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Impact of lipid Profile on Creatine kinase-MB in Myocardial Infarction Patients

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Abstract

Myocardial necrosis results from a sudden stoppage of the coronary blood flow to a portion of the myocardium, and it is referred to as a myocardial infarction (MI). MI is almost caused by atherosclerosis. The goal of this study was to determine the extent to which certain lipid profile parameters caused the increase in creatine kinase-MB (CK-MB) levels, and both are positively correlated with mortality and Myocardial infarction (MI) patients.

This study was carried out between December 2021 and March 2022. The 60 myocardial infarction patients were compared to the outcomes of 40 healthy individuals included 20 males and 20 females with matched ages Diyala Governate. Serum CK-MB values from the time of admission were used to gauge the extent of myocardium injury; and using fasting blood samples, lipid profile was estimated. Data analysis was performed using statistical tool SPSS Roc curve. The findings of this study revealed a substantial positive association between triacylglycerol (TG), very-low-density lipoprotein (VLDL), and total cholesterol (TC), but a negative correlation between HDL and CK-MB levels. The results of the study showed that TG, VLDL, LDL, and TC significantly impacted the severity of the myocardial damage in the patients. According to this study, social determinants of health play a role in the regional difference in cardiovascular illnesses. Results were much greater and exhibited an inverse

among the less educated. In order to assess the diagnostic utility of lipid profile ratio and CK-MB ratio for determining the severity of myocardial infarction (MI).

Keywords: Myocardial infarction, lipid profile, (CK-MB) creatine kinase-MB.

دراسة الإحصاء الحيوي لـ Ck-MB مع ملف تعريف الدهون في مرضى احتشاء عضلة القلب

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الخلاصة

ينتج نخر عضلة القلب عن توقف مفاجئ لتدفق الدم التاجي إلى جزء من عضلة القلب ويشار إليه باسم احتشاء عضلة القلب (MI) يحدث احتشاء عضلة القلب تقريبًا بسبب تصلب الشرايين. كان الهدف من هذه الدراسة هو تحديد إلى أي مدى تسببت معلمات ملف تعريف الدهون في زيادة مستويات الكرياتين كيناز- MB (CK-MB) ، وكلاهما مرتبطان بشكل إيجابي بالوفيات ومرضى احتشاء عضلة القلب (MI) أجريت هذه الدراسة بين ديسمبر 2021 ومارس 2022. تمت مقارنة 60 مريضا مصابا باحتشاء عضلة القلب بنتائج 40 فردًا سليمًا منهم 20 ذكرًا و20 أنثى بأعمار مماثلة في محافظة ديالى. تم استخدام قيم المصل CK-MB من وقت القبول لقياس مدى إصابة عضلة القلب وباستخدام عينات الدم الصائم تم تقدير مستوى الدهون. تم إجراء تحليل البيانات باستخدام منحنى Roc SPSS الإحصائي. كشفت نتائج هذه الدراسة عن وجود علاقة إيجابية كبيرة بين ثلاثي الجلسرين (TG) والبروتين الدهني منخفض الكثافة (VLDL)والكوليسترول الكلي (TC) ، ولكن هناك علاقة سلبية بين مستويات HDL و CK-MB. أظهرت نتائج الدراسة أن TG و VLDL و LDL و TC أثرت بشكل كبير على شدة تلف عضلة القلب لدى المرضى. وفقًا لهذه الدراسة، تلعب المحددات الاجتماعية للصحة دورًا في الاختلاف الإقليمي في أمراض القلب والأوعية الدموية. كانت النتائج أكبر بكثير وأظهرت انعكاسًا بين الأقل تعليماً. من أجل تقييم الفائدة التشخيصية لنسبة ملف تعريف الدهون ونسبة CK-MB لتحديد شدة احتشاء عضلة القلب (MI).

