Evaluation the levels of atrial natriuretic peptide and some Biochemical Parameters in Patients with Hypertension

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Abstract

Background: Hypertension has been identified by WHO as one of the most significant risk factors for morbidity and mortality worldwide and is responsible for the deaths of approximately nine million people annually

Aim of the study: The aim of this study was to evaluate the relation of serum atrial natriuretic and other biochemical parameters with hypertension and possibility of use these parameters in development of hypertension

Material and Methods: The current study is case control study conducted on 90 Iraqi participants (25-85years) during the period between 10th of January to 10th of April 2022, participants from in Kirkuk city.The study included 60 patients previously diagnosed with hypertension whose from both sexes whose age were between 36 and 85 year. Hypertension, defined as a systolic blood pressure greater than 130 mmHg or a diastolic blood pressure greater than 80 mmHg or are taking medication for hypertension. These patients included when attended to Kirkuk General Hospital. The study also included 30 healthy individuals with same age range and from both sexes who apparently haven't any chronic diseases.Blood samples collected by vein puncture for determination of cholesterol, triglyceride (TG), high density lipoprotein- cholesterol (HDL-C), low density lipoprotein(LDL),very low density lipoprotein by bio chemical colorimetric methods and determination of human ANP by enzyme-linked immunosorbent assay (ELISA).

Results: The study showed that the lowest mean of ANP was observed in patients with hypertension (31.57 pg/ml) and the highest mean was in the healthy control group (53.35 pg/ml), the difference was significant at P. value: 0.001.The also study showed that the highest mean of cholesterol was detected in patients with hypertension (178.46 mg/dl) as compared with healthy control group (166 mg/dl), the difference was significant at P. value: 0.017. The highest mean of triglyceride was detected in patients with hypertension (169.01 mg/dl) as compared with healthy control group (124.1 mg/dl), the difference was significant at P. value: 0.015. The highest mean of VLDL was detected in patients with hypertension (33.8 mg/dl) as compared with healthy control group (24.8 mg/dl), the difference was significant at P. value: 0.015. The study also showed a significant positive correlation of ANP levels with each of cholesterol, VLDL and triglyceride.

Keywords: Hypertension; ANP; Lipid profile; Kirkuk; Blood pressure

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Introduction

Hypertension has been identified by WHO as one of the most significant risk factors for morbidity and mortality worldwide and is responsible for the deaths of approximately nine million people annually [(1)]. In the UK, the National Institute for Health and Care Excellence (NICE) defines high blood pressure (BP), also known as hypertension, as a clinic blood pressure of 140/90 mmHg or higher confirmed by a subsequent ambulatory blood pressure monitoring daytime average (or home blood pressure monitoring average) of 135/85 mmHg or higher [(2)].Hypertension is the most common preventable risk factor for cardiovascular disease (CVD; including coronary heart disease, heart failure, stroke, myocardial infarction, atrial fibrillation and peripheral artery disease), chronic kidney disease (CKD) and cognitive impairment, and is the leading single contributor to all-cause death and disability worldwide[(3)]. The relationship between BP and the increased risk of CVD is graded and continuous, starting as low as 115/75 mmHg, well within what is considered to be the normotensive range. Successful prevention and treatment of hypertension are key in reducing disease burden and promoting longevity in the world's population [(4)].Globally, 3.5 billion adults now have non-optimal systolic BP levels (that is, >110–115 mmHg) and 874 million adults have systolic BP ≥140 mmHg. Thus, approximately one in four adults has hypertension. Between 1990 and 2015 there was a 43% increase in the total global number of healthy life years lost to non-optimal BP, driven by population increase, population aging and a 10% increase in the age-standardized prevalence of hypertension[(5)]. The Global Burden of Disease study has shown that non-optimal BP continues to be the biggest single risk factor contributing to the global burden of disease and to global all-cause mortality, leading to 9.4 million deaths and 212 million lost healthy life years (8.5% of the global total) each year [(6)]. According to the latest WHO data published in 2020 Hypertension Deaths in Iraq reached 2,451 or 1.67% of total deaths. The age adjusted Death Rate is 16.27 per 100,000 of population ranks Iraq [(7)]. Like the kidney, the heart plays an important role in regulating salt and water balance. This function is mediated mainly by a cardiac hormone, atrial natriuretic peptide (ANP). When blood sodium levels and pressure are increased, ANP is secreted from the heart. It binds to its receptor in the kidney and blood vessels, and promotes salt excretion, lowers blood volume and relaxes the vessel [(8)]. Numerous biomarkers of interest were identified in this discovery study that may be further investigated to determine their value as a single biomarker or in combination with ANP. Herein we describe a protein with limited known function called Tetranectin that was significantly reduced in coronary sinus serum of asymptomatic patients with elevated ANP. The aim of this study was to evaluate the relation of atrial natriuretic and lipid profile with hypertension and possibility of use these parameters in development of hypertension

