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Original Research Article

Platelet count estimation: a prognostic index in pregnancy induced hypertension

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ABSTRACT

Background: Hypertension in pregnancy is one of the serious complications of pregnancy with an incidence of 5% to 7% of all pregnancies, particularly in cases with preeclampsia and eclampsia. Though platelet count during pregnancy is within the normal non pregnant reference values, there is a tendency for the platelet count to fall in late pregnancy. The frequency and intensity of maternal thrombocytopenia varies and is dependent on the intensity of the disease process and duration of PIH syndrome.
Methods: A prospective observational study was conducted on 200 pregnant women attending OPD Or Inpatients in the Department of Obstetrics and Gynecology, SMGS Hospital, GMC Jammu from November 2015 to October 2016. Pregnant women beyond 28 weeks gestation of pregnancy are included and divided into two groups i.e. the study and control group. Platelet counts will be done every 4 weeks in controls and weekly in subjects from 28 weeks till delivery.
Results: The mean platelet count observed among cases of mild preecclampsia, severe preeclampsia and ecclampsia was 2.26, 1.63 and 0.99 lakh/mm^3 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.
Conclusions: Platelet count is a very important investigation for the antenatal mother 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.

Keywords: Eclampsia, Platelet count, Preeclampsia, Prognostic marker, Thrombocytopenia

INTRODUCTION

A normal pregnancy is associated with a generalized maternal inflammatory response.[1] An exaggerated inflammatory response is seen in preeclampsia much akin to sepsis.[2]

Hypertension in pregnancy is one of the serious complications of pregnancy with an incidence of 5% to 7% of all pregnancies, particularly in cases with preeclampsia and eclampsia.[3] It virtually affects all maternal organs such as liver, kidney, brain and placenta.[4] Changes in the hemostatic system are observed in normal and hypertensive patients. Though platelet count during pregnancy is within the normal non pregnant reference values, there is a tendency for the platelet count to fall in late pregnancy. 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 TXA2. Severe thrombocytopenia, less than 50,000 /ml is seen in 0.1% pregnancies only.[5] The frequency and

intensity of maternal thrombocytopenia varies and is dependent on the intensity of the disease process and duration of PIH syndrome.[6] In general the lower the platelet count, the higher the maternal and fetal morbidity and mortality (Cunni FG).[7]

Hence, this study was done to assess the severity of preeclampsia and eclampsia with focus on platelet count estimation, which is a simple, rapid, cheap and easily available prognostic laboratory tool.

METHODS

A prospective observational study was conducted on 150 pregnant women attending OPD Or Inpatients in the Department of Obstetrics and Gynecology SMGS Hospital, GMC, Jammu from November 2015 to October 2016.

Inclusion criteria

Pregnant women beyond 28weeks gestation of pregnancy were included and divided into two groups. Study group included 100 women with PIH and Control group included 100 healthy pregnant women with no risk factor.

Exclusion criteria

- Thromboembolic episode
- Hemorrhagic disorder
- Epilepsy
- Hepatic or renal disorder
- Preexisting DM
- HTN <20 weeks
- Drug intake which leads to platelet count and function to get altered.

Cases were further subdivided into mild preeclampsia, severe preeclampsia and eclampsia. Control were selected by simple random sampling and every 10th patient in antenatal OPD was selected. After a detailed history and clinical examination, lab investigations were done as per hospital protocol. Platelet counts will be done every 4 weeks in controls and weekly in subjects from 28week till delivery. Mild Preeclampsia patients were followed on OPD basis until delivery. Severe Preeclampsia patient were admitted to the hospital and followed until delivery and Eclamptic patients were followed in labour room emergency.

Routine antenatal investigations like Blood group, Haemoglobin, BT, CT, Blood sugar, HIV, VDRL, HBSAg were done. In women with hypertension additional investigations were done - Platelet count, PBF, PT, PTI, LFTS, RFTS, USG for fetal growth and amount of liqor, Urine for albumin, 24 hr urine for proteins.

Sample collection- 5 ml of blood sample was collected from a vein in from inner elbow region and to which EDTA is added. Platelet count was estimated by manual method using Leishman's stain. Platelets appeared pale pinkish 1cc to 4cc in diameter. They were counted in ten consecutive fields under oil immersion lens. Average no of platelets /field was calculated and multiplied by 20,000 to set approximated value in each cubic mm blood.

All participants were followed until delivery and early Post Partum period for the Maternal outcome. Maternal outcome was studied in terms of following:

- Mode of onset of labour
- Mode of delivery,
- Antepartum complications like Impending eclampsia, Abruptio placentae, HELLP syndrome, Preterm labour
- Post Partum complication like Primary PPH, Secondary PPH, Pulmonary edema, DIC, Haematoma formation or Maternal death.

