

# Mean Platelet Volume as a Predictor of Gestational Diabetes Mellitus

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**Abstract:** Introduction: Gestational diabetes mellitus is one of the most common medical disorder in pregnancy which can result in significant morbidity and mortality if left unrecognized. The prevalence of GDM in India varies from 3.8 to 21% in different parts of the country and it is on a rise. Early diagnosis of this complication & appropriate treatment aimed at tight control over maternal glucose levels may positively influence perinatal outcome. MPV is a simple, cost effective measure to predict GDM. As there is no Indian study available till date on MPV assessment as a predictor for GDM. Aims and Objectives: To study the sensitivity of MPV as a predictor of GDM. Objectives of the study are 1) To assess the mean platelet volume in pregnant women. 2) To compare mean platelet volume to platelet count. 3) To know the sensitivity of MPV in predicting GDM. Materials and Methods: Prospective analysis of 172 pregnant women attending M.S.RAMAIAH HOSPITALS during study period (October 2014 to September 2016) is done. The MPV (Mean platelet volume) of patients who developed GDM and IGTT are compared to the patients who developed no GDM. Results: The mean age of the patients studied was 27.39±4.09. The mean BMI of the study population is 27.62±3.00. In this study, pre pregnancy BMI was not considered as majority of the patients were not aware of their pre-pregnancy body weight. Hence BMI cannot be considered as a significant determinant of the study outcome. Out of 172 patients, 27 patients (15.7%) are detected to have GDM and 9 patients (5.2%) had IGTT. The MPV in the patients with no GDM is 9.70±1.25 and the patients with GDM is 11.05±1.59 whereas with IGTT is 10.93±1.46 in the first assessment. The MPV in the patients with no GDM is 9.81±1.13 (FL) and the patients with GDM is 11.53±1.47 whereas with IGTT is 11.69±1.45 in the second assessment. The P value obtained is statistically significant of <0.001 suggesting that higher MPV values are associated with increased incidence of GDM and IGTT. The platelet count in the patients with no GDM is 2.36±0.55 (lakhs) and the patients with GDM is 2.34±0.79 whereas with IGTT is 2.29±0.41 in the first assessment. Conclusion: The present study shows that elevated MPV as a statistically significant predictor of GDM. Assessment of MPV at earlier weeks of period of gestation has higher sensitivity than the MPV assessment done at later weeks of period of gestation. However, future studies with a larger series and long-term follow-up of such cases are needed to confirm this. Further studies on larger population will help in the detection of the efficacy of MPV in the prediction of GDM.

**Keywords:** Mean Platelet Volume (MPV), Gestational Diabetes Mellitus (GDM), Impaired Glucose Tolerance Test (IGTT).

## 1. Introduction

Gestational diabetes mellitus is defined as any degree of glucose intolerance with onset or first recognition during pregnancy<sup>1</sup>. Gestational impaired glucose tolerance (GIGT) is a glycemic disorder and is considered a predictor state. The active search for disease among apparently healthy women is the fundamental aspect of prevention. Considering GDM consequences of increased perinatal and maternal morbidity, mortality in addition to long term complications, its accurate identification and treatment is of utmost importance. Women diagnosed to have GDM are at increased risk of developing future diabetes especially type 2 diabetes mellitus.

Several randomized clinical trials have compared standard treatment of GDM to no intervention and established better outcomes with treatment. Despite more than 40 years of research, there is still no agreement regarding optimal gestational diabetes screening. Still controversies exist regarding on whom to perform and when to perform screening for the detection of GDM.

Elevated MPV is recognized as an important marker of raised blood sugar level in GDM patients and it is held responsible for the microvascular and macrovascular complications. MPV is an important, simple, effortless, and cost-effective measure that should be used for predicting the possibility of GDM. Patients with large platelet counts can be identified easily during routine hematological examination and could possibly benefit from preventive treatment<sup>2</sup>.

MPV has been shown to be an important predictor for micro and macro vascular complications proved in the studies done on type 2 diabetes mellitus. Elevated MPV is also found in GDM. Several studies are being done to detect the exact sensitivity, specificity and negative as well as positive predictive value of MPV in GDM<sup>3</sup>.

## 2. Materials and Methods

The study subjects are the pregnant women attending M.S.RAMAIAH HOSPITALS during study period (October 2014 to September 2016).

- 2ml of venous blood sample will be collected from antecubital vein of all the participants at 20-24 weeks POG into tube containing EDTA and analysed within 2-4 hrs from venipuncture to minimize changes in platelet size.
- All samples will be analysed on SYSMEX automated haematology analyser XT2000i/XT1800i to perform total platelet count, MPV of each sample.
- OGCT will be performed on all participants at 24-28 weeks POG along with MPV assessment and if blood glucose level is >140mg/dl, a 100 g, 3 hr oral glucose tolerance test will be performed. The patients who had minimum of two raised values were considered to have GDM. Only one abnormal value is considered as IGTT.
- MPV of GDM & IGTT patients will be compared to the nondiabetic pregnant women.