Material and Methods

The current study is case control study conducted on 90 Iraqi participants (25-85years) during the period between 10th of January to 10th of April 2022, participants from in Kirkuk city.The study included 60 patients previously diagnosed with hypertension whose from both sexes whose age were between 36 and 85 year. Hypertension, defined as a systolic blood pressure greater than 130 mmHg or a diastolic blood pressure greater than 80 mmHg or are taking medication for hypertension. These patients included when attended to Kirkuk General Hospital. The study also included 30 healthy individuals with same age range and from both sexes who apparently haven't any chronic diseases.

Note: the control group blood pressure measurement.

D-Exclusion criteria :

1-diabetics
2-arterial thrombosis
3-angina
4-heart attack
5-pregnancy
6-liver disease

then centrifuged to separate the serum at 3,000xg for 15 minutes and the obtained serum were aspirate using mechanical micropipette and transferred in to eppendrof tubes and stored in deep freez at-20C for determination of cholesterol, triglyceride (TG), high density lipoprotein- cholesterol (HDL-C), low density lipoprotein(LDL),very low density lipoprotein by biochemical colorimetric methods and determination of human ANP by enzyme-linked immunosorbent assay (ELISA).

4. Results

The study showed that the lowest mean of ANP was observed in patients with hypertension (31.57 pg/ml) and the highest mean was in the healthy control group (53.35 pg/ml), the difference was significant at P. value: 0.001, Table 4.1

Ethical approval

- Approval of the council of College of Medicine/ Tikrit University was obtain for the proposal of the study .
- Approval permission was presented to the director of Kirkuk Health directorate / Kirkuk General Hospital.
- Questionnaire was developed by the researcher for the purpose of the study to assess the domains related to hypertensive patients (Disease, Signs and Symptoms Blood Pressure , and Dietary Patterns, etc…).

After at least 12 hours of fasting ,blood was collected by vein puncture with plastic disposable syringes took up to 5ml of venous blood from each healthy control and patient and added to the gel tube ,which was then left at room temperature for 30minutes in order to initiate the clotting process ,the sample was

Table 1: Comparison between hypertensive patients and the control group regarding the level of atrial natriuretic peptide

Studied groups	No.	ANP (pg/ml)		P. value
		Mean	SD	
HT patient	60	31.57	12.56	≤0.001
Control group	30	53.35	35.43	

The study showed that the highest mean of cholesterol was detected in patients with hypertension (178.46 mg/dl) as compared with healthy control group (166 mg/dl), the difference was significant at P. value: 0.170 The highest mean of TG was detected in patients with hypertension (169.01 mg/dl) as compared with healthy control group (124.1 mg/dl), the difference was significant at P. value: 0.015. The highest mean of VLDL was detected in patients with hypertension (33.8 mg/dl) as compared with healthy control group (24.8 mg/dl), the difference was significant at P. value: 0.015. While there was no significant difference between patients and control regarding LDL and HDL levels, Table 4.2

Table 2: Comparison between hypertensive patients and the control group regarding lipid profile parameters

Lipid profile (mg/dl)	Groups	No.	Mean	SD	P. value
Cholesterol	HT patient	60	178.46	43.75	≤0.170
	control	30	166	32.17	
Triglyceride	HT patient	60	169.01	83.44	≤0.015
	control	30	124.1	74.79	
HDL	HT patient	60	51.7	12.44	≤0.085
	control	30	47.3	8.83	
LDL	HT patient	60	92.8	33.71	≤0.87

	control	30	93.8	24.21	
VLDL	HT patient	60	33.8	16.68	≤0.015
	control	30	24.8	14.95	

The study also showed a significant positive correlation of ANP levels with each of cholesterol and triglyceride and showed no correlation with HDL, LDL and VLDL among hypertensive patients. Additional information detailed in Table3 and Figures 1 to 5.

