# Analysis of Platelet Volume Indices in Patients with Acute Coronary Syndrome in Gujarat, India

**Shubhi Saxena[1], Nishant Saxena[2], Richa Jain[3], Jasmin Jasani[4]**

*[1]Assistant Professor, Department of Pathology, [2]Senior Resident, Department of Cardiology, [3]Assistant Professor, Department of Pathology, [4]Professor, Department of Pathology, Smt. B K Shah Medical Institute and Research Centre, Sumandeep Vidyapeeth deemed university, Pipariya, Waghodia road, Vadodara, Gujarat, 391760*

## Abstract

**Background:** Coronary artery disease (CAD) is growing in heaps and bounces with increasing incidences every year due to increase in cardiovascular risk factors like diabetes mellitus, obesity, smoking, hypertension, dyslipidemia and sedentary life style. Platelets have always been a cornerstone of thrombosis, aggravation of atherosclerosis and its complications, such as acute coronary syndromes which include acute myocardial infarction (AMI), Non ST Elevation MI (NSTEMI) and unstable angina (UA), and sudden cardiac death. Platelet aggregation and activation plays a pivotal role in thrombus generation in cardiovascular diseases. The aim of this study is to evaluate platelet indices in coronary artery disease and to reveal a clinical discussion based on them.

**Methods:** A total of 65 cases were studied; 21 patients had stable coronary artery disease for which they were admitted for a coronary angiogram. 27 patients had Troponin negative unstable angina (UA) or troponin positive NSTEMI or STEMI having corresponding ECG findings. The third group had a normal cardiogram.

**Conclusion:** Platelet Volume Indices studied were — mean platelet volume (MPV), platelet large cell ratio (PLCR), platelet distribution width (PDW) was increased in ACS as compared to stable CAD and the control group. Large platelets are functionally notorious and are a predisposing contributor for developing myocardial infarction. Larger platelets can be diagnosed routinely by CBC's, Platelet volume indices are common, cheap and easily available tool for screening future thrombotic cardiovascular diseases.

***Keywords:*** *Myocardial infarction, platelet volume indices, coronary artery disease*

## Introduction

In our new century, Coronary artery disease (CAD) has been growing with increasing incidence and prevalence across the world. Cardiovascular risk factors such as diabetes, old age, hypertension, dyslipidemia, smoking, anxiety and obesity increase the probability of developing coronary artery disease manifolds. Platelets play a major role in development of cardiovascular disease and progressive atherosclerosis, which can complicate in the form of acute coronary syndromes like unstable angina, NSTEMI and STEMI. Platelet activation, aggregation and platelet hemostatic plug formation is responsible for acute coronary events.[1] Platelet size determines platelet activity. Larger sized platelets are enzymatically and metabolically active as compared to small platelets and release large amount of Thromboxane A2.[2,3] Nowadays availability of automated cell counters has made the platelet volume available routinely in majority of clinical laboratories. The mean platelet volume shows changes in the rate of platelet production or platelet stimulation in the context of IHD and its clinic-pathological correlation.

**Corresponding Author:**
**Dr. Nishant Saxena**
Senior Resident, Department of Cardiology
E6 Staff Quarters, Sumandeep Vidyapeeth Deemed University, Vadodara, Gujarat, 391760
Email ID: nsaxena014@gmail.com
Contact Number: 9929460540

## Materials and Methods

The study was conducted at Dhiraj Hospital, Smt B K Shah Medical Institute and Research Centre, Sumandeep Vidyapeeth deemed university, Vadodara, Gujarat on 65 patients over a period of 12 months in 2019. Three groups were randomized. Group A: Acute coronary syndrome patients, non ST elevation ST elevation MI or Unstable angina in ICCU - 27 patients; Group B: patients with chronic stable angina admitted for coronary angiography - 21 patients; and Group C: normal healthy controls with normal ECG- 17 patients (Table 1).

4ml Blood was collected in di-potassium EDTA tubes from all the patients on day 1 and also on day 6 for patients by a sterile puncture. The platelet volume indices were studied in one hour of puncture using the ERBA H-560 five part automated cell counter and all platelet indices were calculated i.e. platelet distribution width and platelet large cell ratio, mean platelet volume and platelet count.

