

# The Difference of Average Mean Platelet Volume (MPV) Values in Stable Angina Pectoris Patients with Symptoms of Depression and without Symptoms of Depression

Arief Wibawa<sup>1</sup>, Agus Siswanto<sup>2</sup>, Hariadi Hariawan<sup>2</sup>

<sup>1</sup>Specialty Training Program, Department of Internal Medicine, Faculty of Medicine, Universitas Gadjah Madam Dr. Sardjito General Hospital

<sup>2</sup>The Division of Psychosomatic, Department of Internal Medicine, Faculty of Medicine, Universitas Gadjah Mada, Dr. Sardjito General Hospital

## ABSTRAK

**Latar Belakang:** Depresi merupakan prediktor independen kejadian kardiovaskular. Peningkatan reaktifitas platelet merupakan salah satu dari beberapa kemungkinan mekanisme yang diajukan untuk menerangkan hubungan antara faktor psikososial dengan penyakit jantung koroner. *Mean platelet volume* (MPV) merupakan indikator aktivasi platelet. MPV berhubungan dengan kejadian kardiovaskular mayor pada penyakit jantung koroner.

**Tujuan :** Penelitian ini bertujuan untuk mengetahui perbedaan rerata MPV pada penderita angina pektoris stabil (APS) dengan simtom depresi ndan tanpa simtom depresi.

**Metode:** Desain penelitian adalah studi potong lintang. Pengambilan sampel dilakukan secara berurutan dari pasien APS yang dirawat di bagian Penyakit Dalam RSUP Dr Sardjito Yogyakarta. Pengukuran MPV dan skor HAD dilakukan satu kali saat pasien masuk rumah sakit. Data disajikan dalam bentuk analisis deskriptif tentang karakteristik subjek penelitian berupa rata-rata dan simpangan baku. Korelasi antara MPV dengan simtom depresi pada APS diuji dengan *Pearson's correlation*. Angka kemaknaan adalah  $p < 0.05$ .

**Hasil** Terdapat 40 subjek, terdiri dari 20 APS dengan simtom depresi dan 20 APS tanpa simtom depresi. Rerata kadar MPV pada penelitian ini  $7,56 \pm 0,95$  fl. Rerata MPV pada pasien APS dengan simtom depresi sebesar  $8,45 \pm 0,82$  fl, sedangkan pada pasien APS tanpa simtom depresi sebesar  $7,68 \pm 0,99$  fl dengan nilai  $p 0,009$ .

**Kesimpulan:** Pada penelitian ini terdapat perbedaan rerata MPV yang bermakna secara statistik pada pasien angina pektoris stabil dengan simtom depresi dan tanpa simtom depresi.

**Kata kunci:** APS, MPV, simtom depresi

## ABSTRACT

**Background:** Depression is an independent predictor of cardiovascular events. Increased platelet reactivity is one of several possible mechanisms proposed to explain the relationship between psychosocial factors to coronary heart disease. Mean platelet volume (MPV) is an indicator of platelet activation. MPV associated with major cardiovascular events in coronary heart disease.

**Objective:** This study aimed to determine the average difference of *mean platelet volume* (MPV) in stable angina pectoris patients with symptoms of depression and without symptoms of depression.

**Methods:** The study design was a cross-sectional study. Sampling was carried out in sequence from Stable Angina Pectoris patients who were treated in the internal medicine department of Dr. Sardjito hospital Yogyakarta. MPV and HAD score were measured once on admission. Data presented as a descriptive analysis of the subjects' characteristics on average and standard deviation. The difference average of MPV

between Stable Angina Pectoris patients with symptoms, depression and without symptoms depression assessed with Pearson's correlation. The results were considered at the significance level of  $p < 0.05$ .

**Results:** There were 40 subjects, consisting of 20 Stable Angina Pectoris patients with symptoms, depression and 20 Stable Angina Pectoris without symptoms depression. The difference average of MPV in this study was  $7.56 \pm 0.95$  fl. Average MPV in Stable Angina Pectoris patients with symptoms depression was  $8.45 \pm 0.82$  fl and without symptoms depression was  $7.68 \pm 0.99$  fl with  $p = 0.009$ .

**Conclusion:** In this study, there was a statistically significant difference of average MPV values in stable angina pectoris patients with symptoms of depression and patients without symptoms of depression.

