Article

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Study the effect of Cortisol resistance in patients with hypertension

Furqan Moein Auda[1] and Athraa Rehman Kazem[2]

1. **Furqan Moein Auda, Chemistry Department, Science ,University Of Kufa , Al Najaf, Iraq; E-mail:furqan.chmala@uokufa.edu.iq**
2. **Athraa Rehman Kazem, Chemistry Department, College of Science ,University Of Kufa , Al Najaf, Iraq; E-mail:azraar.alzalemi@student.uokufa.edu.iq**

Abstract

Background & objective: hypertension commonly interact, creating a difficult condition with major cardiovascular effects. Patients who have hypertension are more likely to experience their risk of cardiovascular disease (CVD) , left main disease involvement, and three-vessel

Methodology: sixty Patient with hypertention and thirty healthy are participated in this study. .Their ages ranged between 45-70 years. Samples were taken in the morning when they were fasting ,and it obtained from the Open Heart Institute, Al-Sadr Teaching Hospital, Najaf, Iraq .

Results: The study showed that patients with high blood pressure suffer from a significant increase in cortisol, low-density lipoprotein, cholesterol, and triglycerides, and a significant decrease in high-density lipoprotein, these markers are considered early indicators of heart disease .

Conclusions: From this study it be can concluded that patients with hypertention may have cortisol resistance, although patients continue to take treatment, the levels of, cholesterol, and low-density lipoprotein remain high in patients. On the other hand cortisol has high sensitive to predict heart disease in patients with hypertention .

Abbreviations: HDL-high density lipoprotein, LDL-low density lipoprote, TG-triglyceryde

Key words : hypertension, cardiovascular disease, Insulin resistance and cortisol resistance

1. Introduction

Hypertension is a one of the biggest causes of heart disease and arteriosclerosis (1). 90% of people follow an unhealthy lifestyle, a diet high in sugars and fats, a lack of vitamins and minerals, and a lack of exercise. All of this leads to a significant increase in blood sugar levels, which is matched by an increase in the secretion of the Insulin hormone whose receptors are found in all cells of the body and has many roles depending on its location (2), such as, its effect is on the cells of the blood vessel, it is the expansion and relaxation of the cells of the blood vessel, but if there is a defect in the function of the hormone (Insulin resistance) as a result of high sugar levels, it leads to contract of the artery and high blood pressure. Insulin resistance also activates the renin-angiotensin system, which increases blood pressure (3) . There is a relationship between high blood pressure syndrome and indicators of arteriosclerosis Such as cortisol and lipid levels.

Cortisol is stress hormone secreted from the adrenal gland above the kidney through stimulation of the corticotropic hormone from the pituitary gland. It is made from cholesterol, cortisol cannot pass into the blood so it binds to protein carriers, either albumin 25%or transcortin 75% (4) . After cortisol enters the bloodstream, it

goes to several places in the body, such as it enters the muscles and causes break down of protein to releasing amino acids into the bloodstream then it reaches the liver (5) . as well as in the adipocytes cortisol works to break down triglycerides to release glycerol and fatty acids that are deposited in the body(6) . As for the glycerol and Amino acids resulting from the breakdown of muscle protein form sugar in the liver through the process of glyconewgenosis (7). A continuous increase in cortisol causes high blood pressure by two mechanisim the firest ,increasing the sensitivity of norepinephrine and adrenergic receptors present around the smooth muscle cells surrounding the blood vessel, which causes constriction of the blood vessel, which increases blood pressure . The second mechanism is through water and sodium retention (8). .

Lipid profile is divided into several sections, including total cholesterol and , low density lipoprotein LDL, high density lipoprotein HDL, triglycerideTG. Very low density lipoprotein VLDL(9) . Cholesterol is not transported in the blood except by special carriers called lipo-proteins that are made in the liver (10) . The liver initially makes VLDL and contains triglycerides and cholesterol (11) . This carrier is transported from the liver to the cells that need energy. Then, when the cells are given cholesterol and triglycerides, it turns into LDL, which is called harmful cholesterol because it transports fats from the liver to the body cells(12) . If the liver production of LDL molecules increases, it leads to an increase in its level in the blood circulation.

