

## Predictive Values of Platelet Indices and serum uric acid in Development of Preeclampsia

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**Abstract: Aim:** To evaluate the association between changes in platelet indices (platelet count, mean platelet volume, platelet distribution width) and serum uric acid and development of preeclampsia. **Materials and Methods:** Three hundred pregnant women more than 20 weeks of gestation with singleton pregnancy and normal blood pressure were enrolled after taking well-informed consent. At monthly intervals CBC (complete blood count) and serum uric acid was done from 20 weeks till 40 weeks of gestation. Data regarding changes in platelet indices and serum uric acid with increasing gestation was collected and analyzed. **Results:** Platelet count decreased significantly in patients with preeclampsia compared to normal pregnant patients ( $219 \pm 63$  vs  $250 \pm 81.5$   $p < 0.003$ ) serum uric acid increased significantly in patients with preeclampsia compared to normal pregnant patients ( $5.4 \pm 1.3$  vs  $3.8 \pm 0.6$   $p < 0.001$ ) Mean platelet volume increased non significantly in preeclampsia patients ( $10.2 \pm 1.3$  vs  $9.9 \pm 1.1$ ). Increase in PDW was observed non significantly in patients with preeclampsia ( $13.9 \pm 3.3$  vs  $13.8 \pm 2.3$ ). **Conclusion:** There is a positive association between the decrease in platelet count and development of preeclampsia and there is a positive association between the increase in serum uric acid and development of preeclampsia, also increased mean platelet volume and platelet distribution width are not a significant predictor for preeclampsia in pregnancy. Thus this study reveals that serum uric acid is a more useful predictor marker than platelet indices in predicting preeclampsia. [Mohamed Samir, Mohamed Khaled, Mohamed Saied, Mohamed Al khoully and Mohamed Ramadan. **Predictive Values of Platelet Indices and serum uric acid in Development of Preeclampsia.** *N Y Sci J* 2017;10(1):77-80]. ISSN 1554-0200 (print); ISSN 2375-723X (online). <http://www.sciencepub.net/newyork>. 12. doi:[10.7537/marsnys100117.12](https://doi.org/10.7537/marsnys100117.12).

**Key words:** Preeclampsia, Mean platelet volume, Platelet distribution width, Platelet count, uric acid

### 1. Introduction

Preeclampsia is among the commonest medical disorders during pregnancy, it complicate about 5-10% of pregnancies and continues to be a major cause of maternal and perinatal morbidity and mortality.<sup>1</sup> It is a multisystem disease of unknown etiology and there is a constant search for better prognostic factors to predict the progression and severity of disease, alterations in coagulation, fibrinolysis and platelet are believed to play an important role in the pathogenesis of preeclampsia.<sup>2</sup> Preeclampsia occurs only in human female during pregnancy and characterized by hypertension with proteinuria and/or edema, it occurs usually after 20 weeks of pregnancy but might occur earlier in cases of vesicular mole, polyhydraminos and multiple pregnancy. if it is untreated may end in eclampsia.<sup>3</sup>

### 2. Materials and methods

This prospective study was conducted in the Department of Obstetrics and Gynecology, Sohag teaching hospital from March 2015 to march 2016, on patients attending antenatal clinic and/or admitted in maternity wards. A total of 350 pregnant women more than 20 weeks of gestation with singleton pregnancy

and normal blood pressure were enrolled after taking well-informed consent. Data was collected and analyzed from 300 patients as 50 patients were either fulfilling the exclusion criteria or those who did not come for follow-up. The demographic details, such as age, weight, parity, residence, socioeconomic status were noted. Bloodpressure was taken by auscultatory method in sitting position after making patient comfortable. Patients were considered hypertensive if diastolic BP was greater than or equal to 90mm Hg on two occasions 4 hours apart or single reading of >110 mm Hg. They were further divided into mild and severe preeclampsia. Cases with systolic BP between 140 and 160mm Hg and diastolic BP between 90 and 110 mm Hg were considered as mild and those with systolic BP greater than 160 mm Hg and diastolic greater than 110mm Hg were considered as severe preeclampsia. Blood samples were collected and sent for estimation of platelet indices by performing complete blood count (CBC) with fully automated quantitative hematology analyzer sysmex; Z K-21N and serum uric acid by performing serum uric acid level by german kits Human 5010 a. At each visit BP recorded and weight was taken. At monthly intervals CBC and serum uric acid was done from 20 to 40. The

person maintaining the observations was blinded from the changes in BP. Patients developing hypertension during the study time were dealt by another set of clinicians and were called more frequently according to the severity of hypertension and were investigated and treated accordingly. The observer maintains the records of monthly CBC and serum uric acid level was completely blinded off from this aspect. The cases delivered in the hospital and observations were also made regarding mode of delivery and condition of baby. After completion of study the study group had patients who remained normotensive throughout pregnancy and patients who developed hypertension and further classified into mild and severe. Data

regarding changes in platelet indices with increasing gestation was collected and analyzed.