**Keywords:** *Stable Angina Pectoris, MPV, symptoms depression*

## INTRODUCTION

In cross-sectional and longitudinal studies, it was shown that depression and CAD have a two-way association. Depression is an independent risk factor of CAD and its complication, including recurrent ischemia, heart failure, and arrhythmia.<sup>1</sup> The incidence of heart failure could increase the incidence of depression up to 65%.<sup>2</sup> In addition, patients with ischemia heart disease (IHD) who had undergone coronary angiography could raise symptoms of depression and major depression disorder.<sup>1</sup>

Depression could affect patient's habits such as smoking, compliance to the drug, and physical activities. In addition, depression also influences various physiological responses, including thrombocyte activities, autonomic nervous system disorders, and inflammation.<sup>3</sup> Thrombocytes activities in turn associated with its size.<sup>4</sup> Platelets play an important role in the formation of atherosclerotic lesions and complications. Increased platelet activity is associated with increased platelet volume. Greater platelet metabolically more active than smaller platelets and has a higher potency for the occurrence of thrombosis.<sup>5</sup>

Mean platelet volume (MPV) is an indicator of platelet activation.<sup>5</sup> Large MPV associated with the incidence of restenosis after percutaneous action Transluminal

Coronary Angioplasty in patients with stable and unstable coronary artery disease.<sup>4</sup> In addition a large MPV was also associated with an increased risk for heart attacks independently in patients who are known to have cardiovascular risk factors. Qualified stated that the large MPV is a major predictor of cardiovascular events in acute coronary syndromes.<sup>6</sup>

Increased platelet reactivity is one of several possible mechanisms proposed to explain the relationship between psychosocial factors with coronary heart disease. Incidence of thrombosis during stress may be mediated by stress hormones such as catecholamines. Catecholamine stimulation activates platelets through the platelet receptor  $\alpha_2$ . Platelet activation mediated by catecholamines is only partially inhibited by aspirin.<sup>7</sup>

To date, there was no data showing the difference of average MPV values in stable angina pectoris patients who have symptoms of depression and patients who don't have symptoms of depression. The aim of the study was to check whether there is a difference of average MPV values in stable angina pectoris patients with symptoms of depression and patients without symptoms of depression. The hypothesis of this study was there is a difference of average MPV values in stable angina pectoris patients with symptoms of

depression and patients without symptoms of depression who had been hospitalized in RSUP dr. Sardjito.

## METHOD

The study design was cross-sectional. The research was conducted in internal medicine department ward Dr. Sardjito Hospital, the study began in Maret 2013 to Mei 2013. Subjects were stable angina pectoris patients treated in inpatient wards in the internal medicine department Dr. Sardjito and willing to follow the course of the study as well as meet the inclusion and exclusion criteria. At the time of inspection demographic data including age, social data, body weight (kg), blood pressure, comorbid illnesses, medications taken and laboratory data were recorded. Laboratory tests performed are blood sugar levels, total cholesterol, LDL, HDL, triglycerides, platelet number and MPV.

Study inclusion criteria: hospitalized SAP patients and willing to be responsive for MPV examination. Exclusion criteria in this study are: the sample is not willing to be the subject of research for some reason, the sample had a chronic disease that is chronic renal failure, malignancy, liver cirrhosis, chronic inflammation, severe infection/sepsis, impaired mental/cognitive, acute stroke and acute coronary syndrome.

Informed consent is required to provide clear information about the purpose and course of study so that subjects could follow the research. The entire examination variables covered by the researcher.

Statistical data analysis in the form of mean and standard deviation (mean  $\pm$  standard deviation) was done in this study. Shapiro-Wilk

test (one-sample K-S test) was done to determine data distribution. The difference of average MPV values in stable angina pectoris patients with symptoms of depression and patients without symptoms of depression was analyzed using Pearson's correlation if the data was normally distributed or Spearman rank correlation if the data was abnormally distributed. A confidence interval of 95% and p value  $<0.05$  were considered statistically significant.

**Table 1. Baseline characteristics of the subject**

Variables	N	%
<b>Gender</b>		
Male	31	77.5
Female	9	22.5
<b>Smoking history</b>		
Non-smoker	15	37.5
Smoker	13	32
Ex-smoker	10	25
Passive smoker	2	5
<b>Age</b>		
40-49	2	5
50-59	23	57.5
60-69	10	25
>70	5	12.5
<b>Education</b>		
Elementary school	2	5
Junior high school	6	15
Senior high school	20	50
Graduates	12	30
<b>Marriage status</b>		
Single	1	2.5
Married	35	87.5
Widowed	4	10
<b>Working status</b>		
Not working	15	37.5
Working	25	62.5
<b>Hypertension</b>		
No hypertension	6	15
Hypertension	34	85

*Continued on page 30*

Continued from page 29

<b>Metabolic syndrome</b>			
No MS	31	77.5	
MS	9	22.5	
<b>Dyslipidemia</b>			
No Dyslipidemia	20	50	
Dyslipidemia	20	50	
<b>DM</b>			
No DM	29	72.5	
DM	11	27.5	
<b>Hospitalization history</b>			
No	6	15	
Yes	34	8	

