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Study of Many Biochemical and Oxidative Stress Variables in Patients with Atherosclerosis in Kirkuk City

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ABSTRACT

The current study was designed to detect the role of a number of chemical variables represented by fasting blood sugar, hemoglobin A1c and insulin and oxidative stress factors in atherosclerosis patients. The present study involved (70) blood samples aged between (35-65) years the first group involved (40) blood samples from atherosclerosis patients and the second group involved (30) blood samples from healthy individuals, the samples were collected from respondents at Kirkuk General Hospital and Azadi Teaching Hospital in Kirkuk for a while 2021/12/22 to 2022/2/8 and the samples were taken after eight hours of fasting and all the information was taken from the reviewers by means of a questionnaire that included age, body mass index, systolic pressure and diastolic pressure and the results were as follows: significant increase in body mass index in the group of atherosclerosis patients compared to a healthy control group at a significant level ($p \leq 0.05$) and 55% of them had elevated systolic pressure rate and 40% of them had high diastolic pressure ,the results from the current study show a significant increase in the concentration of asprosin compared to the control group at a significant level ($p \leq 0.05$),the results of cardiac troponin(t) show a significant increase in the concentration of troponin in the patients of atherosclerosis compared to the control group at a significant level ($p \leq 0.05$).

The results of the study biochemical variables have shown significant increase in fasting blood sugar in the group of atherosclerosis patients compared to a control group at a significant level ($p \leq 0.05$) and the results of glycated hemoglobin Test (A1c) showed a significant increase in the group of atherosclerosis patients compared to a control group at a significant level ($p \leq 0.05$) and the results of insulin showed a significant increase in the group of atherosclerosis patients compared to a control group at a significant level ($p \leq 0.05$).

While the results of the study of the oxidative stress which included the glutathione and malondialdehyde there was insignificant reduction in serum concentration of GSH in atherosclerosis patients at a significant level ($p \leq 0.05$) compared to a control group, and it has also been noted that was a significant increase in serum concentration of MDA in the atherosclerosis patients compared to a control group at a significant level ($p \leq 0.05$).

Keywords- Atherosclerosis, cardiac troponin T, insulin, fasting blood sugar, hemoglobin A1C, asprosin, body mass index.

I. INTRODUCTION

Atherosclerosis is a complex metabolic disease that is one of the major morbidity and mortality methods in the world and contributes to many life-threatening diseases[1] in advanced cases stiffness may lead to myocardial infarction and stroke risk factors such as diabetes, hypertension and smoking suggest an increased risk of injury through vascular endothelial disorders[2]. Atherosclerosis goes through three stage plaque formation, plaque development and finally plaque rupture and to understanding the stages is essential to the ability of cardiac imaging to detect each stage where the first stage begins with endothelial dysfunction and inflammation followed by plaque development, oxidized lipoprotein causes damage to the macrophage leads to foam cell death, the formation of a necrotic nucleus as smooth muscle cells migrate, the fiber coating forms and small calcification of the fibrous coating appears[3]. In the third and final stage the plaque ruptures which

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involve the rupture of the fibrous coating, the release of the river core into the blood ,the activation of platelets and the formation of a clot[4]several characteristics of atherosclerosis plaques have been shown to make them prone to rupture and some notable features are severe salivation in the vicinity of the coating and migration of smooth muscle cell from the middle layer of the arterial wall into the inner layer, secreting the most important material, collagen, endothelial erosion, calcification and intra-plaque bleeding[5].Diabetes is a major risk factor in the development of atherosclerosis and obesity has an occupational impact because it shows high levels of reactive oxygen and nitrogen-reactive substances and ultimately increases levels of inflammation due to increased accumulation of lipids[6].Several studied strongly suggest that high blood pressure is one of the main causes of atherosclerosis as its rise causes blood to force through the artery causing stress and as a result the endothelial linin of the arteries becomes compromised[7]. Asprosin has been identified in many adipose tissue including heart where it has been identified as a vital marker for predicting the severity of cardiovascular disease[8], it prevents reactive oxygen types and a promising factor in protecting the heart from programmed cell death and dysfunction from damage associated with hypoxia[9]. Cardiac troponin is used as diagnostic marker to determine atherosclerosis and is evidence of cardiac integrity and its high concentration was found to indicate significant stenosis of the coronary artery[10].

