



ASSESSMENT OF MEAN PLATELET DIAMETER IN PREGNANCY INDUCED HYPERTENSIVE PATIENTS VERSUS NORMOTENSIVE PREGNANT PATIENTS

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ABSTRACT

Background: Almost 2 – 10% of all pregnancies are affected by hypertensive disorders and together along with hemorrhage and infection they form one member of the deadly triad, that contribute greatly to the maternal morbidity and mortality rates. 20 % of women with pre-eclampsia develop bleeding problems during delivery that present serious risks to the mother and the infant. Platelets play a vital role in coagulation (the blood clotting mechanism), which stops profuse bleeding. Hematological changes occur during preeclampsia in both coagulation and platelet aggregation. These platelet changes are thought to be related to the bleeding problems experienced during delivery. It is believed that platelets may play an early pathogenic role in preeclampsia. So in this study we have assessed mean platelet diameter in pregnancy induced hypertension with normotensive pregnant women and concluded its correlation with the outcome. **Methods:** Total 100 subjects, 50 control and 50 cases were taken for study. Samples for platelet count were collected and estimation was carried out by the auto-analyzers. The statistical evaluation is done using SPSS version 22 along with Anova and student t-test. **Results:** there was a significant difference in platelet count in patients with preeclampsia as compared to control group. Mean platelet diameter was significantly increased in cases with preeclampsia. **Conclusions:** This study provides evidence that PC decreases while mean platelet diameter increases as pregnancy advances, and these changes are more pronounced in preclamptic cases than normotensive pregnancy. These changes predate development of preclampsia by 2 - 8 weeks and are proportional to the progress of this disorder. And hence mean platelet diameter can be utilized as a potential marker for not only prediction of preeclampsia development but also severity of hypertension.

KEYWORDS: Eclampsia, Platelet count, Preeclampsia, Prognostic marker, pregnancy induced hypertension.

INTRODUCTION

Almost 10% pregnancies worldwide are affected by hypertension causing serious complications in mother as well as fetus at times. It affects all maternal organs such as liver, kidney, brain and placenta. A normal physiological change in hemostatic system is generally seen in normal pregnancies. However platelet count is within normal non pregnant reference values with a slight tendency to fall in late pregnancy to maintain placental function during pregnancy and to prevent excessive bleeding in delivery. The combined changes of increase coagulation factors and suppression of fibrinolytic activity are defined as hypercoagulable state or prothrombotic state. In the third trimester the change in the platelet count is due to hemodilution, increased platelet consumption and increased platelet aggregation driven by increased levels of Thromboxane A₂. There are some other mechanisms too proposed for decreasing trend of platelet count in late trimester. Mechanisms such as decreased platelet survival time during normal

pregnancy, plasma beta thromboglobulin and platelet factor 4 levels, both reflecting platelet activation, were significantly increased during normal pregnancy, indicating an increase in platelet activation, and supporting the hypothesis that there is an increased turnover of platelets during the progression of normal pregnancy. Severe thrombocytopenia, less than 50,000 /ml is seen in 0.1% pregnancies only. Platelet volume indices (PVIs) are a group of parameters which are inexpensive to measure and are derived from routine blood counts. The mean platelet volume (MPV) and platelet distribution width (PDW) are the best validated and prominent of these and are attractive indices for research in clinical settings due to their widespread availability to clinicians. Platelet indices are potentially useful markers for the early diagnosis of thromboembolic diseases. Platelet volume indices (PVIs) are a group of parameters which are inexpensive to measure and are derived from routine blood counts, The mean platelet volume (MPV) and platelet distribution width (PDW) are

the best validated and prominent of these and are attractive indices for research in clinical settings due to their widespread availability to clinicians.^[11] Platelet indices are potentially useful markers for the early diagnosis of thromboembolic diseases. As an increase in both mean platelet volume (MPV) and platelet distribution width (PDW) due to platelet activation, resulting from platelet swelling and pseudopodia formation was hypothesized.^[12] In this study, these prognostic markers were assessed for its role in diagnosing the severity of preeclampsia.

METHODS

After ethical clearance six months retrospective study was carried out in Acharya Vinobha Bhave Rural Hospital, in the department of Obstetrics and Gynecology, Wardha. during the period of January 2018 to June 2018. This retrospective study includes 100 patients aged 18-35 years, out of which 50 normotensive patients were taken as control and 50 cases which were included were clinically diagnosed as pregnancy induced hypertension with gestational age ≥ 20 weeks attending outpatient department or admitted in antenatal

ward/labour room in department of OBGY, Acharya Vinobha Bhave Rural Hospital. Patients included in the study were pregnant women beyond 28weeks gestation of pregnancy were included. Patients excluded from the study were patients with history of thromboembolic episode, hemorrhagic disorder, epilepsy, hepatic or renal disorder, preexisting DM, HTN. CBC reports were taken of the cases and controls from department of pathology, Acharya Vinobha Bhave Rural Hospital. Platelet count, mean platelet distribution estimation was compared between the normotensive pregnant women with PIH patients. The statistical analysis used was mean, standard deviation and students t-test. The p value < 0.05 was accepted as significant.