الكلمات المفتاحية: احتشاء عضلة القلب، ملف الدهون، (CK-MB) كرياتين كيناز-.MB

Introduction

Myocardial infarction (MI) is the medical name for the necrosis of the heart muscle that happens when the myocardium is deprived of the oxygen it requires from the coronaries. Chest pain or discomfort that may spread out to neck and jaw, shoulder, arm, and back are clear MI symptoms [1, 2]. Acute myocardial infarction (MI) is one of the leading causes of death and morbidity worldwide [3]. Every year, diagnosis of heart attack comprises around 10% of emergency rooms patients with chest pain. Heart failure occurs when the coronary corridor bloodstream diminishes or stops pumping blood to heart muscle or part of it; thus, local necrosis to the myocardium occurs as a result of ischemia [5]. High blood pressure, dyslipidemia can increase the risk of MI, especially high levels of LDL, TG with low levels of HDL [2,6]. The AGlobal Study of Risk Factors in Acute Myocardial Infarction (INTERHEART) research report lists nine that 90% of the MI are caused by several reasons: diabetes, smoking, stress, obesity, hypertension, [7]. the cardiomyocytes contain CK- isoenzyme type MB or (CK-MB); this later isoenzyme specifically made by the myocardium, and it could be a sensitive marker for MI.The cardiac muscle fraction, or CK-MB, is both sensitive and specific for myocardial infarction. CK-MB elevates 4-6 hours after myocardial damage with peaking time of 24 hours, then returns to normal value within 48-72 hours. In addition to MI diagnosis; CK-MB value is helpful marker in rein fraction diagnosis [8]. According to studies, atherosclerosis is defined as lipid build up on the internal arterial walls resulting in atherosclerotic plaque with a central core surrounded by macrophages forming foam cells covered by a fibrous cap. Circulating blood flow through the arteries could rupture the fibrous cap releasing its content, and finally an intraluminal thrombus occurs by the platelets being activated by the tissue factors secreted by macrophages. The creation of an intraluminal thrombus is ultimately caused by the platelets being activated by the tissue factor that the macrophages secrete. Finally, the thrombus' blockage of the coronary artery limits blood flow to the myocardial tissues, resulting in An ischemia and necrosis, which are ultimately results in myocardial infarction [9]. Examine how much smoking, exercise, marital status, BMI, blood pressure, and cholesterol contribute to the relationship between educational attainment and the mortality from ischaemic heart disease

(IHD); and other types of cardiovascular disease with an emphasis on IHD mortality [10]. The Centers for Disease Control (CDC) established the Social Vulnerability Index (SVI), an integrated statistic that includes the socioeconomic status, household composition, disability, minority status and language, housing type, and transportation topics [11].

Material and methods

The study involved 100 blood samples divided into two groups; group-1 included individuals 40 as healthy control and group-2 included (60) patients diagnosed with acute myocardial infarction (AMI) based on patient history, symptoms, Electrocardiography (ECG). The study was carried out between December 2021 and March 2022. 30 males with 30 females aged between 30-70 years diagnosed with MI were included in the study as a diseased group; while the control group comprised of 40 healthy individuals (20 males - 20 females) in Baquba general hospital / Diyala-Iraq. The activity of CK-MB, TGs, Colesterol, HDL, LDL and VLDL was determined by using commercial kit supplied from Biolabo, France (12, 13, 14, 15, 16)

The activity of Creatine kinase-MB (CK-MB) [12], triglyceride (TGs) [13], cholesterol [14], high-density lipoprotein (HDL)[15], Low-Density Lipoproteins (LDL) and Very Low-Density Lipoproteins (VLDL)[16] was determined by using commercial kit supplied from Biolabo, France.

Results

There are non-significant (P>0.05) differences in age between control (46.50±11.73years) and patients (50.95±12.23years), as shown in Figure (1)
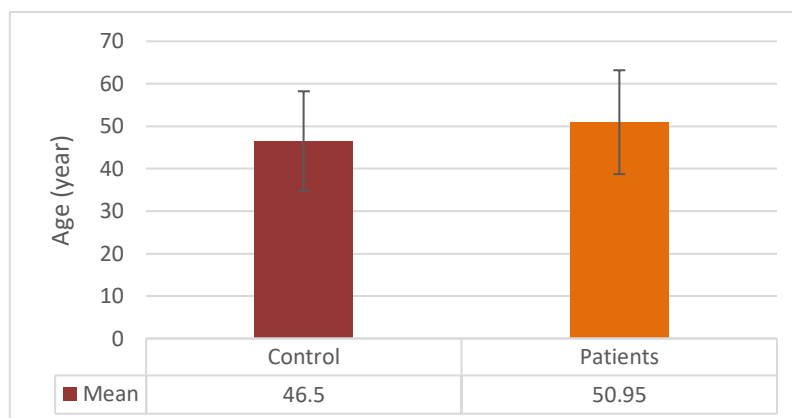
Figure 1: The mean and SD of age in control and patients.

