The oxidative stress state in hypertension patients with type 2 diabetes mellitus

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ABSTRACT

Oxidative stress have potential role in some disease like diabetes mellitus and the long period of oxidative exposure led to disease complications like hypertension and cardiac disease, the present study conducted to evaluated oxidative stress state in DM 2 patient with hypertension to detect the role of OS in diabetic complication, Reactive oxygen species (ROS) and TAOal antioxidant (TAO) levels were detected in patients serum, the results show that the hypertension were observed in high age than other group in non-significant differences P (0.109), the BMI was slightly varied between groups at P (0.574). Non-significant differences appeared in FBG and HBA1c with slightly decreasing at P (0.780 and 0.068) respectively. Significant differences P (0.000) for SYS and DIA were observed; the TAO showed low decrement in patients DM+HP and slightly elevation in ROS in same group in non-significant differences P (0.676, 0.736) respectively. The correlation coefficient between groups show that the ROS non-significant weak correlated with SYS and weak inverse with DIA in DM group. While in DM+HP group; non-significant inverse weak correlation with SYS and DIA were observed. TAO was weak invers correlated with SYS and weak positive correlated with DIA in DM and DM+HP, significant invers correlation observed between TAO and ROS in both groups, the present study concluded that the ROS elevation and TAO decrement were related with hypertension in DM patients.

Introduction

The hypertension is one of the diabetic complications, about 75% of DM patients suffered from hypertension and the long period of HP may lead to other health problems like stroke, coronary heart disease, heart failure, and peripheral vascular disease [1].

Multifactor can be led to HP like chronic inflammation, Obesity, and oxidative stress, the insulin resistance also one of the HP etiology, researches proved the unbalanced oxidative-redox state considered as risk factors in HP [2]. Oxidative stress recorded in high rates in different populations because of variation in lifestyle, food consuming, and sleep time and smoker habit, oxidative stress result from unbalanced between free radical production and scavenger by antioxidant molecules and these were effected by previous factors [3].

The present study aims to evaluation the oxidative stress by detection ROS and TAO in diabetes mellitus type 2 patients with and without hypertension.

Materials and Methods

■ Sample collection and study sitting

a cross match study was conducted to detection the oxidative stress state in diabetes mellitus patients with and without hypertension, 21 sample of patients suffer from diabetes mellitus type 2 without hypertension and 16 patients with hypertension, all patients were clinically diagnosis by specialist physicians with clinical biomarker, blood samples and data were collected according to ethical approval of ministry of environment and health in Iraq. Serum samples were separated and store in -20°C.

■ Biomarker estimation

Fasting blood glucose (FBG), Glycated

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KEYWORDS

- oxidative stress
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hemoglobin A1c, TAOal antioxidant, and Reactive oxygen species were detected by routine lab methods, in addition to systolic and diastolic of blood pressure.

Statistical analysis

The results represented as a mean ± stander error, independent t test was used to detection differences between groups at $p<0.05$, the correlation coefficient also detected.

Results

The present finding that deal with the oxidative stress state in DM with and without hypertension are clarified in TABLE 1, results show that the hypertension were observed in high age (52.81 ± 2.61) than DM group (46.52 ± 2.67) in non-significant differences P (0.109), the BMI was slightly varied between groups (30.82 ± 1.21, 29.84 ± 1.17) for DM and DM+HP respectively at P (0.574). Non-significant differences appeared in FBG and HBA1c with slightly decreasing at P (0.780 and 0.068) respectively. Significant differences (p=0.000) for SYS and DIA were observed; the TAO showed low decrement in patients DM+HP and slightly elevation in ROS in same group in non-significant differences (P=0.676, 0.736) respectively [4-6].

The correlation coefficient between groups were detected, the ROS non-significant weak correlated with SYS and weak inverse with DIA in DM group. While in DM+HP group; non-significant inverse weak correlation with SYS and DIA were observed [7-10]. TAO was weak invers correlated with SYS and weak positive correlated with DIA in DM and DM+HP, significant invers correlation observed between TAO and ROS in both group (TABLE 2).

TABLE 1. Study variables differences of DM and DM+HP groups.

Variables	DM	DM+HP	T test	Significance
Age	46.52 ± 2.67	52.81 ± 2.61	1.64	0.109
BMI	30.82 ± 1.21	29.84 ± 1.17	0.568	0.574
FBG	232.80 ± 25.43	221.93 ± 29.15	0.281	0.780
HBA1c	9.13 ± 0.39	8.04 ± 0.40	1.881	0.068
SYS	12.19 ± 0.14	14.75 ± 0.34	7.379	0.000
DIA	7.85 ± 0.07	9.12 ± 0.18	6.871	0.000
TAO	11.13 ± 0.75	10.71 ± 0.58	0.422	0.676
ROS	105.59 ± 13.54	111.38 ± 12.55	0.444	0.736

TABLE 2. Correlation coefficients among study variables in DM and DM+HP.

Variables	ROS				TAO			
	DM		DM+HP		DM		DM+HP	
	r	P	r	P	r	P	r	P
SYS	0.267	0.243	-0.242	0.366	-0.211	0.358	0.284	0.287
DIA	-0.281	0.217	-0.141-	0.602	0.228	0.320	0.199	0.460
ROS	-	-	-	-	-0.850	0.000	-0.855	0.000

Discussion and Conclusion

The oxidative-redox is a system included free radicals and antioxidant molecules to balance the oxidative-redox state in the body, the long period of unbalanced of this system would lead to oxidative stress that contributed in diseases incidence and developments. The present study shows that the DM has high level of ROS and TAO levels and this were proved by other studies.

The pathophysiological and complications of DM which causes ROS that production by different mechanisms, 1; the pathway of polyol flux, 2; excessive formation advanced glycation end products, 3; high level of receptor expression of AGEs, 4; protein kinase C isoforms activation, 5; hexosamine pathway over activity, in addition to inactivation of two critical anti-atherosclerotic enzymes; the endothelial nitric oxide synthase and prostacyclin synthase. The oxidative stress contributed in the hypertension incidence by different mechanisms included vasodilator nitric oxide quenching, vasoconstrictor lipid peroxidation products generation, tetrahydrobiopterin depletion, endothelial cells and vascular smooth muscle cells damage, intracellular free calcium level elevation, endothelial permeability increased, inflammation and growth signaling events stimulation. The vascular oxidative stress can be stimulated hypertension; on the other hand it is unclear whether ROS initiate the development of hypertension. The results deal with Lassègue and Rhian that proved strong association between hypertension and oxidative stress. The long period of oxidative stress in DM patients contributed in complications, thus it should be treated with supplements, antioxidant foods and drugs.

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