ORIGINAL ARTICLE

Serum Levels of β2-Microglobulin and High Sensitive C-reactive Protein in ST-Elevated and Non.ST-Elevated Myocardial Infarction

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ABSTRACT

Aim: Cardiovascular diseases (CVD) are the most common cause of mortality worldwide. Many risk factors can be taken into account, but recent studies have shown the definite effect of some immune response components and the possible role of some others. The present study focused on Myocardial infarction (MI); β2-microglobulin (β2M) and high sensitive C-reactive protein (hs-CRP) and their possible roles in ST elevated myocardial infarction (STEMI) versus non.ST elevated myocardial infarction (NSTEMI).

Methods: Ninety patients with MI as case group and 90 sex, age and smoking-matched healthy people without the signs of CVD as the control group were enrolled in this case-control study. Demographic information and the hospital records were taken through a datasheet. In both groups, the serum levels of both groups triglyceride, fasting blood glucose, HDL, LDL, cholesterol, β2M and hs-CRP were determined.

Results: The serum levels of β2M and hs-CRP were higher in the case group comparing to the control group (p=0.001). The serum levels of β2M were higher in STEMI than NSTEMI (p=0.001), but there was not a significant difference between the serum level of hs-CRP in STEMI and NSTEMI (p=0.981).

Conclusions: The present study showed significant high levels of β2M and hs-CRP in patients with MI.In addition, significant higher level of β2M in STEMI versus NSTEMIwas seen in this research. Therefore, it is possible that these markers are being risked factor for patients with MI. Further studies are required to explore the role of β2M in STEMI.

Keywords: Myocardial Infarction, Cardiovascular Diseases, Atherosclerosis, B2-Microglobulin,

INTRODUCTION

Cardiovascular disease (CVD) used to be the most common reason of mortality in recent years.Myocardial infarction (MI) is the best representation of CVD[1]. MI is usually resulted from an imbalance in oxygen reserve and requisition, which is most often caused by plaque disconnection with thrombus formation in an epicardia coronary artery, which is led to an acute reduction in the blood supply of the myocardium. MI has been spread worldwide and is prevalent in all societies[2].

Many CVDs are caused by the mechanism of atherosclerosis[1]; such as stroke. Others can be the result of high blood pressure, obesity, smoking, genetics, hormonal, etc[3-7]. Some recent researches showed possible effect of immunologic factors like anti phospholipid antibodies in MI[8-12].

β2-2 macroglobulin (β2M) is a molecule which participates in MHC Class-I structure, so that it is an inflammatory factor. This component can be found on the surface of any nucleated cell[13]. Free β2M circulates in the blood as a result of splashing from cell surfaces or intracellular release. Increased plasma levels of β2M arise in a variety of autoimmune, infectious, neoplastic and renal diseases[14,15].

Serum β2M level is also a risk factor for carotid artery intima-media thickening and independently predicts complete mortality in a general population of elderly people[16]. Recently, it has been indicated that plasma levels of β2M are predictive for peripheral arterial disease (PAD)[17]. β2M is an independent and significant factor in adverse cardiovascular outcome in patients with prevalent asymptomatic carotid atherosclerosis[18].

High sensitivity C-reactive protein (hs-CRP) is an acute-phase protein, which exists in blood plasma during inflammation. This molecule has hepatic origin which is increased in response to IL-6 released from macrophage or T-cells[19].

Some studies suggest hs-CRP as a predicting factor for MI due to its elevating level[20,21,22], while some others reported decreased level of this molecule in the condition of MI[23].

The inflammatory process and hs-CRP have been proved as one of the mechanisms causing plaque rupture[24]. It has been suggested that hs-CRP may be a marker of comorbidities associated with worse health status[25].

According to these findings, the definite roles of both β2M and hs-CRP are clear in MI. However, the role of these inflammatory markers is not completely clear in the type myocardial infarction namely STEMI and NSTEMI.Thus, the present study was conducted to determine and compare the serum levels of β2M and hs-

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CRP in the patients with STEMI versus NSTEMI and in healthy people.

MATERIAL AND METHOD

In this case-control study, 90 patients with definite diagnosis of MI referring to hospitals of Jahrom university of medical sciences, Jahrom, Iran, as case group and 90 sex, age and smoking-matchedhealthy people without the signs of CVD as the control group were enrolled in this case-control study, June 2016- June 2017.

Inclusion criteria was the presence of MI, and exclusion criteria was any type of inflammatory or immune disease. Five ml of venous blood was collected from both groups; the serawere kept at -70°C.

Fasting blood glucose (FBG), triglyceride, cholesterol, LDL and HDL were measured by biochemical enzyme test. Serum level of β2M was determined by ELISA technique, using the commercial kit (R&D system's, catalog number: DBM200); serum level of hs-CRP was also measured by ELISA methods usingcommercial kit (Bio Vendor, catalog number: RAP002.

The patients were divided intoST elevated myocardial infarction (STEMI) and Non-ST elevated myocardial infarction (NSTEMI) according to their type of MI. The data obtained from the laboratory tests as well as the information collected from the hospital records analyzed by SPSS-12, independent T-test and Pearson correlations.

RESULTS

The results of laboratory and clinical findings as well as demographic information of 90 cases of MI and 90 control members are showed in the table 1 according to their serum β2M and hs-CRP level. There were no significant differences in age, male/female ratio, smoking, FBS and HDL-C, but serum levels of total cholesterol, LDL-C, TG, β2M and hs-CRP were significantly higher in case group comparing to the control group (Table 1).