The activity of serum CK-MB increased significantly (p< 0.001) in myocardial patients compared to that in Control group p-value <0.001 as shown in Fig (2).
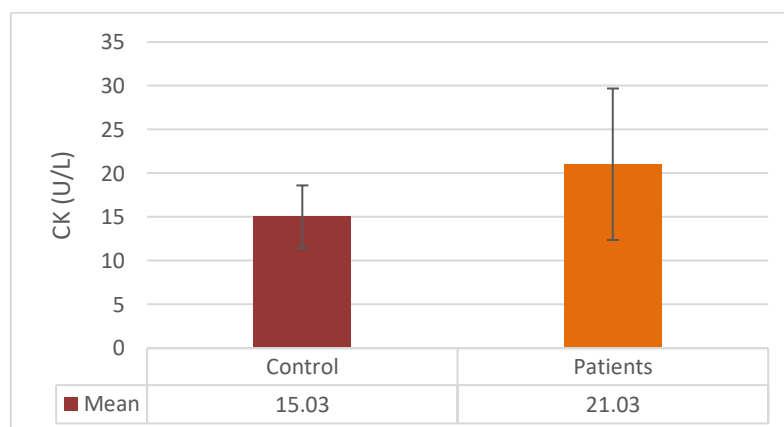

Fig 2: The mean ± SD of CK-MB in control and patients.

Lipid Profile

The results of serum TG levels demonstrate significant increase (p<= 0.029) in MI patients compared to control group as shown in Figure 3
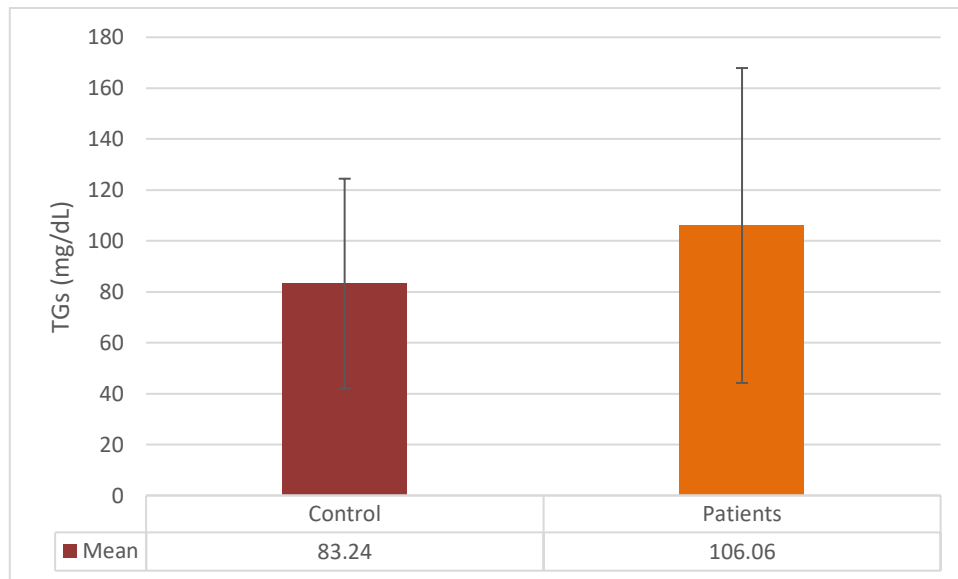
Figure 3: The mean ± SD of TGs in control and patients.

