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PLATELET COUNT IN WOMEN WITH PREGNANCY INDUCED HYPERTENSION

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Abstract:

Objective: One of the most common and potential life threatening complications of pregnancy is pregnancy induced hypertension. This cross-sectional study aimed to investigate the relationship between platelet count and pregnancy induced hypertension.

Materials and Methods: This is a present cross-sectional study was carried out in the Department of Medicine and Obstetrics and Gynecology, Maheshwara Medical College & Hospital over a period of 1 year among 60 subjects. The subjects for this cross-sectional study included consecutively - recruited Normotensive (n = 130) serve as a control, Non-Sever Pre-eclamptic (N = 35) and Severe pre-eclamptic (n = 35). All consenting, adult (≥ 18 years) pregnant women who were confirmed to have pregnancy induced hypertension by an Obstetrician constituted the subjects for these subjects.

Results: A total of 200 pregnant women were included in the study. Platelet count and platelet crit levels tend to decrease as pre-eclampsia becomes more severe. In this study, no statistically significant differences were observed between the three groups in age, residence, number of pregnancies (gravidity), number of deliveries (parity), gestational age, and BMI, but there was a significant difference between the three studied groups with regards to SBP, DBP and MAP which increased with severity of preeclampsia ($P<0.001$). The value of PLT accounts 180(97–352) ×103/μl for pre-eclamptic women and 260(139–445) ×103/μl for normotensive pregnant women ($p<0.001$).

Conclusion: Platelet indices, including platelet count, mean platelet volume, platelet distribution width, and Platelet crit, have been identified as promising candidate markers for predicting preeclampsia in pregnant women. In the future, a serial examination of these indicators during several trimesters of pregnancy should be conducted.

Keywords: Platelet count, Pregnancy, Hypertension.

regnancy Induced hypertension (PIH) is the development of hypertension in the second half of pregnancy on two or more occasions, about four hours apart, in a woman who previously been normotensive, and in whom blood pressure (BP) return to normal with six weeks of delivery. [1] Pregnancy induced hypertension is essentially a disease of primigravidia and is more common in the age group of 35 pears. When the condition is present in multipara, it is commonly associated with multiple pregnancy, essential chronic hypertension and chronic renal disease. [2] Pregnancy induced hypertension can be classified into; gestational

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hypertension or pregnancy induced hypertension alone without proteinuria. Pregnancy induced hypertension without intervention can progress to eclampsia, which is characterized by hypertension. [3]

Platelet counts during pregnancy are lower than those in non-pregnant women, and that approximately 6%–11% of normal pregnant women experience a platelet count of less than 150×10^9/L during pregnancy. [4] This is described as gestational thrombocytopenia if no alternative cause (e.g., preeclampsia, HELLP syndrome, idiopathic thrombocytopenic purpura [ITP], thrombotic thrombocytopenic purpura [TTP], and systemic lupus erythematosus) is identified. This slight decrease in platelet counts may be associated with various physiological changes related to pregnancy, such as hem dilution, increased consumption due to the increased size of the spleen, and increased circulation of platelets in the placenta. [5]

Understanding the reference range and trajectory of platelet counts throughout pregnancy, as well as during the postpartum period enables clinicians to differentiate between normal physiological changes during pregnancy and pathological changes (e.g., ITP, TTP, preeclampsia, and HELLP syndrome). [6] In addition, regarding platelet counts in the diagnostic criteria of preeclampsia, the definition of low platelet counts varies according to different guidelines or by country because of the lack of sufficient data on platelet counts during normal pregnancies. [7]

Thus, the aim of this prospective study was to determine the trajectory of platelet counts and prevalence of gestational thrombocytopenia during normal pregnancies using clinical data from maternity care units in our hospital. We then compared these results with those of matched non-pregnant women. In addition, we sought to compare the trajectories of platelet counts and the prevalence of gestational thrombocytopenia between pregnancies without complications and those with placenta-associated complications, such as HDP, preeclampsia, and FGR.

Materials and Methods

This is a present cross-sectional study was carried out in the Department of Medicine and Obstetrics and Gynecology, Maheshwara Medical College & Hospital over a period of 1 year among 60 subjects.

The subjects for this cross-sectional study included consecutively - recruited Normotensive (n = 130) serve as a control, Non-Sever Pre-eclamptic (N = 35) and Severe pre-eclamptic(n = 35).

Inclusion criteria

All consenting, adult (≥ 18 years) pregnant women who were confirmed to have pregnancy induced hypertension by an Obstetrician constituted the subjects for these subjects.

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Exclusion criteria

Non-consenting, non-adult pregnant women with other pregnancy-related complications were excluded.

Methods

Two milliliters of blood sample were drawn aseptically using the S- Monovette vacutainer blood collection system from the median ante cubital vein of all the subjects and control participants into EDTA-ant coagulated tubes. The blood was diluted with the diluents (1% ammonium oxalate) by 1 in 20 dilutions (0.02 ml of blood and 0.38 ml of diluents) and platelets were counted using improved Neubauer ruled counting chamber and the number of platelets per liter of blood was calculated using the first principle.