Fetal outcome was noted in terms of IUGR, AFD, MAS, IUD or any neonatal complication e.g. jaundice/resp distress/septicemia.

Statistical analysis

Descriptive data was presented in the form of proportions and percentages. Association of various variables with different categories of PIH i.e. mild preeclampsia, severe preeclampsia and eclampsia was done with the help of chi square test, Independent sample t test and one way ANOVA. Two tailed p value of <0.05 was taken as significant.

RESULTS

Table 1 shows that among 100 cases of PIH, 44% had the platelet count more than 2 lakh/mm^3.

Table 1: Distribution of platelet count in mild preeclampsia, severe preeclampsia and eclampsia.

Platelet count (cells/mm^3)	Mild preeclampsia n (%)	Severe preeclampsia n (%)	Eclampsia n (%)	Total n (%)
< 1	0 (0%)	1 (2.56%)	4 (28.5%)	5 (5%)
1-1.5	4 (8.5%)	16 (41%)	9 (64.7%)	29 (29%)
1.5-2	9 (19.1%)	12 (30.76%)	1 (7.1%)	22 (22%)
>2	34 (72.4%)	10 (25.6%)	0 (0%)	44 (44%)
Total	47 (100%)	39 (100%)	14 (100%)	100 (100%)

72.4% of the patients in the mild preeclampsia group had the platelet count more than 2 lakh/mm^3. 41% patients with severe preeclampsia had the platelet count in the range of 1-1.5 lakh/mm^3 and 64.7% eclampsia cases had platelet count between 1-1.5 lakh/mm^3.

Of the 6 babies who required immediate resusucitation, one expired in immediate neonatal period due to birth asphyxia (intrapartum fetal distress at 32 weeks in woman with severe preeclampsia), one expired after 10 days due to metabolic complications and the rest four survived.

Table 2: Distribution of platelet count in controls.

Platelet count (cells/mm^3)	Controls (n)	Percentage (%)
<1	0	0 (0%)
1-1.5	0	0 (0%)
1.5-2	35	35 (35%)
>2	65	65 (65%)
Total	100	100 (100%)

Table 2 shows that the 65% of the controls had the platelet count more than 2 lakh/mm^3.

The mean platelet count observed among cases of mild preecclampsia, severe preeclampsia and ecclampsia was 2.26, 1.63 and 0.99 lakh/mm^3 respectively. The association of platelet count with severity of different categories of PIH was analysed with one way ANOVA. Two tailed p value was highly significant.

Table 3: Mean platelet count of mild preeclampsia, severe preeclampsia and eclampsia cases.

Group	Mean±SD	F	P value
Mild preeclampsia	2.26±0.41		
Severe preeclampsia	1.63±0.42	59.33	<0.001
Eclmapsia	0.99±0.37		

Table 4: Comparison of mean platelet count of cases and controls.

	Case	Control	Test of significance	P value
Platelet count	1.87±0.59	2.28±0.46	t test	<0.001

The difference in mean platelet count among cases and controls was statistically significant.

Table 5: Age wise distribution of various categories of PIH cases and controls.

Age group (yrs)	Mild preeclampsia n (%)	Severe preeclampsia n (%)	Eclampsia N (%)	Control
<20	0	0	0	4 (4%)
20-24	13 (27.6%)	8 (20.5%)	9 (64.2%)	32 (32%)
25 -29	22 (46.8%)	17 (43.5%)	4 (28.5%)	54 (54%)
30-34	5 (10.6%)	10 (25.6%)	1 (7.1%)	8 (8%)
35-39	7 (14.8%)	4 (10.2%)	0 (0%)	2 (2%)
Total	47 (100%)	39 (100%)	14 (100%)	100 (100%)

Table 6: Distribution of parity in patients with various categories of PIH and controls.

Parity	Mild preeclampia, n (%)	Severe preeclampsia, n (%)	Eclampsia, n (%)	Control
Nullipara	29 (61.7%)	26 (66.7%)	9 (64.3%)	57 (57%)
Primipara	10 (21.3%)	7 (17.9%)	3 (21.4%)	32 (32%)
Second para	4 (8.5%)	4 (10.2%)	1 (7.14%)	11 (11%)
Third para or more	4 (8.5%)	2 (5.1%)	1 (7.14%)	0 (0%)
Total	47 (100%)	39 (100%)	14 (100%)	100 (100%)

Table 5 shows the maximum number of cases were in the age group 25- 29 years i.e 43%. 46.8% cases of the mild and 43% cases of severe preeclampsia group were between 25-29 years. However, in eclampsia 64.2%. were in age group 20 to 24 years. The mean age of cases and the controls was 26.87±4.53 years and 25.26±3.76 years respectively.