Cholesterol level exhibited steady increase, MI patients serum showed a significant increase (p< 0.001) of cholesterol level in comparison to control group as shown in Fig 4.

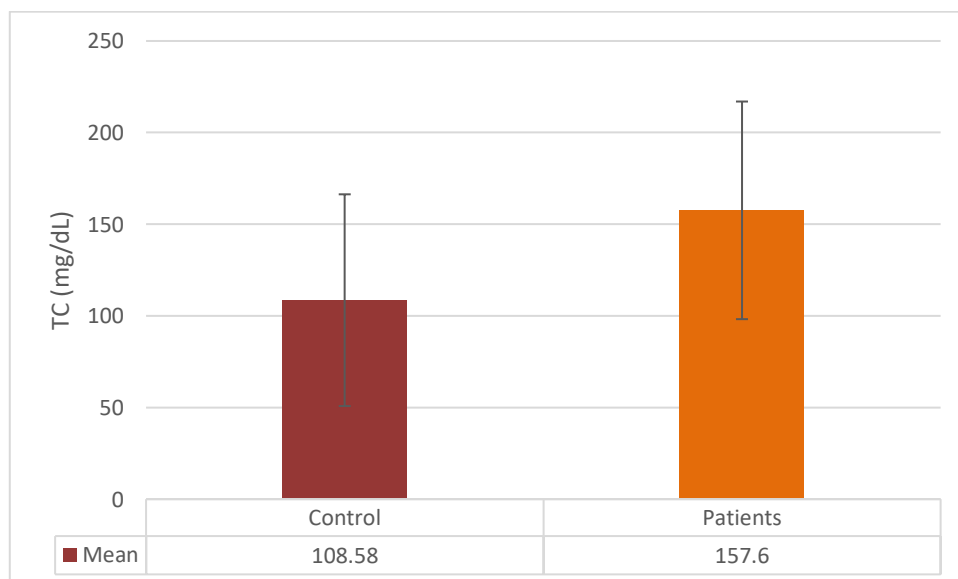**Figure 4:** The mean ± SD of TC in control and patients.

Non-significant changes was observed with HDL levels (p<,= 0.557) between both MI patients and control groups as shown in the figure below in Figure (5)
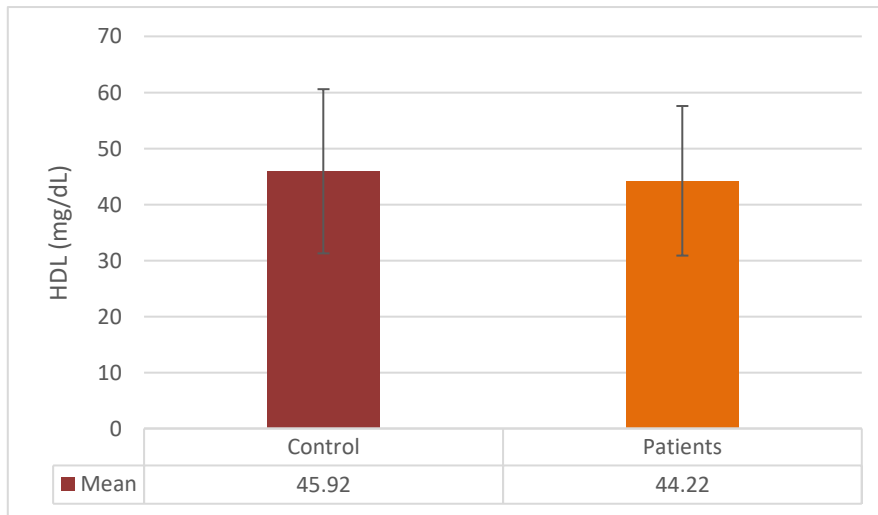

Figure 5: The mean ± SD of HDL in control and patients.

LDL levels demonstrated significant increase (p< 0.001) in MI group compared to control group as shown in fig. 6

Figure 6: The mean ± SD of LDL in control and patients.