Seventy-six patients (84.44%) were STEMI and 14 patients (15.56%) were NSTEMI. There was no significant difference in the hs-CRP serum level between STEMI and NSTEMI group (p=0.981). However, β2M serum level was significantly higher in STEMI group comparing to the NSTEMI (table 2).

Table 1: Laboratory findings and demographic data of both study groups

Variables	Patients group	Control group	P-value
Age (year)	61.855±9.393	63.611± 7.607	0.170
males/females (%)	31/59 (%34.44)	30/60 (%33.33)	0.751
Smoking number (%)	24 (26.67)	26 (28.89)	0.361
FBS * Mg/dl	118.922± 30.438	120.311 ±44.461	0.807
HTN number (%)	24 (26.67)	8 (8.89)	0.001*
Total cholesterol * Mg/dl	184.933± 39.059	153.111± 39.704	0.001*
LDL-C * Mg/dl	124.088± 29.586	88.211± 31.566	0.001*
HDL-C * Mg/dl	43.577± 9.302	43.5± 9.56	0.956
TG * Mg/dl	136.188 ±77.212	107.944 ±41.209	0.003*
β2M * µg/ml	2.304± 1.133	0.99± 0.55	0.001*
hs-CRP * pg/ml	4.339± 1.622	1.082± 0.791	0.001*

FBS=Fasting Blood Sugar, HDL-C=high density lipoprotein-cholesterol, LDL-C= low density lipoprotein-cholesterol, TG= Triglyceride, hs-CRP= High Sensivity C reactive protein, β2M= β2-microglobulin, HTN= Hypertension, *statistically significant different between patients and control groups

Table.2: β2M and Hs-CRP levels comparing in STEMI and NSTEMI MI patients.

Variables	STEMI	NSTEMI	P-value
β2M	2.467 ±1.105	1.42± 0.864	0.001*
hs–CRP	4.33± 1.683	4.341 ±1.622	0.981

β2M= β2-microglobulin,hs-CRP= High Sensivity C reactive protein, STEMI= ST elevated Myocardial Infarction, NSTEMI= Non.ST elevated Myocardial Infarction,*statistically significant different between STEMI and NSTEMI in the patient group

DISCUSSION

Present study showed that serum levels of β2Mand hs-CRP were significantly higher in patients with MI. These results are similar to some studies with same subjects[26,27]. You et al. elucidated that serum β2Mlevel were significantly higher in coronary artery disease (CAD) comparing to non-CAD subjects[18,28].

Amighi et al showed that β2Mlevels are strongly and gradually associated with a significantly increased occurrence of major adverse cardiovascularevents (MACE) and mortality. Their data indicated that addition of β2Mto primary risk factors.These results may prompt further evaluation ofβ2Mas a possible novel biomarker for elevated risk in patients with carotid atherosclerosis[18].

Kawai et al. showed that a higher baseline concentration of serum β2M was the most powerful predictor of cardiac events and cardiac mortality in acute heart failure patients with creatinine≤3.0 mg/d[29].

The relationship between β2M and alterations in vascular structures, immune system and inflammation disorders, suggests that β2M may contribute to vascular inflammation[30,31], but the role of the β2M levels in MI must be clarified.

High sensitive CRP is an acute-phase protein and repeatedly shown to be a marker of inflammation and

atherosclerosis, since atherosclerosis is an inflammation process[32,33].

According to the results of the present study high sensitive CRP serum level was also higher in the MI patients comparing to healthy people. These findingsare parallel with some studies[34,35]. Azarkar et al. showed that 84.4% in the case group and 62.2% in the control group had high hs-CRP and the difference was statistically significant[36].

Trifunovi et al showed that in the acute STEMI patients with pre-diabetes, hs-CRP is higher than non-diabetic subjects, while the difference is negligible compared to diabetic patients[37]. Wadhwa et al. demonstrated that hs-CRP levels were significantly highin acute myocardial Infarction as compared to control subjects[22]. In a study on patients with heart ischemia showed that serum hs-CRP level could be an indicator for acute coronary syndrome[38].

In a cross sectional study on residents over 25 years old, a strong association was seen between hs-CRP and Ischemic disease[39], while there are some other researches who showed decreased serum hs-CRP level in MI patients[40,41]. On the other hand, it has been demonstrated that hs-CRP is a kind of acute phase proteins which isincreased in inflammation, infection and collagen vascular disease[42]. Therefore, hs-CRP may play a role in the atherosclerosis; but the exact role in MI is not clear.

Present study showed that, the serum level of hs-CRP did not show any significant difference in STEMI andNSTEMI. It indicates that hs-CRP cannot be a biomarker for diagnosis of STEMI and NSTEMI. In addition, present study showed that the serum level of β2M was significantly higher in STEMI than NSTEMI. That may be a biomarker for diagnosis of STEMI.

No research was found to compare the resultsof the present study with the serum levels of hs-CRP and β2M in STEMI versus NSTEMI.

In present study, Serum levels of total cholesterol, LDL-C, TGwere significantly higher in case group thanin the control group. In somestudies, It has been elucidated that elevated TG level is a risk factor for atherosclerosis specially in patients with low HDL-C and uncontrolled diabetes but exact role of elevated TG iscontroversial[1,43].

In a study, Goswami (2010) showed that level of total cholesterol, LDL-C andTG in the MI patients compared to healthy individuals were higher[44].

CONCLUSION

The present study showed the higher levels of β2M and hs-CRP in patients with MI. Since the inflammation is startup and foundation of atherosclerosis, thus elevated level of inflammatory factors can be related with MI and predict it. In addition, significant higher levels of β2M in STEMI versus NSTEMI were seen in this research.Further studies are needed to explore the role of β2M in ST-MI.

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