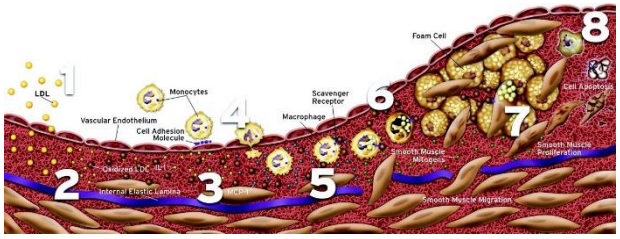

Figure 1: Stages of atherosclerosis development

II. MATERIALS AND METHODS

Experiment design:

The study included the collection of (40) blood samples from patients with atherosclerosis and (30) blood samples for healthy people and statements for patients was collected by means of a questionnaire that included few clinical information for each case samples and drained (5ml) of venous blood was withdrawn using medical syringes and placed in a gel tube it has no coagulant for the purpose of performing the required tests and the blood components in the centrifuge were quickly separated 3000 RPM for 15 minutes than the serum was pulled by a micro pipette and kept at a (-20) temperature to make the required checks.

Calculating body mass index (BMI)

BMI was calculated based on the following equation[12]:

$$BMI=\frac{Wieght(kg)}{Length(m^2)}$$

Asprosin concentration in serum of samples studied

The concentration of asprosin was calculated using diagnostic kit ready by (Bioassay technology laboratory) on the ELISA machine it is an enzyme linked immune absorption assay[13]

Glycated Hemoglobin Test (A1c) concentration in serum of samples studied

The cumulative sugar concentration in serum was calculated using the diagnostic kit prepared by the Korean company (Boditech) using the I chroma appliance[14].

Blood serum glucose concentration in serum of samples studied

Serum glucose concentration was calculated using the diagnostic kit prepared by the American company (Randox) [15]

Concentration of insulin hormone in serum samples studied

The serum concentration of INS hormone was calculated using the diagnostic kit prepared by the American company (Cobs) and using cobs appliance[16].

Cardiac troponin T concentration in serum of samples studied

The concentration of cardiac troponin was calculated using the diagnostic kit supplied by the French company (AFIAS) and using AFIAS appliance powered by Immunofluorescence assay[17].

Concentration of glutathione in serum samples studied

The serum concentration of glutathione was measured using the Moron method[18].

Concentration of Malondialdehyde in serum samples studied

The serum concentration of malondialdehyde was measured using the Rao method[19]

III. STATISTICAL ANALYSIS

Statistical analyzes were conducted by relying on the ready-made program (SPSS) Version 25 to analyze the date according to the one way method and testing the difference between the averages based on the Duncan multi-range test and counting the significant differences at the level of probability ($P \leq 0.05$) and the values of the tests were described in the form (mean$\pm$standard deviation).

IV. RESULTS

Body mass index (BMI)

The results of the present study as shown in figure (2) significant differences among the studied groups at a significant level ($P \leq 0.05$) show a significant increase in the BMI in atherosclerosis patients (29.204 $\pm$6.318) compared to the healthy group (20.313$\pm$ 3.541)

