Study of the Correlation between high sensitivity C reactive protein and Each of Malondialdehyde , Lipid profile, and Atherogenic Index inPatients with Ischemic Heart Diseases(IHD) in Thi-Qar Governorate

HadeelRasheedFaraj* Prof. Dr. Raid M. H. Al-Salih* Asst.Prof. Dr. Adnan T. Al-Khafaji**

*Chemistry Dept. College of Science – Thi-Qar University** College of Medicine – Thi-Qar University

Abstract

Objective: Ischemic heart disease (IHD) is estimated to be leading cause of mortality in the world and in high-income countries. The present study was designed to determine and compare the levels of (hsCRP, MDA, lipid profile, and atherogenic index)in patients with (IHD) and healthy individuals and asses the titer of hsCRP among different types of IHD to predict its role in the risk stratifications of Ischemic Heart Disease and healthy individuals. Material and Methods:Serum high sensitivity C reactive protein ,lipid profile ,malondialdehyde, and atherogenic index levels were measured in 100 patients Ischemic Heart Disease and 70 supposedhealthy subjects .Results:The levels of serum high sensitivity C reactive protein , malondialdehyde, biochemical markers of lipid profile (serum TCH,TG,LDL,VLDL)and atherogenic index (AI) were revealed significant increase in patients with coronary artery disease as compared to control group whereas the levels (HDL) showed a significant decrease in coronary heart disease patients in comparison to control subjects($P \leq 0.01$).This study was also revealed the correlation between the concentrations of the measured parameters and hsCRP.This study revealed significant in hsCRPin patients with (IHD). Conclusion:This study revealed significant inhsCRPin patients with (IHD).Lipid peroxidation and oxidative stress is more prominent in patients with (IHD) comparison to healthy individuals ,and this is mostly the leading cause of atherosclerotic processes and resultant complication of coronary occlusion . this lipid peroxidation reflected by (hsCRP, MDA, LDL, and atherogenic index) were obvious in this study .

Keywords: Ischemicheart diseases,Coronary Heart Disease, high sensitivity C reactive protein , lipid profile ,atherogenic index and Malondialdehyde.

INTRODUCTION

Ischemic heart disease (IHD) is estimated to be the leading cause of mortality in the world and in high-income countries. It is also the leading cause of premature mortality and disability[1]. The term acute coronary syndromes is applied to the spectrum of acute catastrophic manifestations of IHD: e.g. unstable angina/ NonNSTEMI, acute myocardial infarction , and sudden cardiac death. All these events result from acute changes in the morphology of atherosclerotic plaques[2,3].

The a etiology of (CAD) is multifactorial, and a number of risk factors are known to predispose to the condition. Some of these-such as age, gender, race and family history-cannot be changed, whereas other major risk factors, such as serum cholesterol, smoking habits, diabetes and hypertension, can be modified[4].

The researchers have hypothesized that inflammatory markers such as high-sensitivity C-reactive protein (hsCRP) may provide an adjunctive method for global assessment of cardiovascular risk[5,6,7].

Several large-scale prospective studies demonstrate that hsCRP is a strong independent predictor of future myocardial infarction and stroke among apparently healthy men and women. The present data describe hsCRP within athermatous plaque[8].

Lipids are a class of nonpolar molecules, they are found in the cell membranes, in the endoplasmic reticulum, and in specialized fat storage cells [9]. cholesterol is derived from dietary intake, most is synthesized by the liver and other tissues from simpler molecules. Almost 90% of synthesis occurs in the liver and gut; therefore, peripheral cells and other organs depend largely on cholesterol delivery from the circulation [10].

Triglycerides are fatty acid esters of glycerol, each containing three different fatty acids [11]. Lipoproteins are complex aggregates of lipids and proteins that render the lipids compatible with the aqueous environment of body fluids(HDL,LDL,VLDL,chylomicrons) [12].

AIP- atherogenic index of plasma [Log (TG/HDL-C)] reflect the size of LDL and HDL subpopulations and closely correlate with each other over a wide range of plasma lipid values[13,14].

