

# Frequency Of Raised Mean Platelet Volume In Patients With Acute Coronary Syndrome In HIT Hospital Taxila

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## Abstract

**Objective:** To determine the frequency of raised Mean Platelet Volume (MPV) in patients with acute coronary syndrome (ACS) in HIT Hospital Taxila.

**Materials and Methods:** A case-control study was at HIT Hospital Taxila. All the patients presented with chest pain who fulfilled the inclusion criteria were recruited into the study. Patients with acute coronary syndrome were included in the case group (ACS group). The patients included in the control group (non-ACS group) had chest pain without having ischemic heart disease or risk of ischemic heart disease. Data were analyzed using SPSS version 28. To find out the correlation between the type of chest pain and mean platelet volume chi-square test was applied.

**Results:** Total 93 patients were included in this study. 51 patients were included in the ACS group while 42 were in non- ACS group. To find out the correlation between the type of chest pain and mean platelet volume chi-square test was applied. The results show a significant association between raised MPV and acute coronary syndrome.

**Conclusion:** Patients with raised MPV are at higher risk of acute coronary disease and complications related to it. It could be used as a predictor of ischemic heart disease and its complications.

**Keywords:** Acute coronary syndrome, mean platelet volume, atypical chest pain.

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**Cite this Article:** Batool, F., Malik, K., Meraj, L., Tariq, K. M., Iqbal, T., & Zaka, N. (2023). Frequency Of Raised Mean Platelet Volume In Patients With Acute Coronary Syndrome In HIT Hospital Taxila. *Journal of Rawalpindi Medical College*, 27(2). https://doi.org/10.37939/jrmc.v27i2.2050.

Received October 19, 2022; accepted May 07, 2023; published online June 24, 2023

## 1. Introduction

Platelets are a major culprit in atherosclerotic plaque formation. Large and hyperactive platelets accelerate the process of atherothrombosis<sup>1</sup> which causes partial or complete coronary artery obstruction leading to acute coronary syndrome. Mean platelet volume (MPV) is the precise estimate of platelet size. Platelet size and activity are interrelated, and mean platelet volume is mostly increased in acute coronary syndrome<sup>2,3</sup>. High MPV impairs the coronary blood flow and increases the risk of acute coronary syndrome.

Platelets are blood components that initiate clot formation in response to injury to the vessel wall. Their major function is to maintain haemostasis. Mean platelet volume (MPV) is a reliable parameter to assess the dimension of the platelet. During a routine analysis of blood, a complete picture with the help of a hematology analyzer, and volume distribution indices are used to calculate MPV. Mean platelet volume ranges between 7.6 and 12.1 fl. Platelet activity can be assessed by MPV; thus, it is considered a parameter of platelet activity. Patients having raised MPV are susceptible to an increased risk of clot

formation than those with normal values of MPV. The giant platelets have many cell granules, and their activation is usually faster as compared to normal platelets due to a greater number of adhesion molecules. This results in an increased likelihood of clot formation. Raised MPV causes increased aggregation of platelet resultantly more production and release of thromboxane TXA<sub>2</sub> and  $\beta$ -thromboglobulin<sup>4</sup>.

Most of the studies have proven MPV as an independent variable for the prognosis of ischemic heart disease, but some studies have shown no relation between MPV and ischemic heart disease<sup>5</sup>. It has been observed that hyper-reactivity of platelets markedly increases the individual susceptibility to acute cardiac events. A study supervised by Endler et al. conclude that raised platelet volume is responsible for an increased number of cardiac events irrespective of the severity of coronary artery disease<sup>6</sup>. Giant and hyperactive platelets precipitate the chances of thrombus formation after the rupture of atherosclerotic plaque. Slavka et al observed that aspirin used in the treatment of ischemic heart disease usually has no impact on MPV<sup>7,8</sup>

Not many studies have been carried out in Pakistan to assess the relationship between MPV and ischemic heart disease so we will test the hypothesis that high values of MPV are associated with increased risk of IHD in a population living in Taxila as it is a readily available test in almost all hospitals and highly cost-effective.

