



## Role of Mean Platelet Volume in Diagnosing Severity of Preeclampsia

Authors

**Dr Priya Vijaykumar Gameti<sup>1</sup>, Dr Anisha Rajani<sup>2</sup>, Dr Mala Jain<sup>3</sup>**

<sup>1,2</sup>Resident, Department of Pathology, Government Medical College, Surat, Gujarat, India

<sup>3</sup>Resident, Department of Pathology, Government Medical College, Surat, Gujarat, India

Corresponding Author

**Dr Priya Vijaykumar Gameti**

Resident, Department of Pathology, Government Medical College, Surat, Gujarat, India

### Abstract

*Pregnancy induced hypertension (PIH) is the most common disorder of pregnancy affecting approximately 10-17% of pregnancies and is a significant cause of maternal and fetal morbidity and mortality globally. The incidence of PIH in India ranges from 5% to 15%. Profound changes in the coagulation and fibrinolytic system occur during normal pregnancy causing a hypercoagulable state. Recent studies suggest that platelet parameters like platelet indices are markers of platelet activation and are rapid, cheap, most simple and cost effective method for prediction of PIH, way before the appearance of derangements in PT, APTT, TT values. Hence In our study we aimed to investigate the association between severity of preeclampsia and mean platelet volume. In this study MPV was found to be valuable in cases of multigravida subgroup. These indices gives proof of the role of platelet indices in diagnosing severity of preeclampsia and that the peripheral smear alone is not helpful and that these are simple ,easy, rapid and cheap method to incorporate platelet indices in diagnosing preeclampsia.*

**Keywords:** pregnancy, preeclampsia, Mean platelet volume, platelet.

### Introduction

Pregnancy induced hypertension (PIH) is the most common disorder of pregnancy affecting approximately 10-17% of pregnancies and is a significant cause of maternal and fetal morbidity and mortality globally<sup>[1,2]</sup>. The incidence of PIH in India ranges from 5% to 15%<sup>[2,3]</sup>. Preeclampsia is defined as a multisystem disorder occurring in pregnancy and the puerperium which is characterized by development of hypertension of 140/90 mmHg and above after the 20th week in a previously normotensive patient<sup>[4,5]</sup>. Preeclampsia can lead to two life threatening complications, eclampsia and HELLP syndrome<sup>[6]</sup>. The majority of

patients remains in mild to moderate group and does not have any major obstetric problems. However, in a certain proportion of patients, the risk to the mother can be significant<sup>[1]</sup>. Profound changes in the coagulation and fibrinolytic system occur during normal pregnancy causing a hypercoagulable state<sup>[4,7,8]</sup>. Out of all the haematological abnormalities that occur in PIH, thrombocytopenia is the most common seen to occur in 11% to 29% of patients<sup>[7,8]</sup>. These pregnancies also are associated with qualitative changes suggesting increased platelet production and destruction. There is a shortened platelet life span, increased numbers of megakaryocytes in the bone marrow, and an increased number of immature platelets seen in the

peripheral blood smear<sup>[4,9,10]</sup>. Recent studies suggest that platelet parameters like platelet indices are markers of platelet activation and are rapid, cheap, most simple and cost effective method for prediction of PIH, way before the appearance of derangements in PT, APTT, TT values<sup>[4,11,12]</sup>. Hence In our study we aimed to investigate the association between severity of preeclampsia and mean platelet volume (MPV).

**Material and Methods**

- **Study Setting:** The present study was conducted in the Department of Pathology, Government Medical College associated with Tertiary care Hospital from December 2015 to August 2017.
- **Study Design:** This study is a case control study looking at the platelet parameters in normal pregnant women as control and eclamptic pregnant women as study groups.
- **Study Site and Subjects**
  - **Inclusion Criteria:** The sample population consisted of, normal pregnant, and eclamptic pregnant females. Eclamptic pregnant females were defined as women with pregnancy induced hypertension with convulsion that cannot be attributed to another cause. Inclusion criteria for placement in the study group of

eclamptic females were indoor patients coming in department of obstetrics and gynecology and clinically diagnosed cases of severe preeclampsia/eclampsia between second and third trimester between age group 18-40 years. Normotensive pregnant ladies between second and third trimester between 18-40years were taken as control.

- **Exclusion criteria** for this group were females patients who received recent blood transfusion.
- **Sample size:** Control-80 normotensive pregnant women  
Study- 80 patients of eclampsia
- **Equipment and Instruments:** The laboratory analysis was performed at the Hematology and clinical pathology laboratory of Department of pathology. An automated cell counter (Micros 60 haematology analyzer) was used to perform the complete blood count
- **Data Analysis**  
All data was entered in excel sheet and master chart was prepared. All data entered was processed further and the statistical analysis performed on the entire sample used were mean, standard deviation, independent t test.