### Inclusion Criteria

- All pregnant women of age 18-38 years.

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- Pregnant women at 20-24 weeks POG for MPV assessment and 24-28 weeks for OGCT(75g oral glucose load) and MPV assessment.

**Exclusion Criteria**

- Patients with pre existing diabetes mellitus
- Pre eclampsia
- Chronic hypertension
- Cyanotic congenital heart diseases
- Renal failure.
- Autoimmune diseases like SLE,ITP
- Usage of steroids previously
- History of febrile illness in past month

**Anemia of all etiology**

Descriptive and inferential statistical analysis has been carried out in the present study Chi-square/ Fisher Exact test

has been used to find the significance of study parameters on categorical scale between two or more groups. ROC curve analysis is performed to find the predictability of study variables for predicting the Outcome.

**3. Results**

Study population: 172 antenatal cases.

This is an observational clinical study done on 172 antenatal patients and later divided in to GDM, IGTT and NO GDM depending on the outcome of OGCT and OGTT.

MPV assessment is done in all patients and sensitivity of MPV in detecting GDM is predicted.

**Table 1:** MPV (FL) in relation to outcome of patients studied

MPV (FL)	Outcome			Total (n=172)	P value
	GDM (n=27)	IGTT (n=9)	No GDM (n=136)		
First assessment					
• <10	5(18.5%)	3(33.3%)	73(53.7%)	81(47.1%)	<0.001**
• 10-13	17(63%)	6(66.7%)	63(46.3%)	86(50%)	
• >13	5(18.5%)	0(0%)	0(0%)	5(2.9%)	
Second assessment					
• <10	4(14.8%)	2(22.2%)	68(50%)	74(43%)	<0.001**
• 10-13	17(63%)	6(66.7%)	68(50%)	91(52.9%)	
• >13	6(22.2%)	1(11.1%)	0(0%)	7(4.1%)	

Chi-Square test/Fisher Exact test

**Table 2:** MPV (FL) difference in relation to outcome of patients studied

MPV (FL)	Outcome			Total	P value
	No GDM	IGTT	GDM		
First assessment	9.70±1.25	10.93±1.46	11.05±1.59	9.98±1.41	<0.001**
Second Assessment	9.81±1.13	11.69±1.45	11.53±1.47	10.18±1.40	<0.001**

**Table 3:** ROC curve analysis

MPV(FL)	ROC results to predict GDM				Cut-off	AUROC	SE	P value
	Sensitivity	Specificity	LR+	LR-				
First assessment	96.30	42.07	1.66	0.09	>9.5	0.723	0.059	<0.001**
Second assessment	62.96	82.07	3.51	0.45	>11	0.790	0.054	<0.001**

**4. Discussion**

Mean platelet volume is a marker of platelet function and activation. Larger platelets are both more reactive and aggregable. They contain denser granules, secrete more serotonin and b-thromboglobulin, and produce more thromboxane A2 than smaller platelets. This also points to a relationship between platelet function and micro- and macrovascular complications of diabetes mellitus.

MPV in this study is assessed at 20-24 weeks ppg and also at 24-28 weeks ppg along with OGCT 75gm glucose test. MPV is found to be higher in GDM and IGTT patients compared to patients with no GDM. The MPV value obtained in GDM, IGTT patients is statistically significant (p<0.001).

There is a relationship between MPV values and blood glucose levels. MPV changes with alteration of blood

glucose and can be used as an effective marker for blood glucose level. Glucose intolerance during pregnancy may be an early sign of metabolic disease later in life. Pregnancy helps women to assess their metabolic state.

Elevated MPV are associated with large and more active platelets and perceived as a new independent cardiovascular risk factor and our study will assess the platelet count and MPV with GDM and GIGT. The presence of high MPV in GDM would demonstrate an elevated risk of GDM and also future thromboembolic disorders.

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elevated risk of GDM and also future thromboembolic disorders.

The results obtained in the present study are similar to the ones obtained in Sayed M. Abel-Rahman et al<sup>4</sup>, Muhammet ErdalSak et al<sup>5</sup>, ShwedaElnour et al<sup>6</sup>, Aydin Kosus et al<sup>7</sup>, Iyidir OT et al<sup>8</sup>, SuleymanBaldane et al<sup>9</sup>, ErçinErdemÇelikel et al<sup>10</sup>.

## 5. Conclusion

The present study shows that elevated MPV as a statistically significant predictor of GDM. Assessment of MPV at earlier weeks of period of gestation has higher sensitivity than the MPV assessment done at later weeks of period of gestation.

MPV is a simple, economical and feasible test to detect GDM which can be done routinely along with the antenatal blood investigations. MPV is an important, effortless & cost effective measure that should be used for predicting the possibility of GDM. Patients with large platelets can easily be identified during routine haematological examination & could possibly benefit from preventive treatment.

However, future studies with a larger series and long-term follow-up of such cases are needed to confirm this. Further studies on larger population will help in the detection of the efficacy of MPV in the prediction of GDM.

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