Malonaldehyde (MDA), thiobarbituric acid reactive substance (TBARS), lipid hydroperoxides (LH), and4-hydroxyalkenals (4-HNE) are the example of lipid peroxidation by-products which have been used as biomarker of lipid peroxidation level[15].

MATERIAL AND METHODS

This study was conducted at AL-Hussein Teaching Hospital in Thi-Qar, especially coronary care unit (CCU) ,Biochemistry Laboratory, and the Hormones and immunes Laboratory. It included (170) subjects, control(70) and patients(100) diagnosed with(Acute Myocardial Infarction andunstableAngina/ Non STEMI).

About(8mL)ofblood samples of the patients with acute myocardial infarction(AMI),un stable angina (UA) /Non NSTENI patients and controls were taken and allowed to clot at room temperature in empty disposable tubes centrifuge to separate it in the centrifuge at 3000 rotor per minute (rpm)for 10min,the serum samples were separated and stored at (-20ºC) until analyzed for High Sensitivity C Reactive Protein (hsCRP),Lipid Profile ,Atherogenic Index and malondialdehyde.

Serum hsCRP was estimated by enzyme linked immunoassaymethod byELISA Reader, USA using kit supplied by De meditec, Germany.

Interpretation of the results:

The following criteria are commonly found in the literature for the relation between the **hsCRP** values and the risk for developing CVD.

CRP values<1.0mg/L=Low risk for CVD.hs

hsCRP values 1.0-2.9mg/L=Intermediate risk for CVD.

hsCRP values >3.0mg/L=High risk for CVD.

Serum cholesterol(**TCH**) was analyzed by enzymatic colorimetric method byUV/VIS spectrophotometer, Japan using kits supplied by Spinreact, Spain.Serum triglyceride (**TG**) was analyzed by enzymatic colorimetric method byUV/VIS spectrophotometer, Japan using kits supplied byBiolabo, France.

Serum high density lipoprotein (**HDL**) was analyzed by enzymatic colorimetric method byUV/VIS spectrophotometer, Japan using kits supplied byBiomerieux, France .

Serum low density lipoprotein (**LDL**) is calculated through the following equation:-

LDL=Total Cholesterol–(HDL+VLDL)

Serum very low density lipoprotein (**VLDL**) is calculated through the following equation:-

VLDL = Triglyceride/5

Serum Atherogenic Index (**AI**) is calculated through the following

Atherogenic Index = LDL / HDL

Serum Malondialdehyde (**MDA**) was measured as thiobarbituric acid (TBA) activity by using the colorimetric method recommended, MDA level of the plasma was measured according to a modified method of Fong *et al*. [16].

the results were expressed as mean ± standard deviations (mean ± SD). One way ANOVA-test was used to compare parameters in different studied groups. P-values ($P \leq 0.01$) were consideredstatistically significant.

Person correlation coefficient (r) was used to test the correlation relationship among the different parameters in each patients group.

RESULTS

In this study we measured the level of hsCRP, MDA, lipid profile , and atherogenic index among patients with different IHD(AMI,UA/Non STEMI , and healthy individuals).also the correlation between the concentration of hsCRP and(MDA, lipid profile, and atherogenic index) were evaluated in this study.

The levels of serum high sensitivity C reactive protein , malondialdehyde, biochemical markers of lipid profile (serum TCH,TG,LDL,VLDL)and atherogenic index (AI) were showed significant increase among patients coronary artery disease as compared to control group whereas the levels of HDL showed a significant decrease in coronary artery disease patients in comparison to control subjects.

Also the titer of hsCRPwas significantly elevated among patients with acute coronary syndrome (AMI,UA/Non STEMI).

Table (1):- Serum high sensitivity C reactive protein concentrations of (control), (AMI) and (UA) groups

Group	N	hsCRP concentration (mg/L) mean± SD
control	70	1.33±0.33[b]
AMI	55	7.17±2.65[a]
UA	45	8.11±2.48[a]

* Each value represents mean ± SD values with non-identical superscript (a , b or c …etc.) were considered significantly differences ($P \leq 0.01$).

