all Parameters in Hypertensive Patients.

Parameters	Correlation coefficient	Significance level
TG,TC	0.22	*
LDL, TC	0.81	**
LDL, TG	- 0.05	NS
NS, (p≤ 0.01)**, (p≤ 0.05)*		

In this study, there was a correlation between serum lipid profile tests and hypertension disease. Results of this study showed that the value of serum TC, TG and LDL levels was significantly elevated and statistically significant among the hypertensive patients in two durations compared with control group. High levels of serum cholesterol are recognized as a major risk for coronary heart disease and stroke [6]. About 80% of hypertensive patients have co morbidities such as fatty, glucose intolerance and abnormalities in lipid metabolism [4].The results of elevated total cholesterol in hypertensive patients agree with Adedji et al [15] and Goran et al [16]. There is a significant correlation between total cholesterol and systolic blood pressure, also between TG and diastolic blood pressure [17].In the present study, the higher plasma TC, TG and LDL levels in the patients than in the control group agrees with earlier studies [18].

2. Renal function tests

Study the effect of duration of disease on urea, uric acid and creatinine levels.

Table (5) shows the effect of duration of disease in hypertensive patients on uric acid, urea and creatinine levels. When the duration of disease increased, there was elevation in the mean value of urea, uric acid and creatinine. The results show that, there was a significant rise in the mean value of urea concentration in the hypertensive patients (84.68± 10.28) mg/dl in group 2 compared with the control group (23.52± 1.71) mg/dl ,while the mean value of serum uric acid level was significantly higher in the hypertensive patients (5.96± 0.38) mg/dl in group 2 as compared with the control group (3.42± 0.12) mg/dl (p<0.01). Also, there was elevation in the mean value of creatinine concentration in the hypertensive patients (3.93±0.67) mg/dl in group2 compared with control (0.528±0.03) mg/dl. The results indicate a significant difference (p<0.01) in the mean value of all parameters between two durations of illness compared with control group.

Table (5): Effect of Duration of the Disease on Urea, Uric Acid Creatinine Levels in Hertensive Patients.

Groups / Parameters	Mean ± Standard error (Mean ±SE)		
	Urea (mg/dl)	Uric acid (mg/dl)	Creatinine (mg/dl)
Control (Healthy group) (n=25)	23.52±1.71	3.42±0.12	0.528±0.03
Duration of hypertension(1-10) years (n=25)	42.70±813	5.03±0.29	0.926±0.21
Duration of hypertension(11- 30) years (n=25)	84.68±10.2	5.96 ± 0.38	3.93± 0.67
LSD	21.187**	0.794**	1.073**
(p≤ 0.01)**			

Comparison of urea, uric acid and creatinine levels between all hypertensive cases and control group.

The parameters considered in this study were blood urea, uric acid and creatinine as markers of kidney functions. The differences between these parameters between all patients and control group are shown in Table (6).The parameters were significantly higher in patients with hypertensive as compared with healthy group (p≤0.01). The results present an evidence that the mean value of urea, uric acid and creatinine in hypertensive patients reached (63.69 ±7.14, 5.50±0.24 and 2.43±0.41) mg/dl respectively compared with the mean value of control (23.52±171, 3.42±0.12 and 0.528±0.03) mg/dl, respectively.

Table (6): Comparison of Urea, Uric acid and Creatinine Levels Between Patients and Healthy Group (Control Group).

Groups	Number of Subjects	Mean ± Standard error (Mean± SE)		
		Urea (mg/dl)	Uric acid (mg/dl)	Creatinine (mg/dl)
Control	25	23.52± 1.71	3.42± 0.12	0.528 ± 0.03
Patients	50	63.69± 7.14	5.50± 0.24	2.43± 0.41
LSD value	----	18.474**	0.693**	0.935**
(p≤ 0.01)**				

Effect of age categories on renal function levels.

The results in Table (7) show the effect of age categories on urea and uric acid levels (p≤0.05).The results indicate that elevation in the mean value of urea and uric acid in the patients more than 60 years, reached (67.90± 9.04,5.61± 0.38) mg /dl, respectively. On the other hand, there were no significant differences in the mean value of creatinine between all ages in hypertensive patients.

Table (7): Study the Effect of Age Categories on Kidney Function Levels.

Age categories	Number of patients	Mean ± Standard error (Mean ±SE)		
		Urea (mg/dl)	Uric acid (mg/dl)	Creatinine (mg/dl)
38-50 year	12	37.31±7.28	3.81±0.17	1.22±0.39
51- 60 year	17	52.39±10.88	5.49±0.42	2.29±0.65
61 -72 year	21	67.90±9.04	5.61±0.38	2.15±0.50
LSD value	----	21.504*	0.806*	NS 1.089
NS, (p≤ 0.05)*				

The correlation between urea, uric acid and creatinine levels in hypertensive patients.