## 2. Materials & Methods

A case-control study was done for six months from October 2021 to March 2022 at HIT Hospital Taxila after ethical committee approval. Non-probability convenient sampling technique was used. All the patients presented with chest pain who fulfilled the inclusion criteria were recruited into the study. Patients with acute coronary syndrome (ACS group) including ST elevation MI, non-ST elevation MI, and unstable angina admitted in the coronary care unit (CCU) were included in the case group.

The control group (non-ACS group) was included from the medical ICU and medical ward admitted with atypical symptoms like chest pain which is localized or constant pain not relieved by nitroglycerine or pain reproduced by movement or palpation. They have normal cardiac enzymes, ECG, and echocardiography. Atypical chest pain is pain that does not fulfil the criteria of acute coronary syndrome.

Patients with renal failure, hepatic failure, chronic obstructive airway disease, myeloproliferative disorder, or malignancy were excluded from the study. Patients having any platelet disorder as thrombocytopenia or thrombocytosis or any bleeding or clotting disorder were also not included in our study.

The physician working at the Coronary care unit and emergency room identified the patient as having acute coronary syndrome including ST elevation MI, non-ST elevation MI and unstable angina. After taking verbal consent and explaining the purpose of research in Urdu all patients were subject to detailed history including risk factors for ischemic heart disease (IHD), any chronic disease, family history of IHD, physical examination, and relevant investigations. Venous blood samples were collected in a standardized EDTA sample tube within an hour of admission and were sent to the laboratory for analysis of the complete picture including mean platelet volume, using a Hematology analyzer Sysmex KX-21 Japan. Cardiac enzymes, Troponins, and blood chemistry including renal functions, liver functions,

blood sugar random, prothrombin time and activated thromboplastin time were also carried out at the time of admission. All patients had 12 lead ECGs and were interpreted according to conventional criteria.

The control group (non-ACS group) of patients included from the medical ICU and medical ward admitted with atypical chest pain. Non-ACS group subjects were diagnosed on the basis of atypical symptoms, no ECG evidence of ischemia, negative Trop T, no Echo evidence of regional wall motion abnormality, and normal coronary angiogram in some patients.

Data were analyzed using SPSS version 28. Descriptive Statistics were calculated for demographic variables. MPV was divided into 3 categories i.e. less than 8, between 8.1 till 10, and more than 10. Frequencies were calculated for MPV in patients with acute coronary syndrome. To find out the correlation between the type of chest pain and Mean platelet volume chi-square test was applied.

## 3. Results

A total of 93 patients were included in this study. 40 were female 53 were male. The mean age was 60 years. 22% of patients have a positive history of ischaemic heart disease. 40% of patients were diabetic and 42% were hypertensive. 25% of patients have a positive family history of ischaemic heart disease. 39% of patients were smokers and Trop T was positive in 20% of patients. 51 patients had typical chest pain while 42 had atypical chest pain. The mean MPV is 10.04%. Out of 93 patients, 27 had a mean platelet volume lower than 8.

**Table-1** Relationship of MPV and Type of Chest Pain

Mean Platelet volume (fL)	Patients with atypical chest pain	Patients with typical chest pain	Total patients
Less than 8	21	6	27
Between 8.1 to 10.0	20	21	41
Greater than 10.0	1	24	25
Total	42	51	93

Typical chest pain was present in 6 patients which is 22% of these patients. 41 patients have MPV between 8.1 fL to 10 fL, typical chest pain was present in 21 patients (51.2%). 25 patients have MPV of more than 10 fL typical chest pain was present in 24 (96%) patients.

**Table-2** Chi-Square Tests

	Value	df	Asymptomatic Significance(2-sided)
Pearson Chi-Square	28.918 <sup>a</sup>	2	0.000
Likelihood Ratio	34.238	2	0.000
N of Valid Cases	93		

To find out the correlation between the type of chest pain and mean platelet volume chi-square test was applied. The results in Tables 1 and 2 show variation between observed and expected count which depict a significant association between MPV and type of pain which is statistically significant as the value is less than 5% and the correlation coefficient between the two is 0.558.