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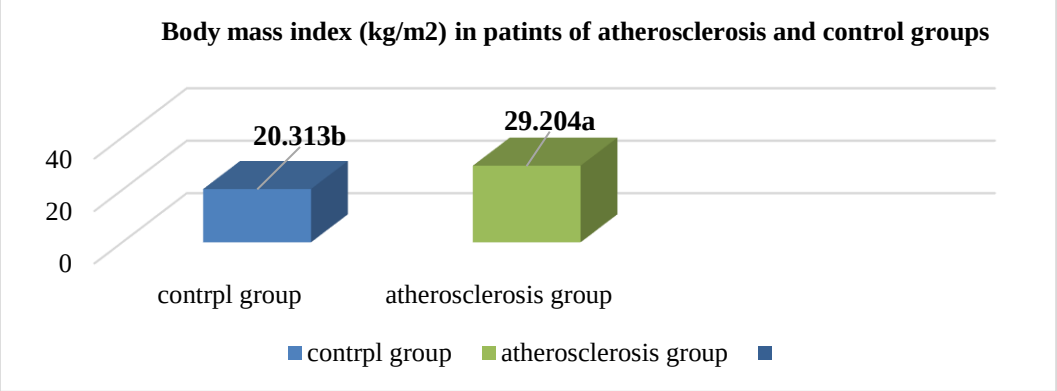

Figure 2: Shows the Body mass index in the totals studied

Estimation of serum ASP concentration

The results of the present study as shown in figure (3) significant differences among the studied groups at a significant level (P≤0.05) show a significant increase in the ASP in atherosclerosis patients (12.020 ±20.228) compared to the healthy group (8.694± 0.8013)

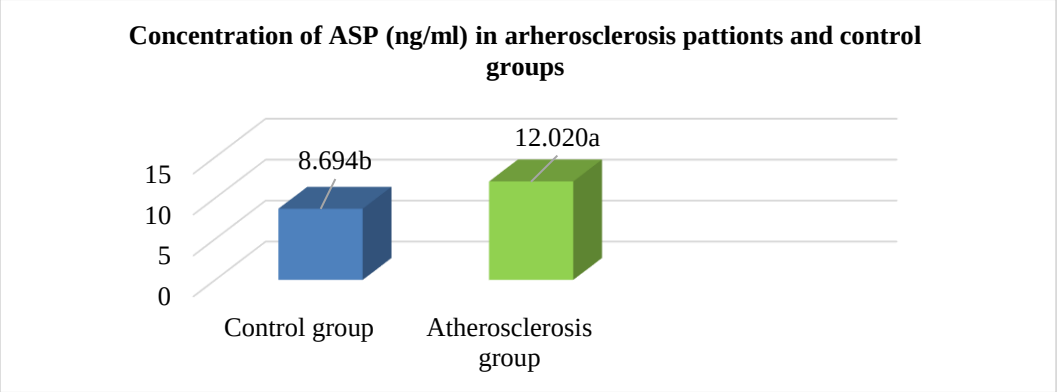

Figure 3: Shows the Asprosin in the totals studied

Estimation of serum HbA1c concentration

The results of the present study as shown in figure (4) significant differences among the studied groups at a significant level (P≤0.05) show a significant increase in the HbA1c in atherosclerosis patients (6.687 ±1.091) compared to the healthy group (5.328± 0.217)

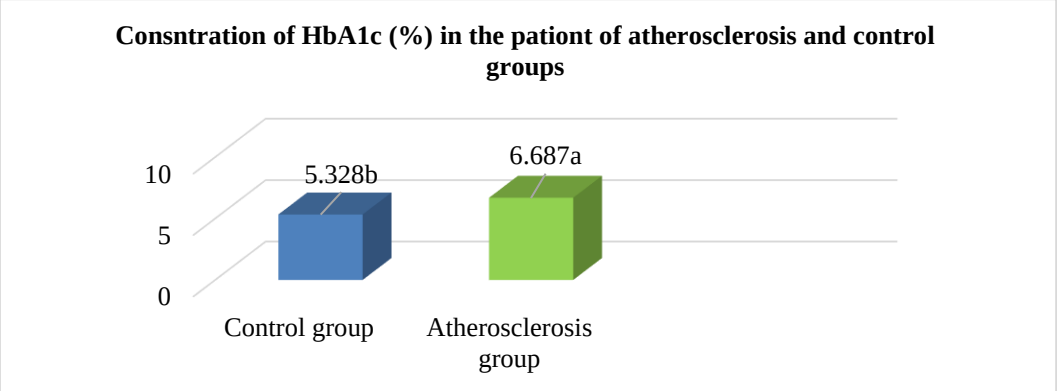

Figure 4: Shows the HbA1c in the totals studied

Estimation of serum blood sugar concentration

The results of the present study as shown in figure (5) significant differences among the studied groups at a significant level (P≤0.05) show a significant increase in the blood sugar in atherosclerosis patients (119.657±27.262) compared to the healthy group (91.980 ±31.253).