Table 3: Correlation of tetranectin and ANP with other parameters among hypertensive patients

Parameter		**Cho**	**TG**	**HDL**	**LDL**	**VLDL**
ANP	r. value	0.094	0.284	0.203	-0.093	0.284
	P. value	>0.05	>0.05	>0.5	>0.5	>0.5

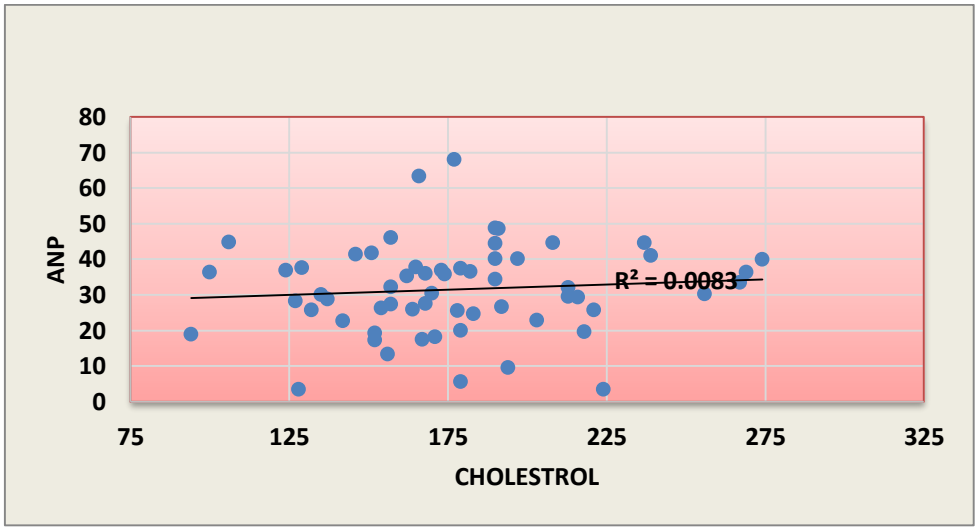

Figure 1: Correlation between ANP and cholesterol levels among hypertensive patients

