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## A Studying of The Effect of Oxidative Stress Among Patients with Atherosclerosis in Al-Najaf City

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**Abstract:** The current study sheds light on the effect of oxidative stress on the development of atherosclerosis. Thirty-eight males and twenty-two females with atherosclerosis were chosen as the patient group, whose samples were collected from the "Open-Heart Unit in Al-Sadr Teaching Hospital in Najaf City". Thirty healthy people who do not suffer from vascular disease, hypertension or diabetes, with similar ageing of patients, were selected as a control group.

Total antioxidant capacity, Insulin, cholesterol, hemoglobin and platelets were measured in atherosclerosis patients and the control group. The results show a significant increase in full antioxidant capacity, Insulin, cholesterol, haemoglobin and platelets in patients with atherosclerosis compared with the control group; the results also showed a significant increase in hemoglobin and platelet count in males with atherosclerosis compared with females. There is a positive relation between T-AOC and Insulin in atherosclerosis patients, while there is no relationship between T-AOC and both (Hb & PCV) in atherosclerosis patients.

**Keywords:** Atherosclerosis, Total antioxidant capacity, Oxidative stress, Free radicals and Insulin resistance

## 1.Introduction

Oxygen is essential for life, but it enters a series of chemical reactions during cellular respiration, losing a single electron and producing very effective fragments called free radicals. Free radicals harm the oxidation of carbohydrates, fats, proteins, and nucleic acids, leading to tissue damage [1]. Oxidative stress is a disparity between oxidants and antioxidants. Oxygen produces many oxidants, such as superoxide hydroxyl radical and  $H_2O_2$  [2]. Free radicals are made from other sources, such as nitrous oxide, ionizing radiation, heavy trace elements, and cigarette smoke [3]. Cigarette smoke reduces the effectiveness of antioxidants; cigarette smoke contains

dangerous amounts of hydroxyl radicals and hydrogen peroxide, which are associated with diabetes and high blood pressure in the progression of atherosclerosis [3,4]. Free radicals cause endothelial cell damage and low-density lipoprotein oxidation, affecting the angiotensin system, an essential source for the production of free radicals in endothelial cells and smooth muscle which leads to inflammation of the heart's blood vessels [5,6]. Increasing the concentration of oxidants leads to a decrease in nitric oxide, which plays an essential role in the expansion of blood vessels [7,8].

The overproduction of reactive oxygen species (ROS) and oxidized low-density lipoprotein (Ox-LDL) lead to atherosclerosis

[9]. In addition to oxidative stress, many diseases cause atherosclerosis, such as obesity, insulin resistance, hypertension, diabetes mellitus, hypercholesterolemia, vascular wall inflammation, a genetic predisposition, as well as unhealthy lifestyle, such as alcohol consumption, smoking, stress, and eating unhealthy foods [10].

## 2. Methodology

### Samples collection

Thirty-eight males and twenty-two females with atherosclerosis were chosen as patients' group, whose samples were collected from the open-heart unit in Al-Sadr Teaching Hospital in Najaf. Thirty healthy people who do not suffer from heart disease, diabetes or high blood pressure and whose ages are similar to those of the patients were selected as a control group.

### Hematological detection

Serum Total antioxidant capacity and Insulin were evaluated using the Elisa method, and cholesterol was determined using a spectrophotometer. While blood hemoglobin, platelet and PCV are determined using a Complete blood content test.

Statistical analysis was expressed as (mean  $\pm$  standard deviation). Pooled t-test was used to compare the patients and control groups in the measured parameters. Correlation coefficients were calculated to estimate the correlation among parameters. All statistical analyses were performed using the SPSS program (The difference will be significant when  $P < 0.05$ ) [21,22].

### 3. Results and discussion:

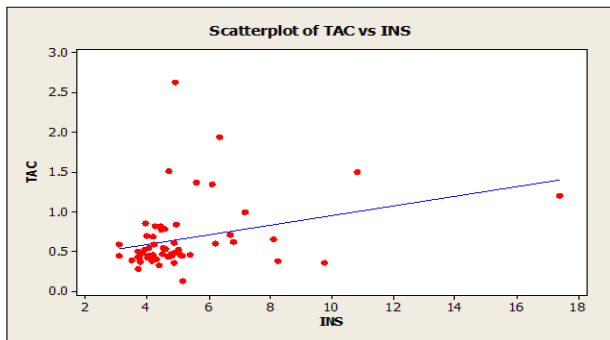
The results in Table (1) appearances an increase ( $p < 0.05$ ) in Total antioxidant capacity, Insulin, Cholesterol, Platelets, hemoglobin and PCV in patients as compared with the control group.