### 3. Results

Demography: The mean age ( $\pm$  SD) of preeclampsia group was 26.5 ( $\pm$ 5.8) years and that of control group was 26.3 ( $\pm$ 5.4) years. The mean gestational age ( $\pm$  SD) of preeclampsia and control group was 35.9 ( $\pm$ 3.6) and 31.6 ( $\pm$ 5.8) respectively. Out of 150 cases in preeclampsia group 60 (40%) were primigravida. Platelet and serum uric acid parameters in preeclampsia and control group: (Table 1). Comparison of the platelet and uric acid parameters.

**Table1: Platelet and biochemical indices in cases with PE and controls**

Variable	Preeclampsia (n=150)	Control (n=150)	t	df	p-value
Platelet count (x1000/mm <sup>3</sup> )	219.1 $\pm$ 63.0	250.2 $\pm$ 81.5	-3.012	186.171	<0.003
MPV (fl)	10.2 $\pm$ 1.3	9.9 $\pm$ 1.1	1.526	198	<0.129
PDW (%)	13.9 $\pm$ 3.3	13.8 $\pm$ 2.3	-0.225	174.783	<0.822
Uric acid (mg/dl)	5.4 $\pm$ 1.3	3.8 $\pm$ 0.6	11.692	142.281	<0.001

**Table2: Platelet and biochemical indices in cases of mild or severe PE**

Variable	Mild PE (n=57)	Severe PE (n=93)	t	Df	p-value
Platelet count (x1000/mm <sup>3</sup> )	222.7 $\pm$ 90.4	117.0 $\pm$ 76.2	0.336	98	<0.037
MPV (fl)	10.4 $\pm$ 1.5	10.1 $\pm$ 1.2	0.921	98	<0.359
PDW (%)	13.9 $\pm$ 4.0	13.7 $\pm$ 2.9	0.330	98	<0.742
Uric acid (mg/dl)	4.5 $\pm$ 0.9	6.0 $\pm$ 1.1	-7.329	98	<0.001

Comparison of the platelet and uric acid parameters i.e., Platelet count, MPV, PDW and uric acid among the preeclampsia and normotensive pregnant control group was done by using independent t test. Platelet count was lower in the preeclampsia group as compared to control group and this was statistically significant ( $p < 0.003$ ) Though MPV was higher in preeclampsia group as compared to control group, the finding was not statistically significant ( $p < 0.129$ ), PDW was non significantly higher in preeclampsia group as compared to the control group ( $p < 0.822$ ). uric acid was significantly higher in preeclampsia group as compared to control group ( $p < 0.001$ ). Severity of preeclampsia (Table 2). Based on the criteria described in the methodology section, out of 150 cases in PE group; 57(38%) were mildly preeclamptic and 93 (62%) were severely preeclamptic. Analyze the platelet and uric acid parameters in the two PE group based on severity. P value of  $< 0.005$  was considered as statistically significant. Platelet count was low in patients with severe preeclampsia when compared to mild preeclampsia patients. These finding was statistically

significant ( $p < 0.0037$ ). There was increase in the PDW values with increasing severity of hypertension from mild to severe but was non-significant ( $p < 0.742$ ). The MPV values in case of mild preeclampsia patients were high when compared to severe preeclampsia patients. However, these findings were not statistically significant ( $p < 0.359$ ). There was significant increase in uric acid with increasing the severity of PE ( $p < 0.001$ ).

### 4. Discussion

Preeclampsia is a leading cause of maternal mortality. The WHO estimates that over 100,000 women die from preeclampsia each year. Preeclampsia may lead to convulsions [eclampsia], kidney failure, liver failure, and death of mother. It is also leading cause of both pre mature delivery and IUGR<sup>4</sup>. A glance at the literature reveals conflicting results over the role of platelets in diagnosing preeclampsia. Santos *et al*, found no difference in platelet count in normotensive and preeclampsia women. However, all other platelet indices were significantly higher in the preeclampsia<sup>5</sup>.

Ceyhan *et al* observed no prognostic significance of complete blood count, platelet count and MPV on presence and/or severity of preeclampsia condition<sup>6</sup>. However there are studies which establish significant difference in platelet count and platelet parameters in preeclampsia and normotensive pregnant women, thus suggesting these tests for diagnosis and predicting the severity of preeclampsia<sup>4</sup>. As seen in the literature, platelet parameters in normal pregnancy show varying trends. Since platelet parameters are easily obtained in the cell counter report, they can be readily used by the clinicians in diagnosis and management of preeclampsia. Of all the hematological changes that occur in preeclampsia, change in platelet parameters are the most common hematological abnormality noted<sup>7</sup> Other investigations are costly, unreliable and unsuitable for a routine hospital.

An attempt was made in the present study to determine the usefulness of platelet count, MPV and PDW and uric acid in prediction of preeclampsia. A further attempt was made to assess whether these parameters can be used to predict the severity of preeclampsia.

