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Research Article

PLATELET COUNT AND PLATELET INDICES IN HYPERTENSIVE DISORDERS OF PREGNANCY

Meghana P and Bharathi M*

Department of Pathology, Mysore Medical College and Research Institute, Mysuru, Karnataka, India

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ABSTRACT

Background: Pre eclampsia is a leading cause of maternal and perinatal morbidity and mortality worldwide. Of all haematological abnormalities, thrombocytopenia is most commonly seen in pregnancy induced hypertension cases. These pregnancies also are associated with qualitative changes in platelets. Research on pre eclampsia and other hypertensive disorders of pregnancy in both the laboratory and clinical arenas requires continued emphasis and finding.

Methodology: The blood samples are analyzed for platelet count and indices using the automated haematology analyzers.

Results: The platelet count showed an inverse relationship with the severity of pregnancy induced hypertension. The platelet indices - mean platelet volume and platelet distribution width too showed consistent relationship with the hypertensive disorders of pregnancy.

Conclusion: The platelet count and indices can be considered as an effective screening tool in antenatal workup of women with the gestational hypertension.

INTRODUCTION

Nearly one-tenth of maternal deaths in Asia and Africa and one-quarter of maternal deaths in Latin America are associated with hypertensive disorders of pregnancy.[1] Pre eclampsia is a leading cause of maternal and perinatal morbidity and mortality, with an estimated 50,000-60,000 pre eclampsia related deaths per year worldwide.[2]

While the exact mechanism leading to the development of pre eclampsia are still being investigated, it is clear that the placenta plays a central role in the pathogenesis of the syndrome as is evident from the symptoms disappearing rapidly after delivery of the placenta. The principal placental pathophysiologic aberrations in pre eclampsia are abnormal placental vasculature, diffuse endothelial dysfunction and imbalance of angiogenic and antiangiogenic factors, vasoconstriction, increased vascular permeability and coagulation abnormalities with alteration of haematological profile.[3] of all haematological abnormalities, thrombocytopenia is most common and is seen in 11-29% of patients. These pregnancies also are associated with qualitative changes suggesting increased platelet production and destruction.[4]

Identification of the patients with severe forms of pre eclampsia continues to challenge the clinicians. Research on pre eclampsia and other hypertensive disorders of pregnancy in both the laboratory and clinical arenas requires continued emphasis and finding.

Clinically, the platelet count and the indices can be a useful screening test for early identification and to assess the prognosis in pregnant women with gestational hypertension.

MATERIALS AND METHODS

The present prospective study comprised pregnant women. Key patient data consisting of name, age, parity, gestational age, examination and investigations were recorded.

The study was conducted on two groups:

Group I: Control - 50 normal healthy pregnant women.
Group II: Cases - 50 pregnant women with pregnancy induced hypertension (PIH).

The cases with systolic blood pressure greater than or equal to 140 mmHg, diastolic blood pressure greater than or equal to 90 mmHg on two measurements taken 4 hours apart, or the cases with 30 mmHg increase in systolic blood pressure, 15 mmHg increase in diastolic blood pressure compared with the pre-pregnancy values, in association with proteinuria more than 300 mg in 24 hours urine were included in the preeclampsia group. The preeclampsia cases were considered mild or severe

Corresponding author:* **Bharathi M
Department of Pathology, Mysore Medical College and Research Institute, Mysuru, Karnataka, India

according to the diastolic blood pressure of <110 or ≥110 mmHg, respectively.[5] and pre eclampsia cases with the occurrence of seizures were defined as eclampsia.

Cases with haemorrhagic disorders, sepsis, functional uterine bleeding, placental abruption or previa, diabetes, hypertension, respiratory, circulatory, thyroid, renal and hepatic disorders which can affect platelet count were excluded from the study.

Blood samples were analyzed by automated haematology analyser for platelet count and platelet indices - Mean platelet volume (MPV) and Platelet distribution width (PDW). The normal range of platelet count was considered to be 150-450 x 10^9/L. Platelet indices-MPV and PDW were estimated with reference range of the laboratory for MPV being 6.9-10.2 fL and PDW being 9-13 fL.