VLDL levels demonstrated significant increase (p<, 0.001) in MI group compared to control group as shown in fig. 7 below
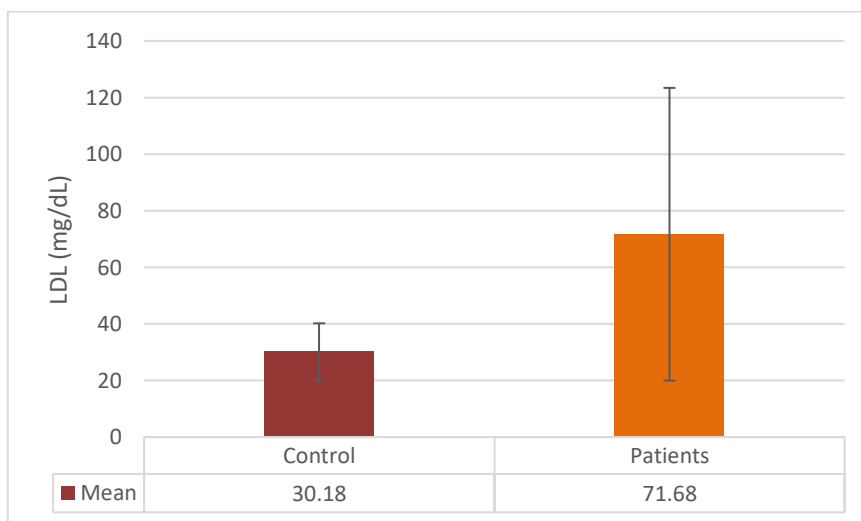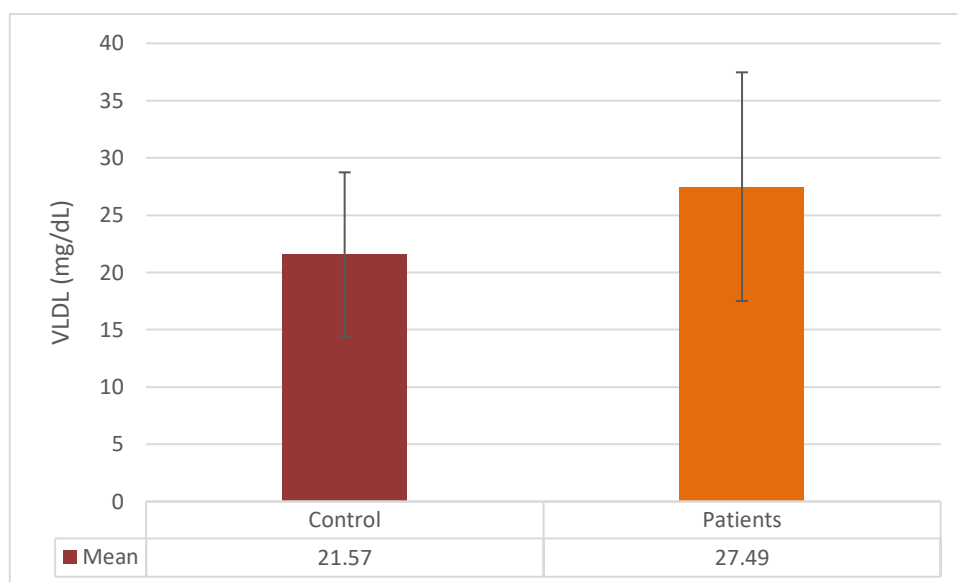

Figure 7: The mean ± SD of VLDL in control and patients.

Discussion

Shows analyzed MI markers (CK-MB, TG, SC, HDL, LDL, and VLDL), and the results are explained as mean±SD with p- value between MI patients group and the control group. It appears from the analysed data that TG, SC, LDL, and VLDL levels are high in MI patients compared to healthy control group, while HDL values are low.

The findings in table 1 cholesterol was significantly higher 80% (p <0.001). Triglycerides and HDL Were not showing any significant. LDL Was significant 70% (p< 0.001). VLDL showed significant change 70% (P<0.001). These results were compared with the CK-MB values and the comparison was significant 71% (p< 0.001).

Table 1: Shows that significant relationship of CKMB level was found with TG, TC, HDL, LDL, VLDL levels.