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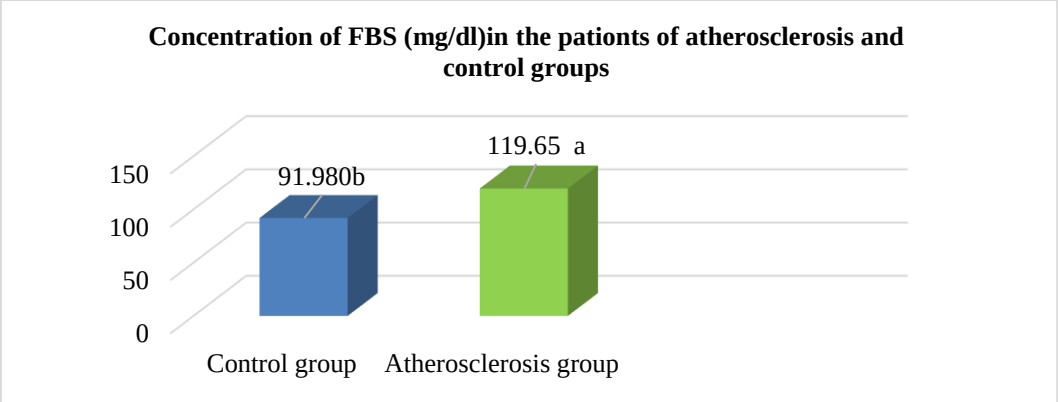

Figure 5: Shows the FBS in the totals studied

Estimation of serum INS concentration

The results of the present study as shown in figure (6) significant differences among the studied groups at a significant level (P≤0.05) show a significant increase in the INS in atherosclerosis patients (22.501 ±10.138) compared to the healthy population (9.610 ±5.380)

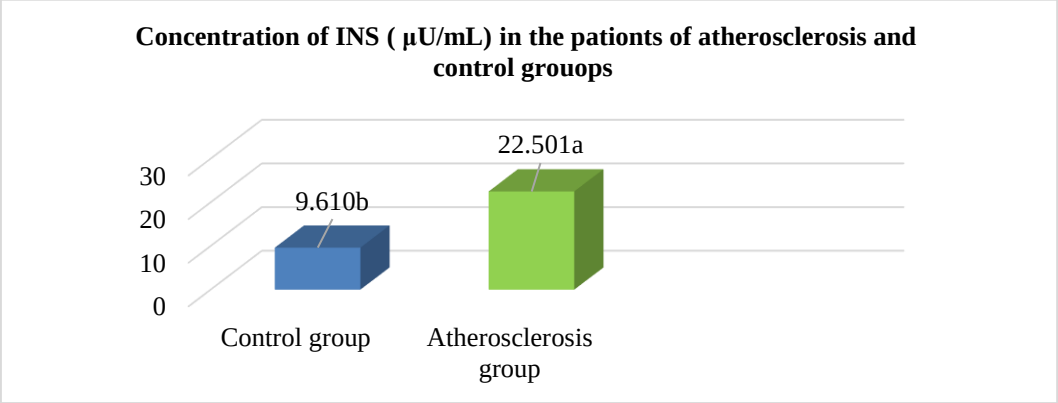

Figure 6: Shows the INS in the totals studied

Estimation of serum TnT concentration

The results of the present study as shown in figure (7) significant differences among the studied groups at a significant level (P≤0.05) show a significant increase in the cardiac troponin T in atherosclerosis patients (0.707 ±0.889) compared to the healthy population (0.255± 0.092)