RESULTS

The mean platelet count observed among cases of mild preeclampsia, severe preeclampsia and eclampsia was 2.16, 1.34 and 0.99 lakh/mm³ respectively. The difference in mean platelet count among cases and controls was statistically significant. The association of platelet count with severity of different categories of PIH was analysed statistically and was highly significant.

Table 1: Demographic and baseline characteristics of all participants

Demographic and baseline characteristics	Normotensive pregnancy	Mild preeclampsia	severe preeclampsia	eclampsia
Age group	22.6 \pm 3	23.1 \pm 4.6	23.9 \pm 4.4	24.1 \pm 4.3
BMI	25.4 \pm 2.2	26.7 \pm 1.8	27.1 \pm 1.6	27.8 \pm 2.1
Socio-economic status low	19	9	2	7
Med	16	5	6	5
High	15	3	5	8
Smoking	12	11	6	2
Gravida primi	26	9	10	7
multi	25	7	8	9

Table 2: Distribution of platelet count in mild preeclampsia, severe preeclampsia and eclampsia.

Platelet count (cells/mm ³)	Normotensive patients	Mild preeclampsia n	Severe preeclampsia n	Eclampsia n	Total n
< 1	5	0	2	12	19
1-1.5	12	2	3	11	28
1.5-2.9	13	7	5	3	28
>2	20	3	1	1	25
Total	50	12	11	27	100

Table 3: Platelet indices of normal pregnant women control group, women with mild PE and women with severe PE and eclampsia.

	Normal pregnant women group (n = 50)	Mild PE (n = 18)	Severe PE (n = 32)	Eclampsia
Platelet count/mm ³	249.120 \pm 38.350	183.940 \pm 37.380	139.340 \pm 32.610	0.91 \pm 22.310
Mean platelet diameter	11.01 \pm 1.77	14.26 \pm 1.84	17.09 \pm 2	18.01 \pm 1.10
Mean platelet volume (fl)	8.50 \pm 0.75	9.82 \pm 0.68	11.07 \pm 1.08	12.51 \pm 1.12
Platelet count: mean platelet volume	25.1 \pm 1.6	24.2 \pm 1.4	20.6 \pm 1.2	19.1 \pm 1.10

Significant (produced by ANOVA test). *

Table 4: Distribution of maternal outcome among cases in relation to the mean platelet diameter.

	Normal delivery	Cesarean section
Cases	22	28
Controls	39	11

DISCUSSION

Normally there are some physiological changes in pregnancy, amongst which platelet counts normally are decreased with increasing gestational age. However in patients with pregnancy induced hypertension the effect on platelets is increased significantly leading to many complications in mother and foetus. Various studies have reported thrombocytopenia frequently in patients with pregnancy induced hypertension. There is progressive fall of mean platelet count with the increasing severity of disease. This study was done to prove prognostic significance of platelet count estimation along with estimation of mean platelet diameter in pregnant patients. It was seen that there was significant decrease in platelet count in pre eclampsia and eclampsia patients when compared to control group i.e. normotensive pregnant patients in their third trimester of pregnancy. Preeclampsia is primarily regarded as a disease of first pregnancy. In our study however no significant difference was noted. But in the study conducted by Kumar P et al and Sajith M et al study, where 61% and 53.8% of PIH cases were of primigravidas and 39% and 46.1% were multigravidas in the respective studies. Mild preeclampsia was taken as patients having systolic blood pressure between 140-160 mmHg, diastolic blood pressure between 90-110 mmHg and proteinuria upto 1+ and Severe preeclampsia: Patient having systolic blood pressure between >160 mmHg, diastolic blood pressure >110 mmHg plus one or more of the following criteria: proteinuria >1+, headache, visual disturbance, upper abdominal pain, oliguria (1.2 mg/dl, marked elevation of serum transaminase AST or ALT, fetal growth restriction.