**Table (1): Level of the measured parameters in atherosclerosis patients in comparison with the control group**

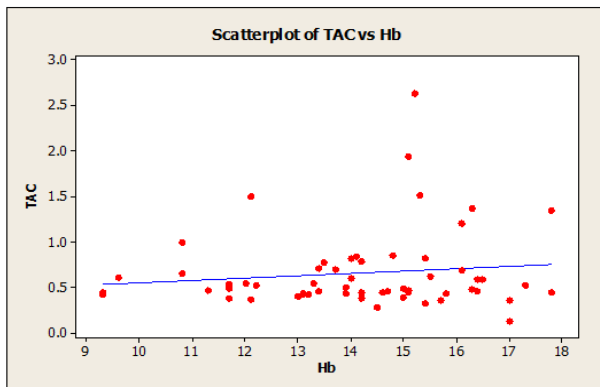
Parameters	Patients =60	Control =30	P-Value
	Mean $\pm$ SD	Mean $\pm$ SD	
T-AOC	0.659 $\pm$ 0.430	0.515 $\pm$ 0.261	0.054176
PCV %	58.56 $\pm$ 85.109	36.15 $\pm$ 2.70	0.0498
Hb	14.137 $\pm$ 2.065	13.43 $\pm$ 0.608	0.018838
Platelets	269.086 $\pm$ 96.750	223.77 $\pm$ 91.36	0.03265
Insulin	5.16 $\pm$ 2.20	4.060 $\pm$ 0.59	0.00062
Cholesterol	144.65 $\pm$ 51.35	121.41 $\pm$ 46.95	0.035049

The study indicated a significant increase in the percentage of hemoglobin, platelets and PCV in patients with atherosclerosis, consistent with previous studies confirming that high PCV leads to inflammation of the lining of the arteries [11,12]. When raised, whole blood viscosity is the resistance of blood flow in vessels, which induces endothelial inflammation, which accelerates atherosclerotic [13].

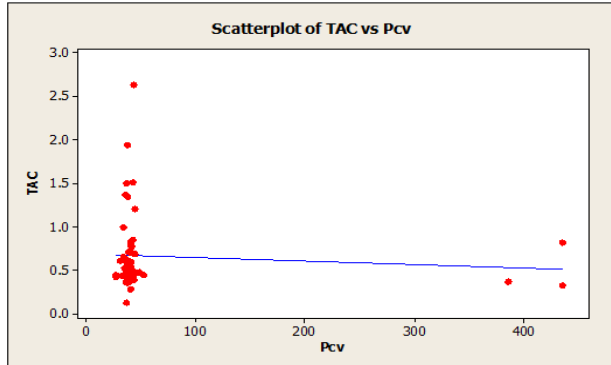
The results showed a significant increase in the concentration of total Antioxidant Capacity in patients (0.659 $\pm$ 0.430) compared with the control group (0.515 $\pm$ 0.261). Total antioxidant capacity (TAC) is a test used to assess the antioxidant reply against the free radicals produced by disease. TAC measures the number of free radicals in samples [13,15,16,17]. Free radicals can be generated through inflammation, natural metabolism, radiation, pollution, drugs, or reduced protective capacity. A rise in free radical production can create oxidative damage [14,18]. Antioxidants keep the body against the acute effects of free radicals [15]. Antioxidants resist free radicals and reduce their concentration, so a lower antioxidant concentration means a high total Antioxidant Capacity level [19]. Figure (1) shows a positive relation between T-OC and Insulin in atherosclerosis patients. Figure (2) and (3) shows no relationship between T-AOC with both (Hb & PCV) in atherosclerosis patients, may be need more patients to prove the relationship between Total Antioxidant Capacity with each of Hb & PCV.



**Figure (1): The relation between T-AOC and Insulin in atherosclerosis patients.**



**Figure (2): The relation between T-AOC and hemoglobin in atherosclerosis patients.**



**Figure (3): The relation between T-AOC and PCV in atherosclerosis patients.**

**Table (2): Level of the measured parameters in male patients and female patients.**

Parameters	Male Patients =38	Female Patients =22	P-Value
	Mean± SD	Mean± SD	
T-AOC	0.6396±0.4253	0.6722±0.434 7	0.78186 2
Platelet	226.758±77.5631 8	282.74±108.0	0.07255 5
Insulin	4.950±2.222	5.4835±2.088 2	0.36195 7

Hb	13.972± 1.6015	12.306±3.190 8	0.00026 8
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Table (2) results indicate a significant increase in hemoglobin and platelet count in males with atherosclerosis compared with females. Atherosclerosis is the primary reason of death worldwide. However, men with atherosclerosis are more likely to die than women at a younger age; men die due to atherosclerosis more than women and at an earlier age (40–60 years) [20,22,23]. On the other hand, the results indicate no significant change in T-AOC levels between male and female patients with atherosclerosis. All patients are smokers and suffer from hyperlipidemia, so there are no significant differences between men and women in this level of T-AOC [24,25,26].

### Conclusions

It can be concluded a significant increase in total antioxidant capacity, Insulin, cholesterol, hemoglobin and platelets in patients with atherosclerosis as compared with the control group. On the other hand, a significant increase in hemoglobin and platelet count in males with atherosclerosis compared with females. The positive relation between T-AOC and Insulin in atherosclerosis patients, while there is no association between T-AOC with both (Hb & PCV) in atherosclerosis patients.

### Ethics:

This study was conducted under approval by the medical ethics committee at the University of Kufa (2017). Parents and agreement provided verbal and written consent for publication was obtained from participants and researchers.

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