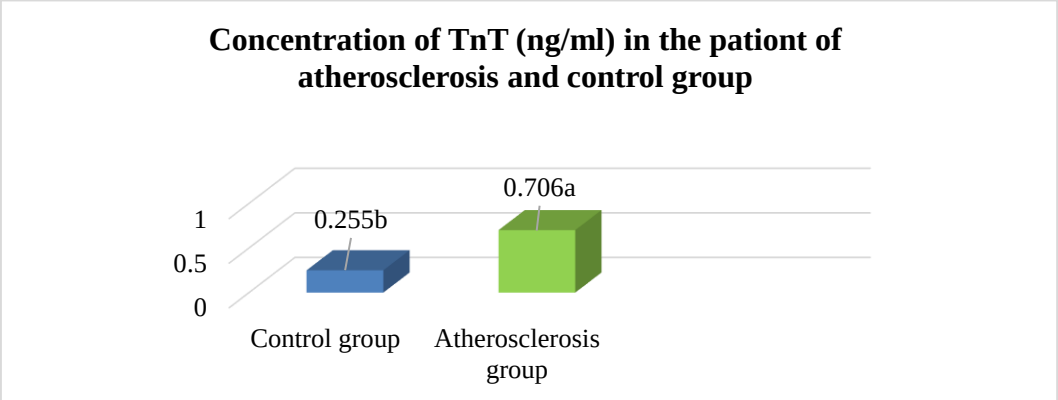

Figure 7: Shows the TnT in the totals studied

Estimation of serum GSH concentration

The results of the current study shown in figure (8) show an insignificant decrease at a significant level (P≤0.05) in the serum concentration of GSH in atherosclerosis patients (1.294±2.162) compared to the control group (1.856±0.512)

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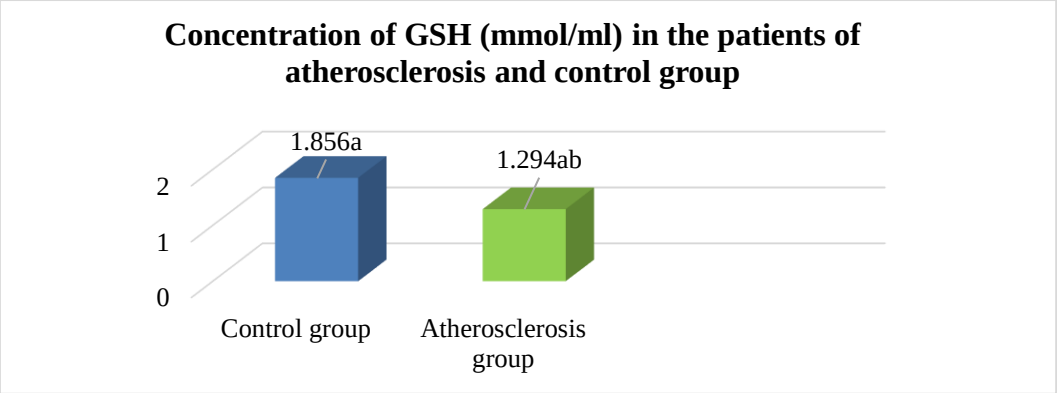

Figure 8: Shows the GSH in the totals studied

Estimation of serum MDA concentration

The results of the current study indicated that as shown in figure (9) there was a significant increase at a significant level (P≤0.05) in the concentration of malondidehyde in the serum of atherosclerosis patients (3.470±0.845) compared to the control group (2.190±0.749)