Table 6 shows that 64% of PIH cases were nullipara (primigravida). The maximum number of controls were also nullipara i.e. 57%. However, the association of parity with different categories of PIH was not significant, p value >0.05.

In the Table 7 it was observed that the most common maternal complication was Preterm labour i.e. 32 out of the 100 PIH cases had preterm labour followed by imminent eclampsia as the second most common complication in 24 cases of 100 PIH cases.

The most common fetal complication of PIH cases seen was IUGR in 20 cases followed by IUD in 11 PIH cases.

LBW was present in 10 fetuses, MAS in 10 and RDS in 7. However, jaundice was the least seen fetal complication seen in 1 PIH case. Out of 100 PIH cases 56 cases developed maternal complication and 61 showed fetal complication.

41.07% of the maternal complications and 42.62% of fetal complications were seen in cases with platelet count in range of 1-1.5 lakh/mm^3. Maternal and fetal complications often coexisted in the same patient.

Table 7: Distribution of maternal complications among various categories of PIH.

Group	Maternal complication*						
	Imminent eclmapsia	Preterm labour	Abruptio	DIC	Pulmonary odema	PPH	Maternal death
Mild preeclampsia n=47	2	6	0	0	0	0	0
Severe preeclampsia n=39	22	15	4	0	0	1	0
Eclampsia n =14	0	11	1	2	2	0	1
Total n=100	24	32	5	2	2	1	1

*In the same patient more than one maternal complication can be seen. Therefore, percentages are not calculated.

Table 8: Distribution of fetal complications in various categories of PIH cases and controls.

Group	Fetal complication*					
	IUGR	IUD	RDS	MAS	Jaundice	LBW
Mild preeclampsia	2	0	0	2	0	1
Severe preeclampsia	17	4	5	6	0	7
Eclampsia	1	7	2	2	1	2
Total	20	11	7	10	1	10

*More than one fetal complication was seen in the same fetus. Therefore, percentages are not calculated.

Table 9: Distribution of maternal and fetal complications among cases in relation to the platelet count.

Platelet count (lakh/mm^3)	Number of cases with complications	
	Maternal complication	Fetal complication
< 1	5 (8.9%)	5 (8.19%)
1- 1.5	23 (41.07%)	26 (42.62%)
1.5 -2	19 (33.92%)	21 (34.42%)
>2	9 (16.07%)	9 (14.75%)
Total	56 (100%)	61 (100%)

DISCUSSION

Thrombocytopenia is reported frequently in severe preeclampsia and which has also been reported in various studies. Out of all hematological abnormalities that occur in PIH, thrombocytopenia is the most common.[8] There is progressive fall of mean platelet count with the increasing severity of disease.[9]

Present study was done to assess the severity of preeclampsia and eclampsia with focus on platelet count estimation and hence, prove its prognostic significance. 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. Out of 100 PIH cases, 62% were nullipara, 20% were primipara and 18% were second para or more. Present finding of increased incidence of preelampsia in nullipara was in agreement with 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.[10,11]

Table 10: Comparison of platelet count (mean) in lakh/mm^3 in different studies.

Group	Present study	Chaware et al	Mohapatra et al	Joshi K et al	Giles et al	Agrwal et al	Dube et al
Control	2.38	2.4	2.38	2.2	2.8	2.4	2.3
Mild preeclampsia	2.3	2.23	2.23	2	2.4	2.1	1.9
Severe preeclampsia	1.6	1.73	1.82	1.4	2.1	1.5	1.9
Eclampsia	0.99	1.38	1.21	1.3	1.5	1.6	1.8

In present study both primigravida and multigravida were equally afflicted by eclampsia. No statistically significant difference of gravidity between the PIH cases and control subjects and also within the PIH groups was seen. Present findings were in accordance with Shikha Saxena et al study.[12] The mean age of the cases in present study was 26.87±4.53 years as compared to 24.75±3.36 years in Prakash J; 25.52±4.38 years in Priyadarshini G et al and 25±3.02 years in Kumar et al study.[13,14]

We noted that as far as age is concerned, there is no or little difference between normal healthy pregnant women and patients with different degrees of severity of pregnancy induced hypertension. Most patients in normal pregnant control group and patients with pregnancy induced hypertension in our study were in the age group of 25-29 years. However, in Chaware et al study the maximum number of patients in mild preeclampsia, severe preeclampsia and eclampsia were in the age group of 20-24 yrs.[15] The younger age of occurrence of preeclampsia and eclampsia in above mentioned studies could be due to the early age of marriage and early pregnancy. The difference of observation in relation to age drawn from the present study can be explained by the demographic variable. Most of the index patients have reported from the urban setting and also had relatively late age of marriage and subsequent pregnancy.

