COMPARING THE MEAN PLATELET VOLUME (MPV) BETWEEN PATIENTS WITH MYOCARDIAL INFARCTION (MI) AND HEALTHY INDIVIDUALS

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ABSTRACT

Purpose and background*: Ischemic heart diseases (IHDs) occurring as a result of the lack of adequate supply of blood and oxygen to part of the myocardium, are the most common causes of death and disability in developed countries. Since platelets play a fundamental role in the onset of atherosclerosis and coronary clots, assessment of platelet volume indices (PVI) can be important in the prediction and detection of coronary facts. This research was conducted to compare the Mean Platelet Volume (MPV) between patients with myocardial infarction (MI) and healthy individuals.*

Materials and methods*: The study population in this cross-sectional survey included 36 patients with acute myocardial infarction (AMI) and 36 healthy individuals whose PVIs were compared with each other. After questioning and recording the demographic data of both groups, their blood samples were taken for testing the platelet indices and the results for the MPV were registered in a questionnaire and analyzed using the SPSS software.*

Findings*: the mean and standard deviation for the platelet volume (PV) in patients with AMI and healthy individuals (control group) were± 0.95, 10.01 and ±0.29, 9.07, respectively. The mean difference in the PV between the two groups was statistically significant (P.value = 0.000). No significant difference was observed between the MPV and the variables of age and gender. Also, no significant differences were observed between the MPV and risk factors for high blood pressure, diabetes, cigarette smoking and body mass index (BMI).*

Conclusion*: This study showed that the MPV is clinically important and a high level of this index can independently be considered as a prognostic factor for cardiovascular disease and myocardial infarction.*

Key words*: acute myocardial infarction (AMI), mean platelet volume (MPV), coronary artery disease (CAD), prognostic factor.*

Received *February 05, 2016;* ***Accepted*** *March 02, 2016*

Introduction

IHDs occur as a result of the lack of adequate supply of blood and oxygen to part of the myocardium[1]. They are the most common causes of death and disability in developed countries and impose the greatest expenses for patients compared to other diseases[2].

AMI is caused by the complete blockage of a coronary artery that has already been narrowed by atherosclerotic plaque[1].

Two important and interdependent processes occur due to the exposure of plaque contents to blood:

1- the platelets get activated and aggregated,

2- coagulation cascade and lead to the deposition of fibrin bands[3]. The normal platelet count (PC) of peripheral blood platelets ranges from 150000-450000[4,5].

The ability of antiplatelet drugs in reducing cardiovascular events, strengthens the important role of platelets in the atherothrombotic process[6]. In a study, it was observed that the level of platelet adhesion in patients with myocardial infarction is higher than in normal individuals[7]. Among patients with ischemic heart disease, those with higher PC and a platelet aggregation faster than ADP, are more prone to death[8].

Therefore, increased platelet activity is correlated with increased IHD. Some studies showed that larger platelets, have more active enzymes and metabolites[9,10] and have a higher thrombosis ability compared to small platelets[11]. Therefore, there must be a relationship between the sizes of platelets and events occurring due to their increased activity, such as IHDs. To show this index, PVIs have been used[12]. It was shown that the size of platelets, when measured as an MPV, is a suitable marker for the activity of platelets and has a positive relationship with them. Increase MPV, which is the index of larger and more active platelets, is related to cardiac damage in the Acute Coronary Syndrome (ACS), and it was revealed that it is the predictor of undesirable outcomes among AMI survivors[13,14].

In 2005, Shafai et al. performed a study to investigate the indices and PC of patients with IHDs and compare them with healthy individuals. In their study, patients with unstable angina had higher MPV, platelet distribution width (PDW) and platelet large cell ratio (P-LCR) values with lower PC compared to patients with chronic stable angina and healthy individuals ($p<0.05$). In patients with chronic stable angina, the MPV was higher compared to healthy individuals, but the PC and other indices did not have a significant statistical difference[15].

Khandek et al. (2006), measured the PVI in patients with CAD and AMI. In their study, all the PVIs (i.e. PLCR, MPV & PDW) in patients with AMI or unstable angina were significantly greater compared to those of healthy people as well as patients with CAD.[16]. Khode et al. (2012), investigated platelet indices in patients with AMI, SA and healthy individuals. Their study results showed that the MPV in patients with AMI, is significantly higher compared to patients with SA as well as the control group[17]. In a study performed by Nurcan et al. on whether MPV can be a predictive marker of AMI, the difference in the MPV between patients with AMI and healthy individuals was statistically significant (P.value<0.05). In a research performed by Neelam et al. on 286 patients, the difference in the MPV between patients and the control group was statistically significant[19]. In a study by Muscari et al. it was revealed that the risk of developing ECG changes in ischemia in patients with an MPV equal to or greater than 8.4fl was 4.2 times greater than of those with a smaller MPV[20].

In a systematic research and meta-analysis performed by S G Chu et al. on whether MPV can be a predictor for the risk of cardiovascular diseases, the hypothesis that there is a relationship between MPV and cardiovascular diseases, was confirmed[21]. Our purpose of this study is to investigate the MPV in patients with myocardial infarction and healthy individuals visiting Ekbatan hospital in 2015 and also evaluate the possibility of using platelet indices to determine the risk of (AMI).