60 (40%) of the total 150 cases in the preeclampsia group were primigravida. Similarly various studies have demonstrated bad obstetric history and previous history of hypertension as risk factors for preeclampsia.<sup>(8,9)</sup>

Platelet count was significantly decreased in preeclampsia patients as compared to normal pregnant controls. (Table 1) Similar findings were demonstrated by various other studies<sup>(10,11,12)</sup> According to the pathophysiology of preeclampsia, endothelial activation leads to increased platelet aggregation which in turn is responsible for decrease in the platelet count. In the present study, the platelet count decreased significantly with the severity of preeclampsia. Similar findings were demonstrated by Shefali *et al* who observed declining platelet count with severity of preeclampsia. They also noted that the decrease in platelet count was antedating significant increase in blood pressure by 4 to 6 weeks. As a result, the authors concluded that this Platelet parameter can be used to predict development of progressive hypertension in at risk patients. Due to increased consumption of platelets, bone marrow produces and release large platelets leading to increase MPV in preeclampsia. However literature reveals conflicting results regarding the relation between MPV and preeclampsia. There are studies which demonstrate increase in MPV even in healthy individuals<sup>(13)</sup> Shefali *et al.*, in their study described MPV as a good marker of platelet dysfunction in preeclampsia<sup>4</sup>. In the present study there was no significant increase in MPV with increasing severity of preeclampsia. In the present study PDW was non significantly higher in

preeclampsia group than in normal control group. In the present study there was significant increase in uric acid in preeclampsia group compared to control group, also there was significant increase of uric acid with increasing the severity of preeclampsia. Similar findings were demonstrated by sangeeta *et al.* which concluded that hyperuricemia can be used as biomarker for prediction of preeclampsia<sup>14</sup>.

## 5. Conclusion

Platelet count and uric acid emerge as reliable indicators for diagnosing preeclampsia and predicting the severity of disease. Also increased MPV or PDW is not a significant predictor of preeclampsia in pregnancy.

## References

1. Roberts JM, Cooper DW. Pathogenesis and genetics of preeclampsia. *Lancet* 2001;357(9249):53-56.
2. Halligan A, Bonnar J, Sheppard B, et al. Haemostatic, fibrinolytic and endothelial variables in normal pregnancies and preeclampsia. *Br J Obstet Gynaecol* 1994;101:488.
3. Rosevear SK, Liggins GC. Platelet dimensions in pregnancy induced hypertension. *New Zealand Med J* 1986;99(802):356- 57.
4. Dadhich S, Agrawal S, Soni M, Choudhay R, Jain R, Sharma S et al (2012) Predictive value of platelet indices in development of preeclampsia. *J South Asian Feder Obst Gynae* 4:1721.
5. Santos, dos EV and José MF (2004) Measurement of platelet parameters in normal and preeclamptic pregnant women. *Rev Bras Ginecol Obstet* 26:201-06.
6. Ceyhan T, Beyan C, Başer I, Kaptan K, Güngör S and Ifran A (2006) the effect of pre-eclampsia on complete blood count, platelet count and mean platelet volume. *Annals of Hematology* 85:320-22.
7. Baha M Sibai (1996) Hypertension in pregnancy. In: S.G. Gabbe, J.R. Niebyl, J.L. Simpson (ed) *Obst. Normal and Problem of Pregnancies*, 3rd edn. Churchill Livingstone, New York, pp 935– 91.
8. Hernández-Díaz S, Toh S, Cnattingius S (2009) Risk of Preeclampsia in first and subsequent pregnancies: prospective cohort study. *BMJ* 18; 338.
9. Xiong X, Fraser WD, Demianczuk NN (2002) History of abortion, preterm, term birth, and risk of preeclampsia: a population-based study. *Am J Obstet Gynecol* 187:1013-8.

10. Vamseedhar A, Srinivasa K, Santosh K Y, Suresh DR. (2011) Evaluation of platelet indices and platelet counts and their significance in pre-eclampsia and eclampsia. *Int J Biol Med Res* 2:425 – 28.
11. Vrunda JK, Saila S (2004) Lowered Platelet Count. A prognostic index in pregnancy induced hypertension. *J Obstet Gynaecol Ind* 54:235–36.
12. Giles C, Inglis TC (1981) Thrombocytopenia and macro thrombocytosis in gestational hypertension. *J Obstet Gynaecol Ind* 88:1115–59.
13. Dogru Y H, Yucel N, Pelit CF, Bolat G (2011) The importance and evaluation of mean platelet volume on the severity of preeclampsia. *Prenatal Journal* 19:108-13.
14. Sangeeta N, Shainil L, Gomi B, 2013: serum uric acid and homocystien as preditors of preeclampsia. Dept of obstet and gyn RIMS, India. *J diabetes metabolism* 4:259.

1/8/2017