The results in Table (8) indicate that, there is a strong correlation between urea and creatinine (r=0.79**, p≤ 0.01) and with uric acid (r=0.58**, p≤ 0.01). As shown in the same table, a positive correlation between creatinine and uric acid (0.58**, p≤ 0.01)was found.

Table (8): Comparison of the Correlation Coefficient between Urea, Uric Acid and Creatinine in Hypertensive Patients.

Parameters	Correlation coefficient	Significant level
Urea, uric acid	0.58	**
Urea, creatinine	0.79	**
Creatinine , uric acid	0.58	**
(p≤ 0.01)**		

The present study shows a significant increase in the mean values of serum uric acid, urea and creatinine levels in hypertensive patient's comparison with control group. These results agree with Jabary et al [19] and vupputuri et al[20]. This elevation may be relevant to the decrease of glomerular filtration rate (GFR) as a result of hypertension effect on renal functions, decrease in blood of low leads to decrease of GFR [21]. The elevation of serum creatinine level may be attributed to the decrease in creatinine clearance due to the decrease in the glomerular filtration rate[10]. Hypertension is strongly correlated in functional and structural abnormalities that damage kidneys and other organs [12]. Renal risk appears to be more closely related to systole than to diastolic blood pressure[22]. Hypertension induced nephrosclerosis proceed, the plasma creatinine level begins to rise and renal insufficiency may develop [23]. Higher serum creatinine reflects generalized endothelial dysfunction of prothrombotic state [24].In this study, the effect of duration of hypertension disease on kidney function in long run, may be attributed to a renal damage and uncontrolled hypertension each contribute to negative spiral. moreover, that arteries become blocked and stop functioning and the kidneys eventually failure[25] .

Conclusion:

The present study highlights the effect of both periods of hypertension disease on lipid profile and renal function levels in Iraqi patients. This association will help to develop future strategies for preventing hypertension and both dyslipidema and renal dysfunction through proper lifestyle changes or medical management or by combination of both.

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مستويات صورة الدهون واختبارات وظيفة الكلية في المرضى العراقيين المصابين بارتفاع ضغط الدم: دراسة تاثير مدة المرض

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الخلاصة:

ارتفاع ضغط الدم هو احد الاسباب الرئيسية للمشاكل الصحية العالمية والذي يتسبب بمشاكل صحية عديدة. ان الهدف من هذه الدراسة، هو فحص مستويات صورة الدهون بالدم من خلال قياس الكولسترول الكلي ،الكلسيريد الثلاثي والبروتينات الدهنية منخفضة الكثافة ومستويات وظيفة الكلية من خلال قياس حامض اليوريك ، اليوريا والكرياتنين . تم اخذ 75شخص من الاشخاص العراقيين البالغين (رجال) و قسمت الى ثلاث مجاميع، 25 مريضا مصابين بارتفاع ضغط الدم خلال مدة المرض (1 - 10) سنوات (المجموعة1) ،25مريضا مصابين بارتفاع ضغط الدم خلال مدة المرض (11- 30) سنة (المجموعة 2) و25 شخصا من الاصحاء كمجموعة ضابطة (المجموعة 3) .وقد اشارت النتائج الى وجود ارتفاع معنوي ($P \leq 0.05$) في مستويات كلا من الكولسترول الكلي، الكلسيريد الثلاثي والبروتينات الدهنية منخفضة الكثافة عند المقارنة مع مجموعة الاصحاء، حيث تكون قيمها المجموعة 2 اعلى من المجموعة1. كما اشارت الدراسة الى وجود علاقة معنوية موجبة بين الكولسترول مع كلا من الكلسيريد الثلاثي والبروتينات الدهنية منخفضة الكثافة ($P \leq 0.01$) و ($P \leq 0.05$) على التوالي . كما اظهرت النتائج التي تم الحصول عليها ، وجود زيادة معنوية في قيمة معدل حامض اليوريك ، اليوريا والكرياتينين في كلا المجموعتين(1,2) للمرضى المصابين بارتفاع ضغط الدم مقارنة مع مجموعة السيطرة، حيث تكون مستوياتها في المجموعة 2 اعلى من المجموعة 1 ($P \leq 0.01$)، كذلك اشارت النتائج الى وجود ارتباطات قوية بين الصفات المدروسة في اختبارات وظيفة الكلية. اظهرت هذه الدراسة ،ان الاعتلال في صورة الدهون ومستويات وظيفة الكلية كثيرة الانتشار بين المرضى العراقيين المصابين بارتفاع ضغط الدم وكذلك لوحظ تاثير مدة المرض على الصفات المدروسة .

الكلمات المفتاحية: ارتفاع ضغط الدم، صورة الدهون، اختبارات وظيفة الكلية.