AMI: Acute myocardial infarction, UA: unstable angina.

Table (2):- Serum Lipid Profile concentrations of (control), (AMI) and (UA) groups

Groups	n	TCH mmol/L	TG mmol/L	HDL mmol/L	LDL mmol/L	VLDL mmol/L
Control	70	2.56± 0.38[b]	1.02±0.37[b]	1.28±0.32[a]	2.04±0.97[b]	0.21±0.06[b]
AMI	55	4.72±1.26[a]	1.56±0.45[a]	0.86±0.12[b]	3.57±1.21[a]	0.37±0.12[a]
UA	45	4.43±0.86[a]	1.42±0.40[a]	0.96±0.19[b]	3.18±0.85[a]	0.28±0.10[a]

- Legend as in table (1)

Table (3):-Atherogenic index levels of (control), (AMI) and (UA) groups

Group	N	Atherogenic index mean ± SD

control	70	2.21±0.88[b]
AMI	55	4.20±1.56[a]
UA	45	4.47±1.28[a]

- Legend as in table (1)

Table (4):- Serum Malondialdehyde concentrations of (control), (AMI) and (UA) groups

Group	n	MDA concentration (nmol/mL) mean± SD
Control	70	59.33±16.21[b]
AMI	55	124.69±33.20[a]
UA	45	124.51±22.22[a]

- Legend as in table (1)

**Correlation relationship between hsCRP and all parameters in patient groups(AMI),(UA).

Figure(1) shows the positive correlation relationship between hsCRP and TCH in (AMI)patients group with coefficient correlation (r = 0.01) , (UA) patients group with coefficient correlation (r = 0.11).

Figure(2) shows the positive correlation relationship between hsCRP and TG in (AMI)patients group with coefficient correlation (r = 0.03) ,(UA) patients group with coefficient correlation (r = 0.07).

Figure(3) shows the negative correlation relationship between hsCRP and HDL in (AMI)patients group with coefficient correlation (r = -0.48) ,(UA)patients group with coefficient correlation(r=-0.65).

Figure(4) shows the positive correlation relationship between hsCRP and LDL in (AMI)patients group with coefficient correlation (r = 0.30), in the(UA) patients groupwith coefficient correlation (r = 0.25).

Figure(5) shows the positive correlation relationship between hsCRP and VLDLin (AMI)patients group with coefficient correlation (r = 0.03) , (UA) patients group with coefficient correlation (r = 0.07).

Figure(6) shows the positive correlation relationship between hsCRP and Atherogenic index in patients groups with coefficient correlation (r=0.41) in group (AMI) and (r = 0.50) in (UA) group.

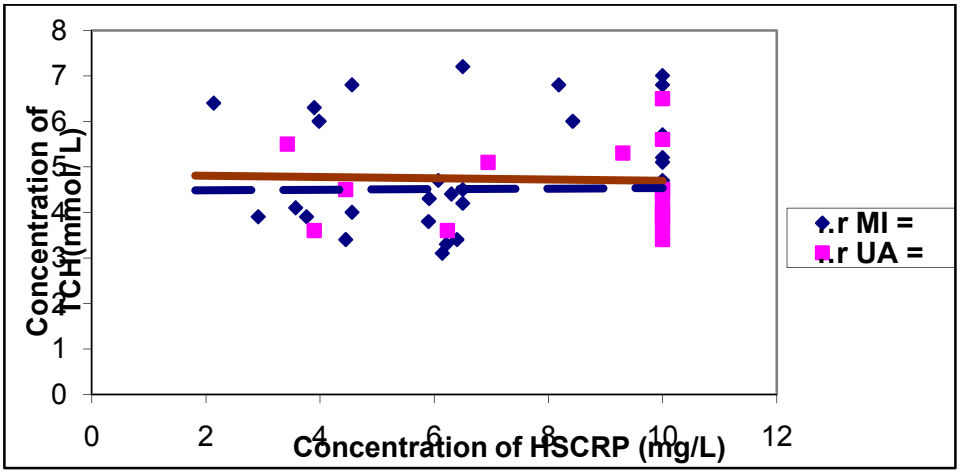

Figure (1): Correlation relationship between hsCRP and TCH in patient groups (AMI), (UA)