Parameters	CK-MB	
	r	*p*
CK-MB (U/L)	-	-
TGs (mg/dL)	0.120	0.361
TC (mg/dL)	0.141	0.283
HDL (mg/dL)	0.054	0.680
LDL (mg/dL)	0.153	0.244
VLDL (mg/dL)	-0.042	0.752
Age (year)	-0.033	0.800

Dependent variable, *r*: Correlation coefficient; *P*: Level of significance.

Our study on CK-MB illustrates a significant positive correlation with TG, TC, and VLDL; whereas HDL shows a negative correlation with CK-MB. Thus, we found that TG, VLDL, LDL, and TC are signifantly affecting MI severity.

Table 2: ROC outcomes.

Parameters	AUC	SE	*p*-value	Cut-off value	Sensitivity	Specificity
CK-MB (U/L)	0.779	0.045	<0.001	17.50	71.7%	67.5%
TGs (mg/dL)	0.590	0.057	0.128	-	-	-
TC (mg/dL)	0.724	0.054	<0.001	113.5	80%	70%
HDL (mg/dL)	0.454	0.060	0.441	-	-	-
LDL (mg/dL)	0.813	0.041	<0.001	36.80	70%	80%
VLDL (mg/dL)	0.675	0.055	0.003	22.13	70%	57.5%

CKMB: Creatine kinase-MB, TG: Triacylglycerol, HDL: High-density lipoprotein, SE: Standard error, AUC; area under the curve.

The results of correlation test between age and serum lipid of in table 3 did not show, but no meaningful relationship between age and any serum lipid. In contrast, the relationship between AMI markers such as total CK-MB and TGs, cholesterol, HDL-cholesterol, LDL-cholesterol, and VLDL-cholesterol in MI form of meanSD. The tests revealed a strong positive link between CK-MB and total cholesterol levels; however, there was no significant correlation between AMI markers and the other lipids, such as HDL. The investigation of the linear regression model's variance table in connection to how different lipid profile parameters affect creatine kinase-MB levels Table3 provides details on the quantification of the association between CK-

MB levels and lipid profile parameters. coefficients illustrating the sensitivity and specificity of the correlation between lipid profile parameter levels and creatine kinase-MB levels.

The ROC curve (figure 8) in the results showed that TC, LDL have the highest effect on myocardial infarction as it appeared above the curve line , than VLDL, TG with a lower value in a middle of the line, while no effect of HDL on myocardial infarction was observed below the curve line.
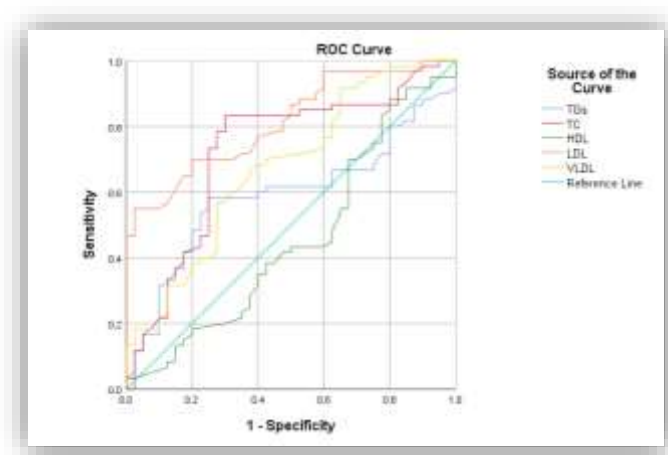

Figure 8: The ROC curve of lipid profile in Disease prognosis.

Conclusions

 The findings of this study revealed a substantial positive association between triacylglycerol (TG), very-low-density lipoprotein (VLDL), and total cholesterol (TC), but a negative correlation between HDL and CK-MB levels. The results of the study showed that TG, VLDL, LDL, and TC significantly impacted the severity of the myocardial damage in the patients. According to this study, social determinants of health play a role in the regional difference in cardiovascular illnesses. Results were much greater and exhibited an inverse among the less educated and ignorant.

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