2. Subject and Method

Study design: Case - control study

Samples: Ninty person (60 Patient with high blood pressure and 30 healthy) .Their ages ranged between 45-70 years . Samples were taken in the morning when they were fasting ,and it taken from the Al-Sadr Medical City's Open Heart Center is located in AL-Najaf Al-Ashraf, Iraq . healthy people were chosen to serve as the control group their age ranges were similar to the patients .All these people were not smokers and did not suffer from vascular diseases, kidney disease , inflammation and thyroid disease.

Methods

1- Cortisol was measured enzymatically using the ELISA technique using ELISA kit from the PARS Biochem Company (China).
2- Cholesterol , triglyceride and high density lipoprotein (HDL) were determined by the spectrophotometer method using a unique kit from the Spinreact firm for each parameter (Spanish).
3- Low density lipprotein , very low density lipoprotein and atherogenic index were measured mathematically

Bio statistical analysis

The statistical analysis of the current study was completed using the SPSS Model 26 program, to determine the mean ± standard deviation and p-value, Excel 2016 (13) was used, (14) .

3.Results and discussion

Table 1: Comparative demographic data of the study population

Variable	Group	Mean	Std. Deviation	Std. Error Mean	Sig. (2-tailed)
Age	Patients	59.6667	7.58553	1.38492	0.880
	Control	59.9333	7.35285	1.34244	0.862
BMI	Patients	29.1093	2.62083	.47850	0.071
	Control	30.5511	3.26532	.59616	0.067

Table 2: cortisol and lipid profile in patients and controls

Variable	Group	Mean	Std. Deviation	Std. Error Mean	Sig. (2-tailed)
TG	Patients	240.2333	98.02042	17.16570	0.002
	Control	169.9322	66.39744	11.75731	0.002
HDL	Patients	36.9534	9.30386	1.69865	0.001
	Control	66.6001	29.63256	5.04499	0.001
CHO	Patients	190.7011	48.80742	9.09353	0.004
	Control	155.0322	36.04475	6.76340	0.004
LDL	Patients	137.5858	37.85733	7.09437	0.025
	Control	114.8922	31.61613	6.13744	0.013
VLDL	Patients	45.7811	11.59154	2.29889	0.002
	Control	34.4944	11.61951	2.30399	0.002
IndexI	Patients	5.6959	3.80568	.51224	0.001
	Control	2.9134	2.87659	.34261	0.000
IndexII	Patients	4.1288	3.28217	.41667	0.000
	Control	2.2001	2.73551	.31688	0.002
IndexIII	Patients	6.9205	4.36062	.61355	0.001
	Control	3.2693	3.49334	.45521	0.001
Cortisol	Patients	90.5276	39.92854	7.10735	.007
	Control	68.3590	17.94193	3.09316	.008

P < 0.05 considered as significant

As compared to the control group, the results in Table (1) show a substantial rise ($p<0.05$) in the patients levels of total cholesterol, low density lipoprotein LDL, triglyceride TG, IndexI, IndexII, IndexIII , cortisol. Furthermore, compared to the control group, the data indicate a considerable drop in HDL.

This study is consistent with many studies (15) high blood lipid mean increase triglycerides and cholesterol, and thus an increase LDL and decrease HDL which removes excess cholesterol from the blood circulation and prevents oxidation LDL (16) . High levels of fats lead to their oxidation and deposition on the walls of blood vessels, causing narrowing of the artery and difficulty in blood flow, leading to high blood pressure(17)

The significant increase in cortisol is may due to cortisol resistance resulting from its continuous increase . Cortisol resistance causes high glucose levels by increasing Gluconeogenic substrates which converted into glucose by the gluconeogenic pathway (18) . The liver is the primary site of glucose synthesis, the main precursors of gluconeogenic include amino acids and glycerol lactate (19) . Cortisol resistance also causes high blood pressure through two mechanisms . The first is that cortisol increases the sensitivity of the hormone epinephrine, which binds to its receptors on the surface of the smooth muscle cells surrounding the blood vessel, and works to contract the vessel, thus raising blood pressure (20) . The second mechanism is that cortisol stimulates the hormone aldosterone, which retains sodium and water, causing high blood pressure(21).