Statistical analysis

The data was collected into an excel spread sheet. Collected data was analyzed statistically using statistical soft-ware SPSS version 25.0 (Chicago Illinois). Statistical analysis included descriptive statistics of percentages, mean and bivariate analysis of t-test and Fisher's exact test. Differences were considered significant when $p<0.05$.

Results

A total of 200 study participants from two groups were recruited in the study. The first group included 130 normotensive pregnant women and the second group 70 pregnant women with preeclampsia. Out of 70 preeclampsia cases, 35 of them had non-severely pre-eclamptic and the remaining 35 cases were severely pre-eclamptic.

Table 1. Distribution of age of the participants

Participants	Age in years
Normotensive (n = 130)	28(20–36)
Non-Sever Pre-eclamptic (N = 35)	31(18–37)
Severe pre-eclamptic (n = 35)	32(18–39)
p-value	0.097

Table 2. Distribution of Gravidity of the participants

Participants	Gravidity
Normotensive (n = 130)	1(1–5)
Non-Sever Pre-eclamptic (N = 35)	2(1–6)
Severe pre-eclamptic (n = 35)	2(1–6)
p-value	0.972

Table 3. Distribution of Parity of the participants

Participants	Parity
Normotensive (n = 130)	1(0–4)
Non-Sever Pre-eclamptic (N = 35)	1(0–5)
Severe pre-eclamptic (n = 35)	0(0–5)
p-value	0.761

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Table 4. Distribution of SBP (mmHg) and DBP (mm/Hg) of the participants

Participants	SBP(mm/Hg)	DBP(mm/Hg)
Normotensive (n = 130)	119(93–137)	77(50–93)
Non-Sever Pre-eclamptic (N = 35)	148(130–159)	105 (90–119)
Severe pre-eclamptic (n = 35)	165(160–170)	116(100–129)
p-value	<0.001	<0.001

Table 5. Distribution of MAP(Mm/Hg) **of the participants**

Participants	MAP(mm/Hg)
Normotensive (n = 130)	90(53–119)
Non-Sever Pre-eclamptic (N = 35)	118(103.3–131)
Severe pre-eclamptic (n = 35)	133(120.33–141.33)
p-value	<0.001

The median (minimum-maximum) ages of the normotensive, non-severe and severe preeclampsia group in full-year was 28.00(20–36), 31.00(18–37), and 32(18–39) respectively. In this study, no statistically significant differences were observed between the three groups in age, residence, number of pregnancies (gravidity), number of deliveries (parity), gestational age, and BMI, but there was a significant difference between the three studied groups with regards to SBP, DBP and MAP which increased with severity of preeclampsia (P<0.001).

Table 6. Distribution of Gravidity of the participants

Participants	Proteinuria
Normotensive (n = 130)	0
Non-Sever Pre-eclamptic (N = 35)	+3(1–3)
Severe pre-eclamptic (n = 35)	+4(1–3)
p-value	<0.001

Where, (0 indicate negative for proteinuria, +3 and +4 for results of values of urine dipstick protein. P-value is significant at the level of <0.07, "The result is expressed with median (minimum-maximum) and number (%)" in table 6.

Table 7. Comparisons of platelet indices between normotensive and pre-eclamptic pregnant women

Platelet indices	**Normotensive pregnant women**	**Preeclamptic pregnant women**	**P-value**
PLT×10^3/µl	260(139–445)	180 (97–352)	<0.001
MPV(fl)	13(7.7–10.5)	10.34(10–14.5)	<0.001
PDW(fl)	20(17–20.6)	16.2(15–18)	<0.001
PCT (%)	0.2095(0.124–0.473)	0.161(0.019–0.302)	<0.001

Where: PLT×10^3/µl, Platelate in per microliter, MPV Mean Platelet Volume in femtoliter (fl), PDW (fl) Platelet Distribution Width in femtoliter and PCT (%) Platelate Crit in percentage.

The median (min-max) values of PLT and PCT were significantly lower in pre-eclamptic pregnant women than normotensive women. The value of PLT accounts 180(97–

352) ×103/µl for pre-eclamptic women and 260(139–445) ×103/µl for normotensive pregnant women ($p<0.001$). The value of PCT for the two groups of pregnant women was 0.161 (0.019–0.302) % for pre-eclamptic women and 0.2095(0.124–0.473) % for normotensive pregnant women ($p<0.001$); Whereas MPV and PDW were significantly higher in the preeclampsia group than the control group. The value of MPV among pre-eclamptic women was 10.34 (10–14.5) and its value among normotensive pregnant women was 13(7.7–10.5) fl. The level of PDW among pre-eclamptic women was 16.250(15.5–18) and for normotensive pregnant women, its value was 20(17–20.6) fl with ($p<0.001$) in the Mann-Whitney U test (Table 2).