## 5. Discussion

MPV is a relatively inexpensive and readily available method to measure the functional status of platelets. Platelets play a vital role in atherosclerotic plaque formation and therefore a major culprit in the pathogenesis of acute coronary syndrome. Our study recruited 93 patients and their mean age was 60 years which is 5 years less than a study conducted by Madavi T<sup>9</sup> in 2019 in India but in that study, the mean MPV was 10.2 fl in the case group and 7.26 fl in the control group whereas in our study 24 patients out of 51 had MPV more than 10.1fl in case group and 21 patients out of 42 had MPV lower than 8fl and this finding is in accordance with this study and other studies.

MPV was significantly higher in patients with the acute coronary syndrome in our study which was similar to the studies conducted by Manchanda J et al and Khandekar MM et al in India<sup>10,11</sup>. Similar findings were also inferred from the research conducted by SG Chu et al in a meta-analysis<sup>12</sup>.

There was a study conducted in India by Khandekar MM et al<sup>11</sup> in which the mean MPV was 10.43 fL in patients with acute coronary syndrome whereas in our study mean MPV was 10.04% fL which is slightly lower. The mean MPV in patients with stable coronary artery disease was 9.37 fL in the same study which is conducted in India but in our study mean MPV in patients with atypical chest pain was 8.01fL.

In our study, 25 patients (26.8%) have MPV > 10 fL and 24 patients (96%) have ACS and the mean MPV is 10.04% fL but research done by K Vitthal et al<sup>2</sup> reveals MPV (9.65 ± 0.96) in patients with acute myocardial infarction as compared to stable coronary artery disease (9.37 ± 0.88) and their control group (9.21 ± 0.58). The values of MPV are slightly lower than in our study but are significantly higher in patients with ACS in both research projects. G. Endler et al<sup>3</sup> in their research proved that patients with a history of ischemic heart disease and raised MPV > 11.6 fl were at higher risk of acute coronary syndrome.

Yaghoubi A et al<sup>13</sup> conducted a study in Iran which concluded that mean platelet volume values of patients in the myocardial infarction and unstable angina group were significantly higher than the control group (10.14 ± 1.05 fL, 9.82 ± 0.93 fL and 9.34 ± 1.14 fL, respectively; p < 0.001) and these findings are in accordance with our study.

MPV can be easily performed during routine blood complete picture and patients with raised values can be identified to offer preventive treatment to avoid morbidity and mortality associated with ACS.

Tamer D et al<sup>14</sup> found raised MPV in patients presenting with ischemic stroke and these results were similar to our findings but in patients with acute coronary syndrome which suggest that raised MPV is associated with significant cardiovascular events. On the contrary Mahmood N et al<sup>15</sup> did not find any substantial relationship between MPV and ischemic stroke.

There are a few limitations of the current study like it is carried out in one hospital which may not truly represent the regional population and there was a limited number of patients included in it. The complication developed after acute coronary syndrome were not studied in it due to limited follow-up of patients. Serial levels of MPV could not be assessed.

## 5. Conclusion

Patients with raised MPV are at higher risk of acute coronary disease and complications related to it. It could be used as a poor predictor of ischemic heart disease and its complications. Routine blood pictures including MPV can be useful to identify high-risk individuals and they could possibly get the advantage from preventive treatment.

## CONFLICTS OF INTEREST- None

**Financial support:** None to report.

**Potential competing interests:** None to report

## Contributions:

F.B, K.M, K.M.T- Conception of study

F.B, K.M, T.I - Experimentation/Study conduction

F.B, K.M, L.M - Analysis/Interpretation/Discussion

F.B, K.M, L.M - Manuscript Writing

F.B, K.M, K.M.T - Critical Review

F.B, K.M, T.I - Facilitation and Material analysis

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