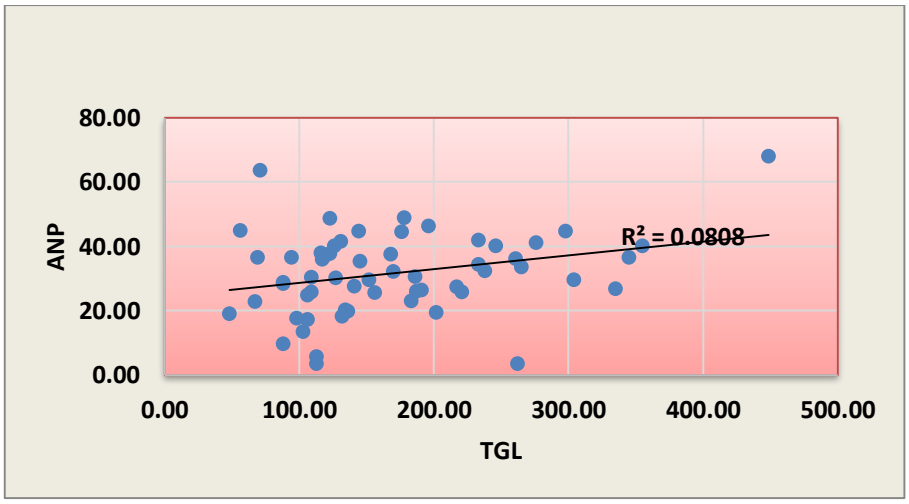

Figure 2: Correlation between ANP and TG levels among hypertensive patients

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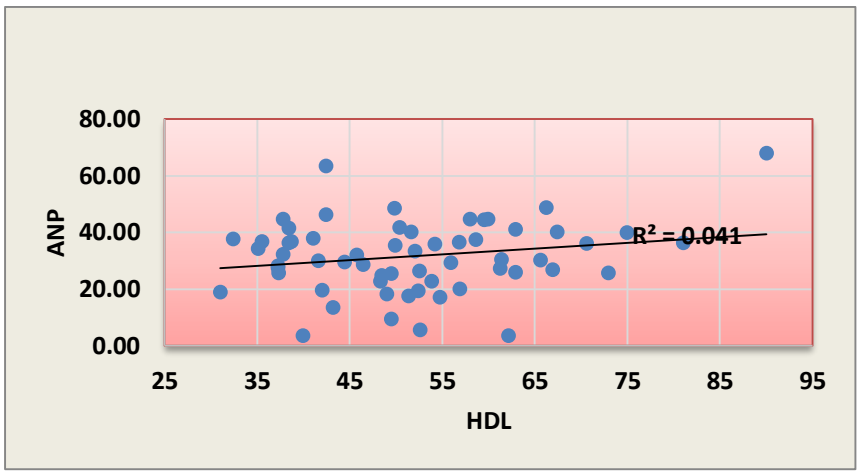

Figure 3: Correlation between ANP and HDL levels among hypertensive patients

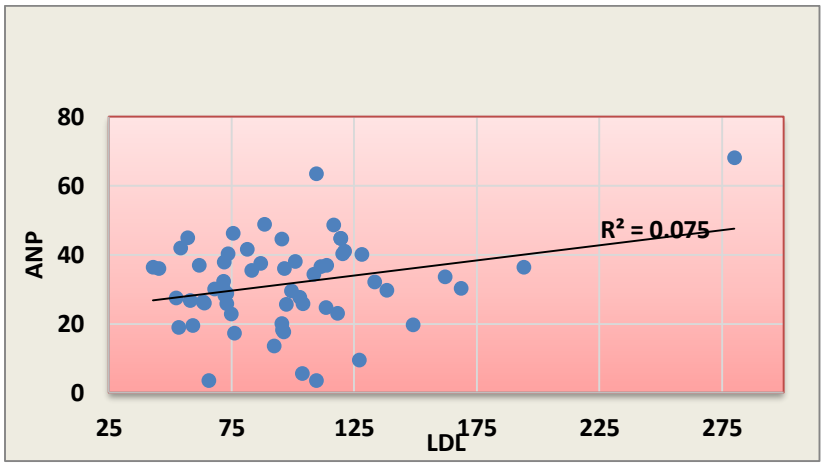

Figure 4: Correlation between ANP and LDL levels among hypertensive patients

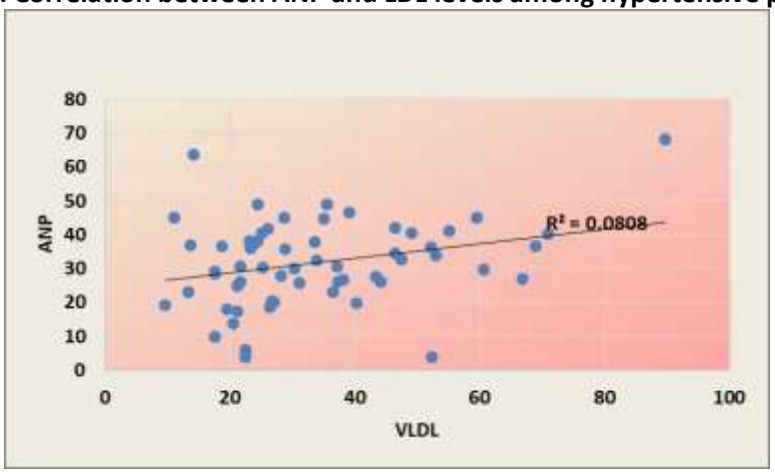

Figure 5: Correlation between ANP and VLDL levels among hypertensive patients .