Table 8. Platelet count of Normotensive pregnant women and Preeclamptic pregnant women

Platelet indices	Normotensive pregnant women	Preeclamptic pregnant women	P-value
PLT×10^6	98.7±10.3	193.4±51.9	<0.001

Discussion

Pregnancy induced hypertension is a significant cause of maternal and fetal morbidity and mortality in developing countries. [7] The current study was undertaken to study the correlation between platelet indices and blood pressure in preeclampsia. While thrombocytopenia and low PCT values were not significant in the preeclampsia patients, in comparison to normotensive pregnant females, other parameters, namely MPV and PDW, showed a significant difference between the two groups.

Thrombocytopenia has been observed in various studies and reported to be an early marker in preeclampsia. [8] A few studies have also reported decreased platelet counts as the disease progressed, but normal counts in the initial stages. In our study, the platelet counts were comparable between the two groups, with a slight reduction in the preeclampsia patients. Thus, the normal platelet counts in preeclampsia in our study can be explained on the basis that most of the patients had mild preeclampsia at an early gestational age (majority 20–28 weeks). Our findings regarding platelet count are consistent with the study by Han, Xiaojie, Hongmei et al. [9] They too did not report a significant difference between normal and mild preeclampsia and severe preeclampsia patients and suggested that decreased platelet count may be due to the gestation itself, rather than the preeclampsia. Thus, the platelet count, though an important parameter in preeclampsia, cannot be used as a definitive marker for the same.

The mean platelet volume showed a significant difference between the two groups, with an increase in the MPV greater in preeclampsia than in normal healthy pregnant females. Similar findings were reported in several other studies as well. [10] According to Dadhich et al. [11] the MPV values increased with the duration of gestation, as well as the severity of the disease. In our study, a higher MPV was noted in patients with more severe disease, and a highly significant correlation was also found between the increased BP and MPV values. Dundar et al. [12] found a significant increase in the MPV weeks before the diagnosis of preeclampsia.

However, Al Sheeha et al. [13] and Altinbas et al. [14] have reported no significant difference between the normal healthy pregnant females and preeclampsia patients. Thus, it can be suggested that the MPV can be used as a valuable marker in the diagnosis and prediction of preeclampsia, as well as in the prognosis of the disease.

Similar to the MPV, the platelet distribution width also showed a significant increase in the preeclampsia patients, compared to the normal control group. The values were also higher in patients with more severe elevations of blood pressure. Similar findings were reported by various authors. Giles et al. [15] reported aPDW of 16fl in preeclampsia and 12fl in normal pregnant females, which was in accordance with our study, in which the PDW was 16.84fl in preeclampsia and 13.68fl in the control group. A few authors have also reported no significant difference. We found a significant correlation of the PDW with the BP in the preeclampsia patients and it was also found that increased BP was accompanied by increased PDW values. The increase in both the MPV and PDW, which are the markers of platelet activation, suggests an active turnover of platelet production in the bone marrow due to peripheral consumption. The increase in values of both the MPV and PDW, along with increased BP, further suggests that they are also elevated in severe preeclampsia with higher elevations of BP.

The plateletcrit in our study showed a mild reduction in the preeclampsia patients and the difference of the values in the cases and controls was however not significant, with the $p < 0.05$. Karateke et al. [16] and Freitas et al. [17] have demonstrated a significant decrease in the platelet concentration in preeclampsia. This could be due to the fact that in our study the platelet count in preeclampsia patients tends toward normal and the PCT is calculated using platelet counts.

All the participants in both the groups demonstrated a normal platelet count, but slight reduction in the platelet count was noted in the preeclampsia group. Both the MPV and PDW had higher values in the preeclampsia patients and in cases with higher elevations of blood pressure, the MPV and PDW was also raised. Significant elevation in the MPV was noted with elevated blood pressure. The PCT, on the other hand, was lower in the preeclampsia group, indicating a decreased concentration of platelets. These results may point toward a continuous consumption, as well as an activation of platelets. [18]

Hence, according to our study platelet indices, namely the MPV and PDW, could be used as detection markers for preeclampsia, as well as markers for the severity of preeclampsia. The platelet count and plateletcrit, though comparable between the two groups, showed decreased values in the preeclampsia group, but statistical significance could not be found and their reliability as markers for preeclampsia cannot be commented upon. [19]

Conclusion

Preeclampsia is a serious condition which leads to maternal morbidity and mortality. The increase in the MPV and PDW was observed in preeclampsia. The MPV and PDW

showed a significant correlation with increased BP. However, the platelet count and PCT in our study did not show a significant correlation with preeclampsia. Thus, the platelet indices, mainly MPV and PDW, which are easily available, as well as economical, can also be used in the prediction and early diagnosis of preeclampsia and as markers for the severity of preeclampsia, however further studies with larger numbers of patients are required.

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