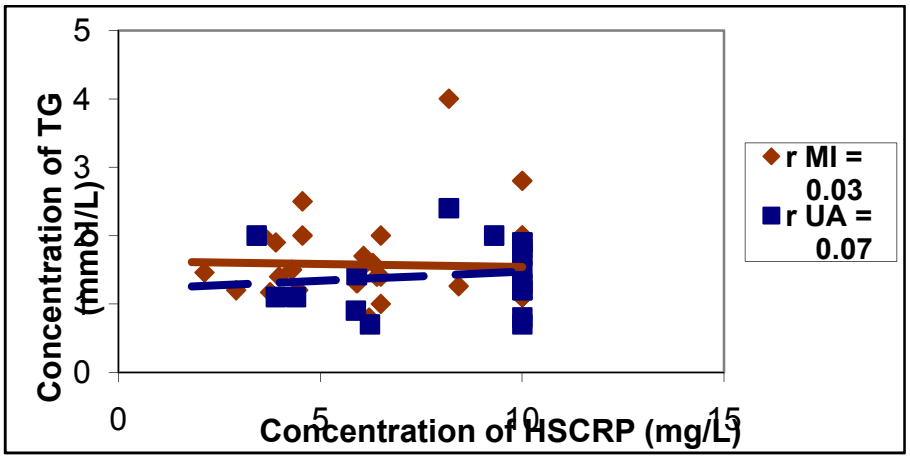

Figure (2): Correlation relationship between hsCRP and TG in patient groups (AMI),(UA)

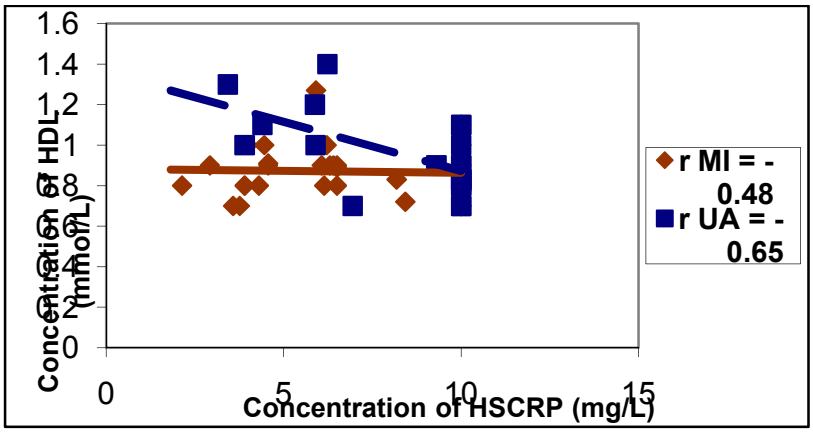

Figure (3): Correlation relationship between hsCRP and HDL in patient groups (AMI), (UA)