Discussion

detected in patients with hypertension (169.01 mg/dl) as compared with healthy control group (124.1 mg/dl), the difference was significant at P. value: 0.015. The highest mean of VLDL was detected in patients with hypertension (33.8 mg/dl) as compared with healthy control group (24.8 mg/dl), the difference was significant at P. value: 0.015. While there was no significant difference between patients and control regarding LDL and HDL levels. The association between hyperlipidemia and hypertension has been shown in several previous studies [14,17,18]. An excessive dietary intake of saturated fats, cholesterol and other calorie sources and subsequent lipid profile disruption leading to hypertriglyceridemia and hypercholesterolemia are related to obesity and hypertension . In a study Brown, 2000 confirmed the association between several factors including BMI, serum cholesterol, HDL and hypertension [19]. Hypertension is considered to be associated with lipid metabolism alterations that give rise to serum lipid and lipoprotein levels abnormalities [20]. It has also been documented that the presence of hyperlipidaemia makes the prognosis in hypertensive patients significantly worse [21]. High total blood cholesterol level increase the risk of many large vascular complications such as coronary artery disease (CHD) and stroke [14]. The study by Olaitan *et al*[22] , In both hypertensive patients and normotensive controls, a positive and significant serum TC relationship with systolic and diastolic blood pressure was found in. High total cholesterol levels may be attributed to a number of causes including stress , increased intake of animal fat, lack of physical activity and genetic factors[23]. Abnormalities in serum lipid profiles play a central role in endothelial functional abnormality which is important in the pathogenesis of atherosclerosis, thrombosis, insulin resistance, and hypertension. Lipoproteins rich in TG and LDL-C have been recognized to be toxic to endothelium, while HDL-C may have protective role. Abnormally high serum TC levels are considered to be risk factors for developing macrovascular complications such as coronary heart disease

The study showed that the lowest mean of ANP was observed in patients with hypertension (31.57 pg/ml) and the highest mean was in the healthy control group (53.35 pg/ml), the difference was significant at P. value: 0.001. Atrial natriuretic peptide (ANP) is a potent diuretic, vasorelaxant hormone, which is synthesized predominantly in the cardiac atria. In response to intravascular volume expansion and blood pressure (BP) elevation, this peptide controls sodium-water balance [9,10]. Under normal hemodynamic conditions, it is predominantly synthesized, stored, and secreted in a regulated fashion by modified myocytes of the cardiac atria. However, in pathophysiological conditions of hemodynamic overload (in congestive heart failure, ventricular synthesis of the peptide) it is reactivated and contributes significantly to the circulating pool of the peptide [11,12]. In agreement with our result, Zaid *et al*[13] indicated that the level of atrial natriuretic peptide (ANP) showed a significant increase (P≤0.05) in patients compared with control group. Al-Fartosi[14] also indicated similar finding. Additionally, recent study done by Chen*et al*[15] shown that ANP reduced significantly in patients suffered from hypertension. The possible reason for the reduction of ANP levels is that the increased atrial stretch, resulting from volume overload, increases atrial peptides release rates. With the atrial problem of changes in left ventricular function induced by hypertension, this is likely to be a strong combined trigger for the release of auricular peptides [16]. The reduction levels of ANP in hypertensive subjects can be associated with a tendency towards decreased kidney sodium excretion, either as a result of hereditary kidney abnormality or as a result of high blood pressure [17]. This could cause sodium retention and thus increase compensatory mechanisms to excrete the sodium excess [18].The study showed that the highest mean of cholesterol was detected in patients with hypertension (178.46 mg/dl) as compared with healthy control group (166 mg/dl), the difference was significant at P. value: 0.017. The highest mean of TG was

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(CHD), stroke, and hypertension[24]. In agreement,Reza*et al*[25] indicated that the level of atrial natriuretic peptide (ANP) showed positive correlation with serum cholesterol and triglyceride among hypertensive patients. Recently, several lines of evidence have suggested that ANP is involved in lipid metabolism in different ways. Gabriella Garruti*et al*[26] found that ANP was expressed in and secreted from subcutaneous and visceral adipose tissue and pre-adipocytes. Dedoussis*et al*[27] found that ANP gene G664A polymorphism was associated with lower levels of apoA-I and HDL-C in familial hypercholesterolemia patients. Osajima*et al*[28] found that NT-proANP levels were negatively correlated with Triglyceride in the hypertensive group.

Conclusions:

1. The study lowest mean of atrial natriuretic peptidewas in patients with hypertension with a significant positive correlation between them
2. The study showed a significant positive correlation of atrial natriuretic peptidewith each of cholesterol and triglyceride among hypertensive patients

Recommendation

1. Study the role of atrial natriuretic peptide in other diseases and disorders like obesity, chronic kidney disease and diabetes mellitus
2. Study the relation of atrial natriuretic peptide with other factors related to hypertension in like serum electrolytes and albumin

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