Materials and methods

Given the results of similar studies and an effect size of 0.8, alpha of 05.0 and beta of 10%, the sample size for every group was estimated as 34 individuals, and in this study, 36 individuals were selected as the sample. Therefore, in this cross-sectional study performed in 2015, the MPVs of 36 patients were evaluated. These patients had visited the Ekbatan Hospital emergency with chest pain and were diagnosed with AMI. Also, their profile included a history of blood pressure, diabetes, cigarette smoking and BMI>30. The control group included 36 healthy individuals with no previous problems recorded in their medical profile. It was tried to make sure that these individuals matched the patients under study in terms of their history of blood pressure, diabetes, cigarette smoking and BMI 0. Exclusion criteria included a history of diseases effective on the values of platelet indices such as thyroid disorders, blood disorders, sepsis, cerebral ischemia, preeclampsia, contact with organic solvents, major surgery or trauma in the last 2 weeks[21].

The sampling was performed using identical 2ml syringes from the antecubital fossa. From each individual, 1ml of venous blood was poured in standard tubes containing an EDTA anticoagulant. All the samples were examined within 1 to 3 hours after the sampling was performed. To count and measure platelet indices all samples were examined using an autoanalyzer device made in Japan.

The case group members' age and gender were synchronized using the frequency synchronization method. At the end, the collected data were entered into the SPSS software version 16

Results

In this cross-sectional study, a comparison was made between the platelet volume of 36 patients with AMI and 36 healthy individuals. The mean and standard deviation of the platelet volume in the patients with AMI and the control group were ±

0.95, 10.01 and ±0.29, 9.07, respectively. the MPV of patients with AMI was compared with the control group. At the degree of significance of 0.05 and confidence of 95%, a significant statistical difference was observed between the MPV of patients with AMI and the control group (P.value = 0.000) (table 1). In comparing the MPV in terms of risk factors (blood pressure, diabetes, smoking more than 4 cigarettes a day and a body mass index greater than 30) and age group (under 50, 50, 50 and above), a significant statistical difference was observed between the platelet volume and age of patients with blood pressure (p.value=0.01), but no significant statistical relationship was observed between MPV and smoking more than 4 cigarettes every day (p.value<0.05) (table 2).

Control group		Patients with AMI		Platelet volume
Frequency	Percentage	Frequency	Percentage	
38.89	14	11.11	4	8.5-8.9
50	18	22.22	8	9-9.4
11.11	4	22.22	8	9.5-9.9
0	0	44.45	16	>10
100	36	100	36	Sum

Table 1: absolute and relative frequency distribution of MPV in patients with AMI and the control group.

Variable	Age group	Number	Mean Rank	Sum of Ranks	Z	P.value
Diabetes	Below 50	0	0			
	50 and higher	15	8.00	120		
Blood pressure	Below 50	3	5.50	22.50	-2.25	0.01
	50 and higher	34	20.19			
Smoking more than 4 cigaretter a day	Below 50	3	7.50		-0.57	0.59
	50 and higher	14	9.32	130.50		
+30 MBI	Below 50	0	0	0		-
	50 and higher	12	6.50	78		

Table 2: comparing the mean rank and sum of the ranks of MPV based on the variables of age and risk factors.

Conclusion

In the present study, the mean and standard deviation for the platelet volume (PV) in patients with AMI and healthy individuals (control group) were± 0.95, 10.01 and ±0.29, 9.07, respectively. The mean difference in the PV between the two groups was statistically significant (P.value = 0.000). This study was in agreement with several other studies including Shafai et al. (2005), similar to our study, their study results showed significant MPV difference in both groups[15]. Khandekarf et al. (2006) showed that all the MPV indices (PLCR, MPV and PDW) in patients with AMI or unstable angina, were significantly more than those of the individuals in the healthy group as well as patients with CAD[16]). In a study performed by Khode et al. it was shown that the MPV difference in patients with AMI and the individuals in the healthy group was statistically significant[17].

Also, in a study performed by Muscari et al. it was discovered that the risk of developing ECG changes in ischemia in patients with an MPV equal to or greater than 8.4fl was 4.2 times greater than of those with a smaller MPV[20]. In a research performed by S G Chu et al., the hypothesis that there is a relationship between MPV and cardiovascular diseases was confirmed[21].

In the present study, MPV was compared in terms of the risk factors of blood pressure, diabetes, smoking more than 4 cigarettes a day and BMI, and no significant statistical difference was observed between MPV and the said risk factors. In a study by Nurcan, no significant statistical difference was observed between MPV and the variables of age, blood pressure, diabetes and Lipid Profile[18]. But a significant statistical difference was observed between the variables of cigarette smoking as well as gender (male) and MPV. Our findings about the significant statistical relationship between the said risk factors and MPV were not in agreement with the findings of the studies by Muscari and Nurcan. The most important reason for it can be the nearly equal distribution of the individuals with the risk factors in the study group as well as the control group and also the low number of the individuals having the risk factors in the groups. The data in this study, similar to the other studies in this field showed that MPV is clinically important and a high level of this index can independently be a risk factor for developing cardiovascular diseases and MI. Therefore, testing the MPV in MI patients can help clinicians in the diagnosis of disease prognosis.

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