Table 3: Spearman's correlation of variables in patients

Variables		TG	HDL	CHO	LDL	VLDL	IndexI	IndexII	IndexIII	Cortisol	ADM	PTX3
TG	Pearson Correlation	1	0.127	0.347	-0.475**	0.499**	0.112	-0.290	0.745**	-0.185	-0.071	0.218
	Sig. (2-tailed)		0.488	0.070	0.007	0.004	0.544	0.111	0.001	0.320	0.701	0.236

HDL	Pearson Correlation	0.128	1	-0.283	-0.240	0.017	-0.785**	-0.732**	-0.513**	0.035	-0.279	0.065
	Sig. (2-tailed)	0.488		.129	.202	.928	.001	0.001	0.003	0.845	0.125	0.722
CHO	Pearson Correlation	0.336	-0.283	1	0.010	.268	.689**	0.218	0.478**	-0.187	-0.088	0.218
	Sig. (2-tailed)	0.060	.229		0.946	.151	0.001	0.248	0.007	0.310	0.633	0.236
LDL	Pearson Correlation	-0.475**	-.0240	0.010	1	-0.126	0.264	0.706**	-0.160	-0.012	-0.109	-0.276
	Sig. (2-tailed)	0.008	0.202	0.957		0.508	0.159	0.000	0.397	0.948	0.566	0.140
VLDL	Pearson Correlation	0.499**	0.017	0.268	-0.126	1	0.170	-0.038	0.493**	-0.353	-0.023	0.042
	Sig. (2-tailed)	0.004	0.918	0.152	0.517		0.358	0.839	0.005	0.045	0.914	0.816
IndexI	Pearson Correlation	0.112	-0.785**	0.689**	0.264	0.170	1	0.780**	0.658**	-0.156	-0.001	0.060
	Sig. (2-tailed)	0.549	0.001	0.001	0.148	0.357		0.001	0.001	0.418	0.985	0.743
IndexII	Pearson Correlation	-0.290	-0.732**	0.218	0.706**	-0.038	0.780**	1	0.311	-0.044	-0.040	-0.193
	Sig. (2-tailed)	0.120	0.000	0.247	0.000	0.841	0.000		0.094	0.818	0.834	0.306
IndexIII	Pearson Correlation	0.745**	-0.513**	0.478**	-0.160	0.493**	0.658**	0.311	1	-0.215	0.092	0.165
	Sig. (2-tailed)	0.001	0.003	0.007	0.398	0.007	0.001	0.084		0.242	.0621	0.369
Cortisol	Pearson Correlation	-0.185	0.035	-0.187	-0.012	-0.353	-0.156	-0.044	-0.215	1	0.097	0.013
	Sig. (2-tailed)	0.335	0.845	0.310	0.937	0.049	0.418	0.824	0.253		0.612	0.939

The results in the table(2) indicate that there is a significant positive relationship between triglycerides with very low density lipoprotein VLDL and indexlll the reason is that VLDL is made in the liver a main carrier of triglycerides from the liver to the cells, and indexlll is directly proportional with TG, this means that the level of TG higher than HDL (22) , when the level of triglycerides increases the index percentage increases, however there is a significant inverse relationship between TG and low density lipo protein because LDL carries a higher amount of cholesterol than triglycerides. While the study showed that there is an inverse relationship between HDL and Indexl, Indexll, Indexlll , this indicates that levels of

good cholesterol are low or there is an imbalance in cholesterol transport, as the transport of cholesterol from cells to the liver is less than the transport of cholesterol from the liver to cells where the Index l and indexll also has a Negative relationship with HDL , this is the reason for the positive relationship between cholesterol and Index l (23) . The results also showed that the relationship between cortisol and VLDL is negative and high significant , cortisol inhibits the biosynthesis of apoproteins of VLDL in the liver and disrupts the metabolism of lipoproteins in the blood, contributing to hyperlipidemia (24)

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