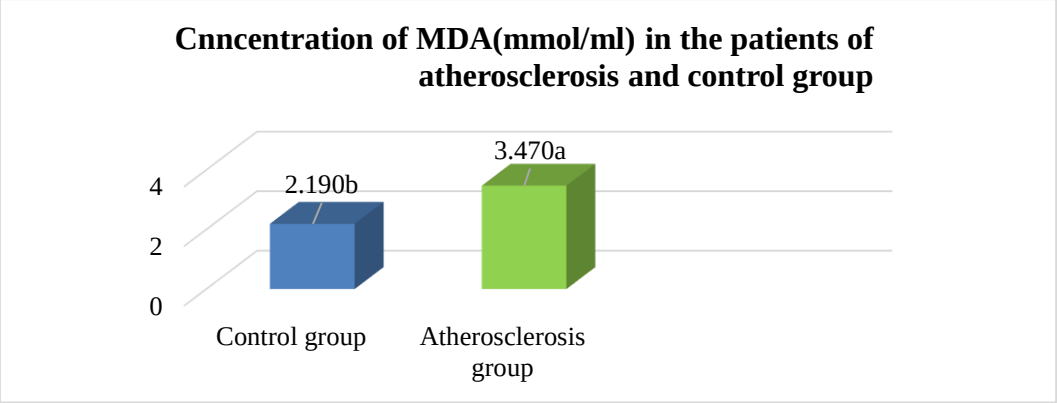

Figure 9: Shows the GSH in the totals studied

V. DISCUSSION

The current study found that an increase in the body mass index of atherosclerosis patients is a sign of obesity and is a risk factor, thus reinforcing AS factors leading to a decrease in antistatic activity of statins on coronary plaques[20] Nicholls[21] stated that lipid-lowering therapy was effecting in suppressive the development of arterial plaques associated with the BMI may be a good sign for limiting the statin dose to be given to obese and atherosclerosis. Mechanical pressure on blood vessels due to high blood pressure has serious consequences for the cardiovascular system and appears to be mainly due to mechanical pressure on the heart and blood vessels high blood often shows no acute symptoms and is not diagnosed creating a risk factor for AS. The results of asp rosin were consistent with Mirada[22] who reported significant changes in the concentration of asp rosin in patients with atherosclerosis when compared to the results of healthy individuals, since cardiac events occur as a result of free radicals and processes involving an inflammatory response, the beneficial effects of asp rosin in turn crush free radicals and reduce apoptosis[23]. Cumulative diabetes results are consistent with Hernandez[24] finding that HbA1c is a predictor of individuals at risk as well high blood hemoglobin is a predictor of cardiovascular disease regardless of fasting glucose levels, high glucose is not only a symptom of diabetes but also of stress in which these people have what is called the Stress hyperglycemia common for patients with arterial disease these findings are consistent with Zhao[25] and Shah[26] with high sugar concentration in atherosclerosis patients. In the case of insulin hormone this finding is consistent with Monnier[27] finding that there were significant differences in insulin concentration his elevation was linked to arterial sclerosis for the average person the concentration of insulin in the portal vein was much higher than in the systemic circulation. One reason for the increase in insulin concentration was the prolonged treatment of insulin in diabetic patients, the treatment stimulated the formation of anti insulin bodies which correlated and may have inoperable INS in patients. As for the enzyme troponin the results of the current study agree with Laufer[28] finding that there is a rise in the

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concentrations of cardiac troponin t in atherosclerosis patients which is more specific to the diagnosis of cardiac injuries because when there is damage to the heart muscle the cytosolic robonates quickly reach the bloodstream leading to a peak of troponin in the first hours of heart injury[29]. An important cause of reduction in the concentration of GSH is the incidence of oxidative stress which reduces glucose-6-phosphaate dehydrogenase causing a decrease in NADPH which is essential for GSH and thus decreases its concentration[30] and the increase in MDA is due to the lon ischemic period in which inflammation occurs as well as the role of leukocytes in production and reproduction and so a rise in the MDA can be said to be an indicator of atherosclerosis[31]

VI. CONCLUSION

The results of the current study show that many cases of atherosclerosis are rhe result of damage caused by free radicals and proesse involving an inflammatory response, showing elevated levels of asprosin hormone high cardiac troponin concentrations, insulin levels, and FBS, also observed high BMI, both systolic and diastolic pressure were. All these variables are important predictors of cardiac injury.

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