**Table 2. The difference of baseline characteristics of patients with symptoms of depression and patients without symptoms of depression**

Variables	Without depression N (20)	With depression N (20)	X <sup>2</sup>	P
<b>Gender</b>				
Male	16 (80)	15 (62.5)	0.143	1.000**
Female	4 (20)	9 (37.5)		
<b>Smoking history</b>				
Non-smoker	5 (25)	8 (40)	3.692	0.297**
Smoker	9 (45)	6 (30)		
Ex-smoker	6 (30)	4 (20)		
Passive smoker	0	2 (10)		
<b>Age</b>				
40-49	0	2 (10)	4.243	0.236**
50-59	12 (60)	11 (55)		
60-69	4 (20)	6 (30)		
>70	4 (20)	1 (5)		
<b>Education</b>				
Elementary school	2 (10)	0	8.200	0.042**
Junior high school	3 (15)	3 (15)		
Senior high school	6 (30)	14 (70)		
Graduates	9 (45)	3 (15)		
<b>Marriage status</b>				
Single	1 (5)	0	2.029	0.363**
Married	18 (90)	17 (85)		

Widowed	1 (5)	3 (5)		
<b>Working status</b>				
Not working	8 (40)	7 (35)	0.107	1.000*
Working	12 (60)	13 (65)		
<b>Hypertension</b>				
No hypertension	2 (10)	4 (20)	0.784	0.661**
Hypertension	18 (90)	16 (80)		
<b>Metabolic syndrome</b>				
No MS	3 (15)	14 (70)	1.290	0.451**
MS	17 (85)	6 (30)		
<b>Dyslipidemia</b>				
No dyslipidemia	11 (55)	9 (45)	0.400	0.752*
Dyslipidemia	9 (45)	11 (55)		
<b>DM</b>				
No DM	15 (75)	14 (70)	0.125	1.000*
DM	5 (25)	6 (30)		
<b>Hospitalization history</b>				
No	1 (5)	5 (25)	3.137	0.182**
Yes	19 (95)	15 (75)		
<b>Medications</b>				
Aspirin	16 (80)	13 (65)	1.129	0.480*
CPG	10 (50)	15 (75)	2.667	0.191
Beta Blocker	8 (40)	12 (60)	0.417	0.343

P<0.05. \*Fisher. \*\*Chi-square

**Table 3. The difference of mean between patients with symptoms of depression and patients without symptom of depression**

Variables	N	MPV		CI 95%	P
		Mean	SD		
Non-depression	20	7.68	± 0.99	0.21 1.37	0.009*
Depression	20	8.45	± 0.82		

## RESULT

In this study, MPV on patients with stable angina pectoris has normal distribution (Shapiro-Wilk test, p = 0.764) whereas data on stable angina pectoris patients with symptoms of depression has abnormal distribution

**Table 4. Multivariate analysis of HT, HDL, and symptoms depression variables**

Variables	B	SE	B	T	p
Constant	9.788	0.842	-	11.620	0.000
HT group	-0.505	0.452	-0.172	-1.117	0.271
HDL group	0.004	0.007	0.527	0.527	0.602
Depression group	-0.881	0.297	-2.569	-12.569	0.005

(Shapiro-Wilk test,  $P = 0.014$ ). The average of MPV value in this study was  $8.07 \pm 0.98$  fl, the average of MPV value in stable angina patients with symptoms of depression was  $8.45 \pm 0.82$  fl, while stable angina patients without symptoms of depression was  $7.68 \pm 0.99$  fl. In this study, there was a difference of average MPV values in stable angina patients with symptoms of depression and patients without symptoms of depression with  $p$  value 0.009.

## DISCUSSION

From previous studies, it has been proved that psychosocial factors were considered as a major risk factor for coronary heart disease, as with other classic risk factors such as hypertension, diabetes mellitus, smoking, obesity, and age. This was supported by a multinational study INTERHEART conducted on 29.972 patients from 52 countries, whose aim was to define the effect of classic risk factors of coronary heart disease and psychosocial factors to the incidence of acute myocardial infarction. Psychosocial stress was associated with higher adjusted relative risk for acute myocardial infarction, compared with hypertension, abdominal obesity, diabetes, and other classic risk factors.<sup>8</sup>

Stress, either physically or mentally, is one of risk factors for coronary heart disease. Nowadays, working environment has become the main cause of stress.<sup>9</sup> In addition, stress

also triggers cardiovascular response by releasing catecholamine which increases heart beat and results in vasoconstriction.<sup>10</sup> Both anxiety and depression is of an important predictor for coronary heart disease.<sup>11</sup>