**Inclusion criteria**

1. Patients admitted with acute coronary syndromes, i.e. unstable angina, NSTEMI, STEMI.

2. Patients who have history of previous of antiplatelets therapy.

**Exclusion criteria**

1. Critically ill patients.

2. Patients with any bleeding or clotting disorder.

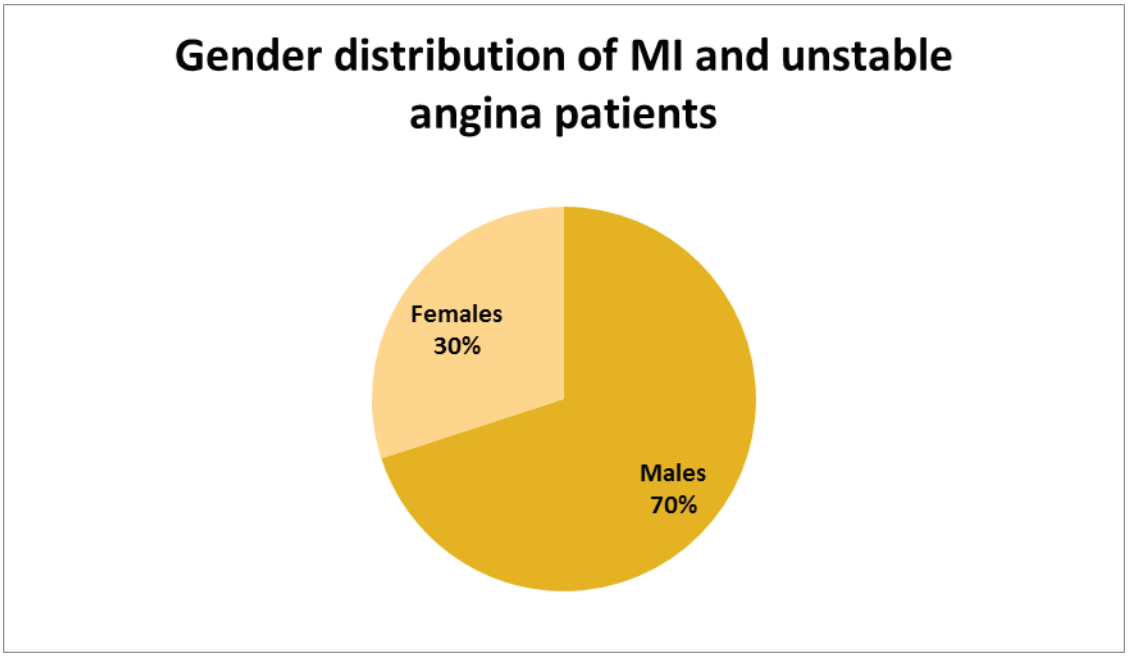
3. Patients having any platelet disorder such as immune thrombocytopenia.

**Table 1: Group distribution of the patients**

| S.no. | Groups | Number of Patients |
|---|---|---|
| 1 | Group A: NSTEMI, STEMI, Unstable angina | 27 |
| 2 | Group B: Stable CAD | 21 |
| 3 | Group C: Normal healthy controls | 17 |
| | | 65 |

## Results & Discussion

In this study, 70% of ACS patients (myocardial infarction and unstable angina) are males (graph 1). The most common age group in unstable angina group is 50-60 years and of patients in myocardial infarction group is 60-70 years. The table 2 shows that in patients of group A, the mean values of MPV and PDW are 8.2 fl and 17.9 % while in group B, the mean values of mean platelet volume and platelet distribution width are 7.6 fl and 16.5 % while in normal controls the mean values of mean platelet volume and platelet distribution width are 6.8 fl and 15.9 % respectively. This shows that these platelet volume indices are elevated in acute coronary syndrome patients.