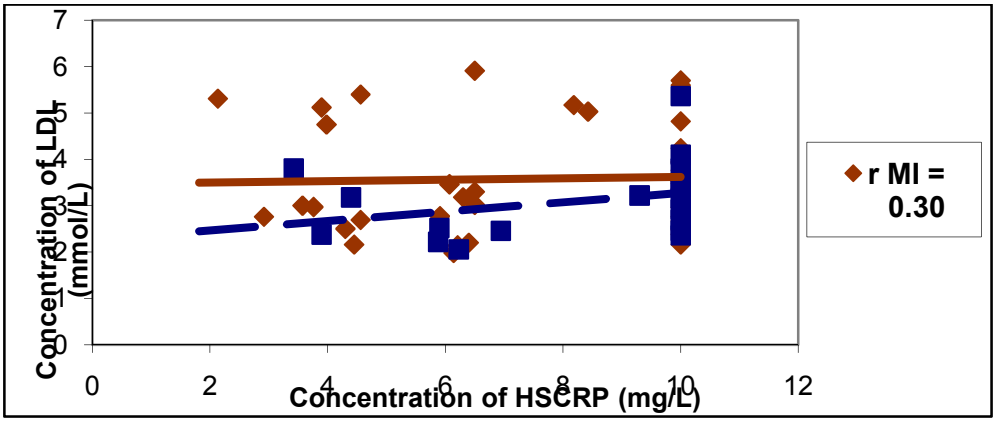

Figure (4): Correlation relationship between hsCRP and LDL in patient groups (AMI), (UA)

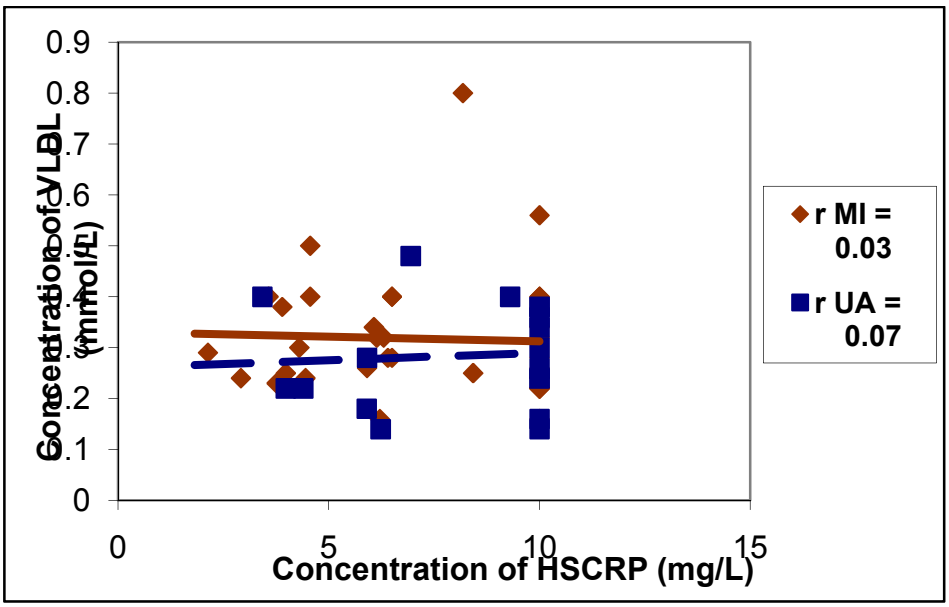

Figure (5): Correlation relationship between hsCRP and VLDL in patient groups (AMI), (UA)

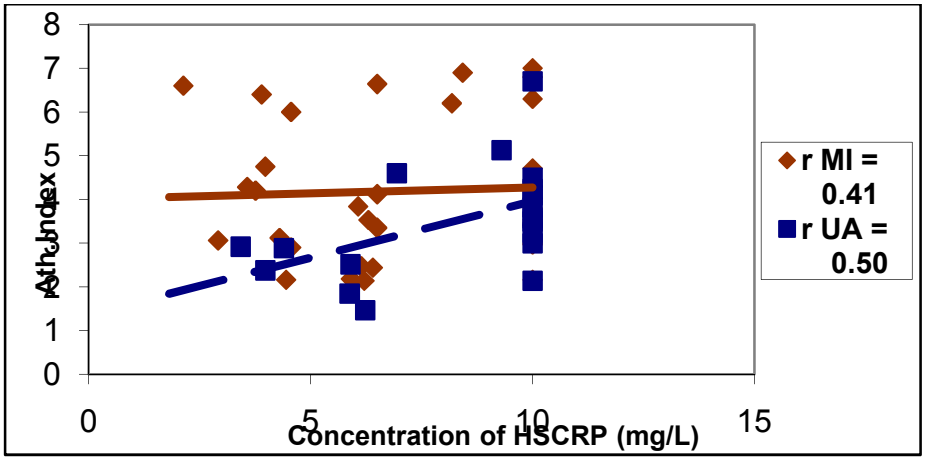

Figure (6): Correlation relationship between hsCRP and Ath.Index in patient groups (AMI), (UA)

Figure(7) shows the positive correlation relationship between hsCRP and MDA in patients groups with coefficient correlation (r=0.26) in group (AMI) and (r = 0.31) in (UA) group.