RESULTS

In the present study, age of the pregnant women ranged from 18 to 35 years and primigravidas constituted the majority of patients (80%) in the PIH group (Table 1).

Table 1 Distribution of PIH and control groups according to the parity

Parameter	PIH	Control
Primigravida	40	24
Multigravida	10	26
Total	50	50

Thrombocytopenia is the most common haematological aberration seen in PIH. In the present study thrombocytopenia was seen in 41 (82%) PIH cases, of which 36 cases were primigravida and the remaining 5 cases were multigravid females. The platelet count in mild pre eclampsia ranged from 110-148 x 10^9/L and that in severe pre eclampsia ranged between 58 x 10^9/L and 99 x 10^9/L. The platelet count in eclampsia cases ranged from 42 to 50 x 10^9/L, whereas the platelet count in normotensive control group ranged between 190 x 10^9/L and 420 x 10^9/L (Table 2, Figure1).

Table 2 Comparison of platelet count between the PIH and control groups

Parameter	Platelet count (x 10^9/L)	Mean Platelet count (x 10^9/L)
Control	190-420	280
Mild pre eclampsia	110-148	122
Severe pre eclampsia	58-99	78
Eclampsia	42-50	46

Platelet indices

Mean Platelet Volume

In the present study MPV ranged from 10.4 to 12.1 fL in mild pre eclampsia and 11.2 to 13.8 fL in severe preeclampsia. The MPV in the eclampsia cases ranged between 11.8 and 13.9 fL, whereas the control group showed the MPV range of 7.2-10.1 fL (Table 3, Figure 2).

Platelet distribution width (PDW)

The PDW in the normotensive control group ranged from 9 to 12.8 fL. The PDW in the mild and severe preeclampsia cases ranged from 13.6 to 17.2 fL and 14.1 to 20.1 fL respectively. And the eclampsia cases showed PDW ranged between 19.8 fL and 20.3 fL (Table 4, Figure 3).

Table 3 Comparison of MPV between the PIH and control groups

Parameter	MPV (fL)	Mean MPV (fL)
Control	7.2-10.1	8.8
Mild pre eclampsia	10.4-12.1	11.2
Severe pre eclampsia	11.2-13.8	12.4
Eclampsia	11.8-13.9	12.9

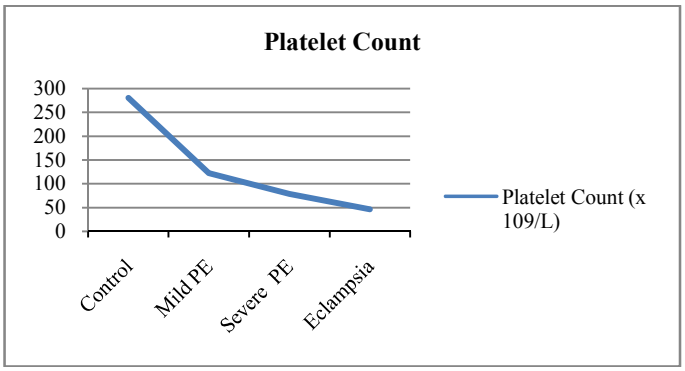

Figure 1 Comparison of platelet count in normotensive, mild pre eclampsia (mild PE), severe pre eclampsia (severe PE) and eclampsia

Table 4 Comparison of PDW between the PIH and control groups

Parameter	PDW (fL)	Mean PDW (fL)
Control	9-12.8	11.2
Mild pre eclampsia	13.6-17.2	16.4
Severe pre eclampsia	14.1-20.1	18.8
Eclampsia	19.8-20.3	20.1

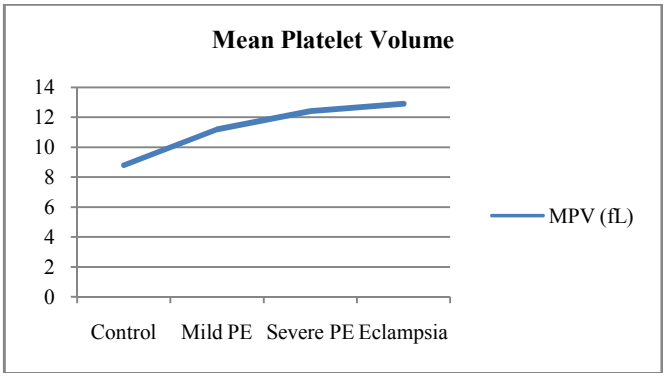

Figure 2 Comparison of MPV in normotensive, mild pre eclampsia, severe pre eclampsia and eclampsia