In mild preeclampsia 72.39% women had platelet count more than 2 lakh/mm, 19.1% within 1.5 to 2 lakh/mm, followed by 8.5% in the range 1-1.5 lakh/mm^3 (Table 1). No patient had thrombocytopenia among the mild preeclampsia cases. In severe preeclampsia 25.6% patients had platelet count more than 2 lakh/mm, 41% within 1-1.5 lakh/mm^3 and 30.7% in 1.5-2 lakh/mm^3. Only 1 preeclampsia case out of 39 had thrombocytopenia, the platelet count was 90,000 cell/mm. However, in eclampsia cases 64.7% had platelet count between 1-1.5 lakh/mm^3 and 28.5% had platelet count in 0.5-1 lakh/mm^3.

The mean platelet count values in our study were: control 2.38±0.39 lakh/mm^3, Mild Preeclampsia - 2.3±0.43 lakh/mm^3, Severe pre-eclampsia - 1.6±0.42 lakh/mm^3 and Eclampsia - 0.99±0.0.37 lakh/mm^3 (Table 2, 3). The mean platelet count of cases as a whole is 1.87±0.59 lakh/mm^3. 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/mm^3) and eclampsia (1.51±0.56 lakh/mm^3) decrease in platelet count was highly significant.[16]

In present study we observe that as the severity of PIH increases from mild preeclampsia to severe preeclampsia and eclampsia a decreasing trend of platelet count is seen and the association is statistically 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/mm^3 and in eclampsia the lowest platelet counts recorded was 51,000 cells/mm^3.

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/mm^3 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/ mm^3. But in eclampsia the mean platelet count was seen to be below 1 lakh/mm^3.

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. In the control group the maternal complications were present only in 6, out of which 4 had preterm labour and 2 had primary PPH. In mild preeclampsia cases 6 patients had premature labour and 2 had imminent eclampsia. In severe preeclampsia 22 patients had imminent eclampsia, 19 had premature labour, 4 had abruption, 1 patient had DIC and 1 had primary PPH. Also in eclampsia patients 11 women had preterm labour, 2 had pulmonary odeoma and 1 maternal death occurred (Table 7).

Among the cases the most common fetal complication was IUGR followed by IUD (Table 8). IUGR was present in 17 patients with severe preeclampsia, 2 with mild preeclampsia and 1 with eclampsia. IUD occurred in 11 PIH cases with 7 seen in eclampsia patients and 4 in severe preeclampsia. LBW was observed in 7 severe preeclampsia, 1 mild preeclampsia and 2 eclampsia cases. RDS was seen in 5 severe preeclampsia and 2 eclampsia cases. MAS was observed in 2 mild preeclampsia, 6 severe preeclampsia and 2 eclampsia cases. 94% of the controls delivered healthy babies with no fetal complication.

In the present study we observed that cases with low platelet counts had increased risk of maternal and fetal complications. Most of the PIH cases who developed Preterm labour, impending eclampsia and placental abruption had platelet count in the range of 1 to 1.5 lakh/mm^3 as shown in Table 9. Out of 5 PIH cases who presented with thrombocytopenia, 2 women had pulmonary odema, 1 had placental abruption, 1 had DIC and 1 maternal death occurred. Most of the fetal complications were also seen in cases with platelet count

in the range of 1-1.5lakh/mm^3. In all of the 5 women who developed thrombocytopenia intrauterine fetal demise was seen.

CONCLUSION

Platelet count is a very important investigation for the antenatal mother 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 propotional to the severity of PIH. Platelet count less than 1 lakh/cumm indicate increasing risk of DIC and HELLP syndrome.

In present 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 the severity of PIH. A proportionate fall in the platelet count was well correlated with the increasing severity of PIH. Moreover thrombocytopenia (platelet count <1 lakh/mm^3) was present in a total of 5 PIH cases of which 4 had eclampsia and 1patient had severe preeclampsia. Majority of the maternal and fetal complications were seen in severe preeclampsia and eclampsia cases. Preterm labour, Imminent eclampsia, abruption placentae and DIC are the common maternal complications. Among the fetal complications IUGR, IUD, LBW, RDS and MAS were common. There is a demand for increasing the awareness and education to highlight the prognostic significance of platelet count in PIH.

So, it can be concluded from the present study that the platelet count estimation can be taken as an early, simple, rapid and a low cost routine procedure for the assessment of severity of PIH cases and their subsequent management. But alone it cannot be relied upon to assess the severity of PIH. Hence, more research is required in this field for platelet count to be used as an ideal screening test for early identification of preeclampsia and the prediction of its severity.

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