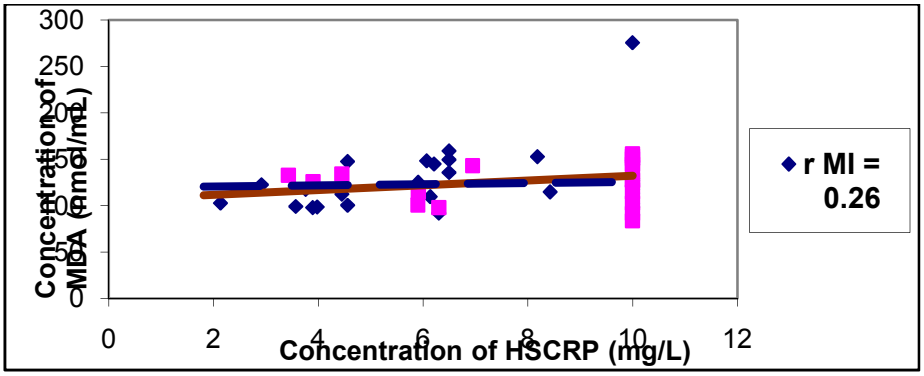

Figure (7): Correlation relationship between hsCRP and MDA in patient groups (AMI), (UA)

DISSCUSSION

Ischemic heart disease has two manifestations according to the degree of arterial vascular obliteration and the presence or absence of myocardial necrosis. When obliteration is total (full occlusion) and tissue necrosis occurs, acute myocardial infarction (AMI) results. In the case of partial obliteration of the vascular lumen without myocardial necrosis, angina (chest pain) results [17].

Coronary Heart disease is one of the leading causes of death in most industrialised countries of the world and it is now also considered as a prominent health problem in developing countries[18].

This study shows an increased level of hs-CRP among patients of CAD. There is increasing evidence that inflammation plays an important role in pathogenesis of atherosclerosis and its complications.

This finding is matched with the result of (Ridker P.,2003)[19], (Liuzzo*et al.*,1994)[20], and (Ferreiros*et al.*,1999)[21]. The levels of hs-CRP were above 3µg/ml in all the patients, which is considered abnormally high .However, in all the control group had hs-CRP level <3µg/ml.

High levels of TCH, LDL and TG and low levels of HDL cause deposition of lipid in arteries thus causing atherosclerosis. So lipid profiles are routinely measured for risk assessment in preventing CAD[22].

The results, as shown in Table (2) reveal a significant decrease in HDL level in serum of patients with MI , UA in comparison, with that of control group (P≤0.01). While significant increase in LDL level was noticed in serum of patients with MI,UA in comparison with that of control group (P≤0.01)..These alteration in serum lipoproteins were also confirmed by agarose gel electrophoresis (Hasanand Al-Aumary, 2007)[23].

and(Moselhyand Demerdash,2003)[24], results concerning what they obtained when they measured the concentration of HDL-c in MI patients after different time periods of MI occurrence

This study showed significantly higher level of total cholesterol, triglyceride, and VLDL-cholesterol levels than the healthy controls. (P≤0.01). This result is similar to the result of (Topsakal, R., *et al*. ,2009)[25].

We observed that increased concentrations of MDA in the circulation of total AMI patients indicating increased lipid peroxidation. Our results are in accordance with previous reports (Senthil*et al*., 2004)[26].

CONCLUSION

From the data presented in this study, we could obtain the following conclusions:- This study revealed significant in hsCRP among patients with IHD.