In this study, Table 1 shows mean platelet count in mild preeclampsia, severe preeclampsia and eclampsia. Mean platelet count was seen significantly seen reduced as the severity of PIH increases. It was seen that the platelet count in severe preeclampsia and cases with eclampsia were very significantly lower than the healthy pregnant control, whereas the platelet count in mild preeclampsia was not significantly lower than the healthy pregnant control. Jambhulkar et al also found normal platelet count in mild preeclampsia when compared with normal pregnant control group but in severe pre-eclampsia (1.70 ± 0.57 lakh/mm³) and eclampsia (1.51 ± 0.56 lakh/mm³) decrease in platelet count was highly significant. Similar association was shown by Poulri et al. 17 Thrombocytopenia was present in 5 out of the 100 PIH cases and in which 4 were eclampsia patients and only 1 was that of severe preeclampsia. Therefore, thrombocytopenia was mostly a feature of eclampsia. In preeclampsia case the lowest platelet count was 90,000 cells/mm³ and in eclampsia the lowest platelet counts recorded was 51,000 cells/mm³. The mean platelet

counts in both the case and control group was compared with other studies conducted by Chaware SA et al, Mohapatra S et al, Kale J et al, Agarwal et al, Dube et al and Giles et al. 15,18-21 In all the studies including the present one, the mean platelet counts in the controls was >2.2 lakh/mm³ and it also demonstrated a decreasing trend as the severity of pre eclampsia increased even though in most of the studies the mean platelet counts were in the normal range of 1.5- 3 lakh/ mm³. But in eclampsia the mean platelet count was seen to be below 1 lakh/mm³. In present study we observed that the rate of maternal complications and fetal complications during pregnancy increased as the severity of PIH increased. The complication rate was seen to be higher in the cases of severe preeclampsia and eclampsia.

Table 2 shows Comparison of mean platelet diameter in cases and controls. In normotensive patients the range of MPD was found between 10-11 % and the ones with PIH it was in the range between 14-17%. So in our study we found that MPD increased with increasing severity of PIH. Mean platelet distribution increases in normal pregnancy but non significantly till 32 weeks while in PIH patients MPD values were higher with increasing severity of hypertension. Giles et al in their study found MPD 16 in PIH and 12 in normal pregnant females. Vamseedhar in his study on significance of platelet indices in PIH observed MPD in PIH patients 15.5 fl and in normal pregnancy it was approximately 11 fl. In our study we further distributed this range in mild, severe preeclampsia and eclampsia and found directly proportional relationship with MDP as described in table 3. The current study also demonstrated significantly lower PC and PC to MPV ratio in patients with preeclampsia compared with the normal controls.

CONCLUSIONS

Platelet count is a very important investigation for the antenatal mother irrespective of her having PIH, as it is directly related to maternal and perinatal outcome. Routine and regular monitoring of platelet count can be included in the routine antenatal checkup among the pregnant women with PIH. Patients with low platelet count should be under the management of a qualified obstetrician to avoid the further risks. Thrombocytopenia is directly proportional to the severity of PIH. Platelet count less than 1 lakh/cumm indicate increasing risk of DIC and HELLP syndrome. In this study we noted significant association was established when the platelet counts of PIH cases were compared with the normotensive control patients. Strong association was made out between the platelet count and MDP and the severity of PIH.

REFERENCES

1. Adam GK, Bakheit KH, Adam I. Maternal and perinatal outcomes of eclampsia in Gadarif Hospital, Sudan. *J Obs Gynaecol*, 2009; 29(7): 619–620. [PubMed]
2. Redman Christopher W, Sargent Ian L. Latest advances in understanding preeclampsia. *Science*, 2005; 308(5728): 1592–1594. [PubMed]
3. Walker JJ. Pre-eclampsia. *Lancet* (London, England), 2000; 356(9237): 1260–1265. [PubMed]
4. Anderson UD, Olsson MG, Kristensen KH, Åkerström B, Hansson SR. Review: biochemical markers to predict preeclampsia. *Placenta*, 2012; 33(Suppl): S42–S47. [PubMed]
5. Burton GJ, Woods AW, Jauniaux E, Kingdom JCP. Rheological and physiological consequences of conversion of the maternal spiral arteries for uteroplacental blood flow during human pregnancy. *Placenta*, 2009; 30(6): 473–482. [PMC free article] [PubMed]
6. Burton GJ, Charnock-Jones DS, Jauniaux E. Regulation of vascular growth and function in the human placenta. *Reproduction*, 2009; 138(6): 895–902. [PubMed]
7. Maynard SE, Karumanchi SA. Angiogenic factors and preeclampsia. *Semin Nephrol*, 2011; 31(1): 33–46. [PMC free article] [PubMed]
8. Juan P, Stefano G, Antonella S, Albana C. Platelets in pregnancy. *J Prenat Med*, 2011; 5(4): 90–92. [PMC free article] [PubMed]
9. Tzur T, Sheiner E. Is there an association between platelet count during the first trimester and preeclampsia or other obstetric complications later in pregnancy? *Hypertens Pregnancy*, 2013; 32(1): 74–82. [PubMed]
10. Altınbas S, Toğrul C, Orhan A, Yücel M, Danışman N. Increased MPV is not a significant predictor for preeclampsia during pregnancy. *J Clin Lab Anal*, 2012; 26(5): 403–406. [PubMed]