Depression is also a condition that has been known to hasten the progression of cardiovascular disease. Platelet has a similar feature with central nervous system in terms of serotonin uptake, metabolism, and storage. The similarity between platelets and central nervous system, along with the central role of platelets in the pathophysiology of cardiovascular disease, has become the main reason on why patients with depression have relatively high cardiovascular risk.<sup>12</sup>

Platelet size measured as mean platelet volume (MPV), a marker of platelet function and is associated with platelet activity. The increased platelet MPV is an indicator of a bigger and more active, associated with myocardial damage in acute coronary syndromes and is a predictive factor in myocardial infarction<sup>10</sup>. Increased platelet reactivity is one of several possible mechanisms proposed to explain the relationship between psychosocial factors to coronary heart disease. The incidence of thrombosis during stress may be mediated by stress hormones such as catecholamines. Catecholamines activates platelets through stimulation of  $\alpha_2$  receptors platelet.<sup>7</sup>

Early detection of depression symptoms in patients with Stable Angina Pectoris is an early intervention to reduce the risk of cardiovascular

events associated with depression. After the early detection it is necessary to have appropriate intervention in this regard include more intensive antiplatelet therapy that is directly aimed in the mechanisms of platelet reactivity and behavioral interventions also include activity can reduce anxiety and improve event-free survival in patients with coronary heart disease, as well as overall stress management can reduce risk by improving the psychosocial well together event-free survival and emotional stress that leads to myocardial ischemia. It is expected to reduce the level of depression symptoms may improve platelet activity or improve cardiovascular outcomes.

## CONCLUSION

In this study, there was a statistically significant difference of average mean platelet volume (MPV) value between MPV values in stable angina pectoris patients with symptoms of depression and patients without symptoms of depression. Further study is needed in order to deeply understand the correlation between depression symptoms and mean platelet volume (MPV) in cardiovascular patients. Psychosocial factors should be included in clinical evaluation of cardiac patients.

## REFERENCES

1. Yoon S.G., Jung M.E. and Her S.H., 2011. Effect of Percutaneous Coronary Intervention on Depressive Mood in Elderly Patients, *Journal Korean Geriatr Soc*; 15(2) J: 107-108
2. Januzzi S.C., Stein T.A., and Pasternak R.C., 2000. The Influence of Anxiety and Depression on Outcome of Patients with Coronary Artery Disease, *Arch Intern Med*; Vol. 160(10): 1915-1916
3. Lett, H.S., James A., Blumenthal, Michael A. Babyak, and Andrew S., 2004. Depression as a Risk Factor for Coronary Artery Disease: Evidence, Mechanisms, and Treatment, *Journal Psychosomatic Medicine*; 66: 305 (abstract)
4. Yang A., Pizzuli L., and Luderitz R., 2006. Mean platelet volume as a marker of restenosis after percutaneous transluminal coronary angioplasty in patients with stable and unstable angina pectoris, *Thrombosis research*; 117: 371-377
5. Aşikar K., Association between mean platelet volume and coronary artery calcification in patients without overt cardiovascular disease: an observational study (*Anadolu Kardiyol Derg* 2012; 12: 35-9).
6. Mumpuni, H. 2011. Hubungan Mean Platelet Volume (MPV) dengan Kejadian Kardiovaskular Mayor pada Penderita Sindroma Koroner Akut Selama Perawatan di Rumah Sakit. *Tesis*. Universitas Gadjah Mada Yogyakarta.
7. Larsson PT, Wallen NH, Hjerdahl P, 1993). Norepinephrine induced human platelet activation in vivo is only partly counteracted by aspirin. *Circulation* 1994; 89: 1951-7.
8. Yusuf S, Hawkin S, Ounpuu S, et al, 2004, Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. *Lancet*. 2004; 364:937–952. [PubMed: 15364185]
9. Gray H.H., Keith D. Dawkins, John M. Morgan, and Iain A. Simpson, 2002. *Lecture notes cardiology*, Edisi 4, Erlangga Medical Series, Jakarta, 107-150.

10. Long B.C., 1996. Medical and Surgical Nursing—A nursing process approach, The C.V Mosby Company St. Louis, USA.
11. Burg M.M., *Stress Behavior and Heart Disease*, [www.med.yale.edu/library/heartbk/8pdf](http://www.med.yale.edu/library/heartbk/8pdf)
12. Parakh, K., Sakhuja, A., Bhat, U., and Ziegelstein, R.C. 2008. Platelet function in patients with depression. *Southern Medical Journal* 101:612-7.