Lipid peroxidation and oxidative stress is more prominent among patients with IHD comparison to healthy individuals ,and this is mostly the leading cause of atherosclerotic processes and resultant complication of coronary occlusion . this lipid peroxidation reflected by hsCRP, MDA, LDL, and atherogenic index were obvious in this study ,and relation with increase level of hsCRPreflected the inflammatory processes that's why the hsCRP might be used for evaluation of risk factors of different patients with IHD reflected the degree of atherosclerotic injury to the complications and it's possible complication.

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دراسة علاقة بروتين سي الفعال عالي الحساسية وكل من المالون داي الديهايد، نمط الدهون، وعامل التصلب في مرضى امراض القلب الاسكيمية في محافظة ذي قار

هديل رشيد فرج* الاستاذ د. رائد معلك حنون الصال

استاذ مساعد د. عدنان طعان الخفاجي**

*قسم الكيمياء. كلية العلوم- جامعة ذي قار/**كلية الطب-جامعة ذي قار

الخلاصة

الهدف: مرض القلب الاسكيمي قدر ليكون السبب الرئيسي للوفيات في العالم وفي البلدان ذات الدخل المرتفع .وقد تم تصميم هذه الدراسة(الدراسة الحالية) لتحديد ومقارنة مستويات بروتين سي الفعال عالي الحساسية ،مالون داي الديهايد ،نمط الدهون ،وعامل التصلب لمرضى امراض القلب الاسكيمية والاشخاص الاصحاء .وتقويم معيار بروتين سي الفعال عالي الحساسية بين انواع مختلفة من امراض القلب الاسكيمية للتنبؤ بدورها في مطابقات خطر مرض القلب الاسكيمي والاشخاص الاصحاء. الموادوطرق العمل :تم قياس بروتين سي الفعال عالي الحساسية في مصل الدم ونمط الدهون ومالون داي الدبهايد وعامل التصلب في (100) مريض من مرضى امراض القلب الاسكيمية و(70)شخصاً مفترض انهم اصحاء. النتائج:تناولت مستويات بروتين سي الفعال عالي الحساسية ومالون داي الديهايدوعلامات الكيموحيويةمن نمط الدهون (الكولسترول، الترايكليسيرايد، والبروتينات الدهنية واطئة الكثافة ، والبروتينات الدهنية واطئة الكثافة جداً)في مصل الدم وعامل التصلب زيادة كبيرة في المرضى الذين يعانون من مرض الشريان التاجي مقارنة مع مجموعة السيطرة. بينما اظهرت مستويات البروتينات الدهنية عالية الكثافة انخفاض ملحوظ في مرضى القلب التاجي مقارنة مع مجموعة السيطرة ($P \leq 0.01$)وقد تناولت هذه الدراسة ايضاً العلاقة بين تراكيز كل من المعايير المقاسة وبروتين سي الفعال عالي الحساسية، هذه الدراسة تناولت الاهمية لبروتين سي الفعال عالي الحساسية في المرضى الذين يعانون من امراض القلب الاسكيمية. الاستنتاجات : تناولت هذه الدراسة الاهمية لبروتين سي الفعال عالي الحساسية في المرضى المصابين بامراض القلب الاسكيمية . الاكسدة الفوقية للدهون وفرط الاكسدة هو الاكثر بروزاً مقارنة في مرضى القلب الاسكيمية الى الاشخاص الاصحاء وهذا هو في الغالب السبب الرئيسي لعمليات تصلب الشرايين والناتجة من مضاعفات انسداد الشريان التاجي. هذه الاكسدة الفوقية للدهون التي يعكسها بروتين سي الفعال عالي الحساسية ومالون داي الديهايد والبروتينات الدهنية واطئة الكثافة وعامل التصلب واوضحت الدراسة الحالية تناسبها طردياً

كلمات البحث: امراض القلب الاسكيمية ،مرض القلب التاجي ،بروتين سي الفعال عالي الحساسية،نمط الدهون ،عامل التصلب ،مالون داي الديهايد.