This study has been approved by Institutional ethical committee.

**Observation**

**Table 1:** Distribution of Mean Platelet Volume (MPV) in Study and Control based on parity

	Study (mean platelet volume in fl)		Control (mean platelet volume in fl)	
	PRIMI	MULTI	PRIMI	MULTI
Mean	8.32	8.54	7.76	7.96
	8.43		7.86	
Standard Deviation	1.19	1.36	1.08	1.15
Range	5.9-11	6.3-11.6	5.7-10.5	6.6-10.6
P Value	0.07	0.03		
Significance	Not Significant	Significant		

**Table 2:** Comparison of Mean Platelet Volume in Different studies

Authors	Study (fl)	Control (fl)
Amita et al	9.60	8.89
Bhavana et al	11.37	10.07
Vamseedhar et al	11	8.63
Rabia et al	10.49	8.42
Present study	8.43	7.86

## Discussion

Few studies have been done regarding the feasibility of using MPV as markers in preeclampsia and eclampsia and have shown variable results. They have shown that there is macrothrombocytosis and increase in mean platelet volume in patients with moderate or severe hypertension in pregnancy<sup>[13,14]</sup>. Whereas another study showed that there was no change in the mean platelet volume in patients with mild to moderate hypertension<sup>[15]</sup>.

In present study we found mild increase in MPV values from normotensive pregnant women to eclampsia patients which correlated with other studies. In our study MPV is 8.43 fl in eclampsia and 7.86 fl in control group which is comparable with Amita et al who observed MPV of 9.60 fl in study group and 8.89 fl in control group<sup>[16]</sup>. Bhavana et al also observed the value of MPV as 11.37 fl in eclampsia and 10.07 fl in control. The higher values of MPV in Bhavana et al are not comparable to present study yet even though in present study MPV was within normal range the increase in MPV in eclamptic patients in comparison to normotensive patients was comparable to Bhavana et al<sup>[17]</sup>. Vamseedhar et al also reported MPV of 11 fl in eclamptic patients and 8.63 fl in control group and another study by Rabia et al reported the value of MPV as 10.49 fl in eclampsia and 8.42 fl in control group which are comparable to present study as the values are not significantly high and within normal range<sup>[18,19]</sup>.

The p value in the present study was found to be insignificant when compared primigravida of study and control group but found to be significant comparing multigravida in study and control group suggesting there is no significant increase in MPV in primipara with increasing severity of preeclampsia but there is significant increase in MPV in cases of multipara with increasing severity of preeclampsia. Though several studies demonstrate direct relationship between MPV and preeclampsia severity our findings correlated with these studies in multipara subgroup only. This emphasizes that MPV has some role in pathogenesis of the disease. Due to increased consumption of platelets, bone marrow produces and release large

platelets leading to increase MPV in preeclampsia. So any increase in MPV may be considered as a caution and patients can be monitored more carefully to avoid adverse outcome hence further studies are necessary to explore the usefulness of MPV in Preeclampsia<sup>[20]</sup>. However literature reveals conflicting results regarding the relation between MPV and preeclampsia and there are studies which demonstrate increase in MPV even in healthy individuals<sup>[21]</sup>. In the present study MPV was proportionally higher in eclampsia as compared to normal pregnant females but the difference was not statistically significant. Amita et al also did not find any significant difference in the MPV between preeclampsia and normal pregnant group<sup>[16]</sup>. Vamseedhar et al and Bhavana et al in their study described MPV as a good marker of platelet dysfunction in preeclampsia. Similar findings were observed by Rabia et al.<sup>[17,18,19]</sup> Recent studies demonstrate by Altibas et al observed that MPV is not a significant predictor of preeclampsia severity<sup>[22]</sup>. Kashanian et al also observed that MPV changes did not predict preeclampsia or preterm labour and Cyehan et al did not observed any significant difference in the MPV<sup>[23,24]</sup>. This confusing behavior of MPV in various studies may be explained by the differences in equipment and method of automated cell counter<sup>[38]</sup>. Moreover MPV measurement should ideally be done soon after taking blood sample<sup>[18]</sup>.

## Conclusions

Simple and easy procedure - Estimation of platelet count & platelet indices are simple and routine tests, which can be easily estimated by automated hematology analyzer and hence can be used as an early and simple procedure in the assessment of severity of preeclampsia and prevent progression to complications. Platelet volume indices (PVIs) are a group of parameters which are inexpensive to measure and are derived from routine blood counts. Clinically platelet indices can be useful screening test in diagnosing severity of preeclampsia. These indices gives proof of the role of platelet indices in diagnosing severity of preeclampsia and that the peripheral smear alone is not helpful. However

further large studies are required to generalize the findings for the population.

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