**Graph 1: Gender distribution of MI and Unstable angina patients.**

**Table 2: Mean value distribution of platelet indices in all groups of patients.**

| S.no. | Platelet Indices | Group A | Group B | Group C |
|---|---|---|---|---|
| 1 | Platelet Count | 203 x 109/l | 235 x 109/l | 274 x 109/l |
| 2 | Platelet distribution width | 16.9 | 15.5 | 14.9 |
| 3 | Platelet large cell ratio | 30.4 % | 27.3 % | 23.1 % |
| 4 | Mean platelet volume | 8.2 fl | 7.6 fl | 6.8 fl |

Automated blood cell counters are now readily available in most laboratories state-wise. The parameters for platelets which can be studied by these are, i.e., platelet distribution width, platelet count, platelet large cell ratio, platelet volume indices and mean platelet volume. In the 21st century, CAD and its related mortality and morbidity have increased in incidence and prevalence in all developed and developing countries. Atherosclerotic cardiovascular risk factors like; diabetes, old age, hypertension, smoking, dyslipidemia, metabolic syndrome and obesity are always fuel to this increasing non communicable pandemic. It is emphasized here that Platelet volume indices are now being researched as a significant parameter in ACS. Our study unveils platelet volume indices (PVI) in the spectrum of acute coronary syndromes and ischemic heart diseases. The results revealed that Mean Platelet Volume directly proportional to the thrombotic state in acute coronary syndromes and the larger platelets play significant role in infarction. Larger sized platelets can be found out by platelet studies and the patients with could benefit from early primary prophylaxis and intervention.[4]

The current study showed higher MPV mean value (8.2 fl) in unstable angina and myocardial infarction groups compared to group B and group C which had MPV of 7.6 fl and 6.8 fl respectively. Our study was cross sectional so follow up details could not be tracked down and the diagnostic benefit of these values cannot

be established. This finding is also supported by Ranjith M P et al [5] done in Jabalpur India, M M Khandekar et al [4] done on 210 patients, and also by Pervin S et al [6] among 142 patients.

There are plenty of evidences to support the hypothesis that generalised platelet activation occurs before an acute ischemic cerebrovascular and coronary event. The enhanced platelet consumption causes the bone marrow to release megakaryocytes at the site of the atherosclerotic plaque.

Platelets are proven to play an essential role in the progression of atherosclerosis and atherosclerotic cardiovascular diseases including myocardial infarction and cerebrovascular accidents. To provide a larger surface area for clotting factors to form hemostatic plug, platelets change in shape from discoid to spherical. Platelet indices such as PDW and MPV can be easily studied and they are elevated during platelet aggregation and activation. Platelet distribution width measures the difference in platelet sizes, and its large values suggest larger reticulated platelets.[7]

## Conclusion

Our study revealed that high values of mean platelet volume leads to the widespread thrombosis in cardiovascular syndromes and the large platelet play an important role in thrombosis. As larger platelets are functionally more active, they appear to be one of many contributory factors for cardiovascular thrombosis. Patients having large platelets can be diagnosed by pathological blood tests as Platelet Volume Indices are reported as a side product of all blood count's study. In summary, Platelet volume indices provide a cheap, easily available and important investigation, which is useful for future acute cardiovascular events.

**Ethical Clearance-** Taken from sumandeep vidyapeeth deemed university ethical committee.

**Source of Funding-** Self funded

**Conflict of Interest** - Nil

## References

1. Trip MD, Cats VK, van Capelle FJL, et al. Platelet hyperreactivity and prognosis in survivors of myocardial infarction. New England Journal of Medicine 1990;322:1549–54.
2. Corash L, Tan H, Grolnick HR. Heterogeneity of human whole blood platelet subpopulations. I. Relationship between buoyant density, cell volume and ultrastructure. Blood 1977;49:71–87.
3. Thompson CB, Eaton KA, Princiotta SM, et al. Size-dependent platelet subpopulation: relationship of platelet volume to ultrastructure, enzymatic activity and function. British Jornal of Haematology 1982;50:509–20.
4. Khandekar MM, Khurana AS, Deshmukh SD, et.al. Platelet volume indices in patients with coronary artery disease and acute myocardial infarction: an Indian scenario. Journal of Clinical Pathology 2006;59:146-49.
5. Ranjith M, Divya R, Mehta V, Krishnan M, KamalRaj R, Kavishwar A. Significance of platelet volume indices and platelet count in ischaemic heart disease. Journal of Clinical Pathology 2009;62:830-33.
6. Pervin S, Ferdoushi S, Hossain M, Joarder A, Sultana T. Elevated mean platelet volume is a marker of acute coronary syndrome. Bangladesh Medical Journal 2014;42:45-50.
7. Turk U, Tengiz I, Ozpelit E, Celebiler A, Pekel N, Ozyurtlu F et al. The relationship between platelet indices and clinical features of coronary artery disease. Kardiologia Polska 2013;71:1129–34.