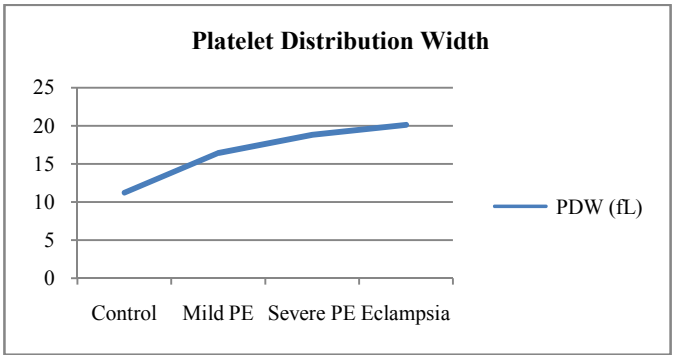

Figure 3 Comparison of PDW in normotensive, mild pre eclampsia, severe pre eclampsia and eclampsia

DISCUSSION

Hypertension is one of the most common obstetric problems in pregnant women, associated with significant morbidity and mortality.[6] Pregnant women with pregnancy induced hypertension disorders develop numerous alterations in the haematological parameters. These altered parameters have a major impact on the final outcome of pregnancy. Early detection of the women with these disorders will help in the initiation of aggressive therapy at the very early stage and thus decrease the maternal and neonatal morbidity and mortality.

Thrombocytopenia is the most common haematological parameter altered in the pre eclampsia and eclampsia cases. It is caused by increased platelet destruction as shown by decreased platelet lifespan, increased number of megakaryocytes in the bone marrow and an increased proportion of young, oversize platelets - megathrombocytes in the peripheral blood film. And this decrease in the platelets is also directly associated with disease severity and progression.[7]

The estimation of platelet count and platelet indices is thus a reliable method for early detection and management of hypertensive disorders of pregnancy.[8] The platelet indices - MPV and PDW, predict the haemostatic abnormality in them.[9] Contact of platelets with the dysfunctional endothelium activates the coagulation system, and cause an increase in both consumption and bone marrow production of platelets. Enhanced thrombopoiesis thus produced releases much younger platelets into the circulation, which are larger i.e. an increased MPV, which are more active than the older platelets both enzymatically and metabolically.[10] The increase in platelet destruction with a decrease in the platelet survival time results in an increase in the platelet turnover and thus an increase in the PDW.

Thomas *et al*[11] and Vrunda *et al*[12] in their studies reported thrombocytopenia in 16% and 41% respectively, in women with pregnancy induced hypertension. Whereas, the current study showed thrombocytopenia, in 82% of the cases diagnosed with pregnancy induced hypertension. Giles *et al*[13] and Fahmi *et al*[14] observed an increase in the mean values of the platelet indices in their studies, which were comparable with the mean MPV and PDW values obtained in the present study.

There are several biomarkers of preeclampsia including soluble endoglin (sEng) or soluble fms-like tyrosine kinase-1(sFlt-1).[15] The only limitation of the current study is the lack of a relative analysis between the platelet parameters obtained from the automated haematology analyzers and biochemical markers. However, the detection of altered haematological parameters is simple and easy for early identification of the abnormalities associated with gestational hypertension during the antenatal care.

CONCLUSION

Gestational hypertension is one of the most common complications of pregnancy and remains a foremost cause of maternal and foetal morbidity and mortality. As a consequence of abnormalities in haematology parameters, there can be maternal death resulting from severe haemorrhage and foetal growth retardation in the thrombocytopenic groups.

Estimation of platelet count and platelet indices offer simple, economical and rapid assessment of the severity and the complications associated with the disease. Thus these parameters can be considered as an effective screening tool in antenatal workup of women with the gestational hypertension in alerting the clinician for the initiation of appropriate and timely management.

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