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Original Research Article

Comparison of Platelet Indices in Patients with Pre Eclampsia and Normotensive Patients

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Abstract

Introduction: Pre eclampsia is a major health problem leading to maternal morbidity and mortality.It involves endothelial dysfunction and over consumption of platelets due to vasoconstriction, aggregation and adhesion of platelets. This can be assessed by platelet function tests like platelet count, mean platelet volume, plateletcrit and platelet distribution width.

Methodology: It was a case-controlled study which enrolled a total of 110 patients (55 cases and 55 controls). Blood samples were collected and the platelet indices – platelet count, plateletcrit, mean platelet volume and platelet distribution width – were evaluated and compared between the two groups.

Result: The study included 110 patients divided into cases (n=55) comprising of patients with pre eclampsia and control (n=55) comprising of normotensive healthy pregnant patients. The platelet indices mean platelet volume(MPV) in cases was 12.66±6.72 as compared to 8.76±3.94 in controls (p <0.001%) .The platelet distribution width (PDW) showed a statistically significant difference. The PDW showed AUC of 0.84 (95% CI- 0.767– 0.913). the critical cutoff for PDW was calculated to be 15 U/ml, for this cutoff the sensitivity and specificity for predicting pre eclampsia was 78.2% and 76.4% respectively. The plateletcrit was lower among the cases (0.18±0.11) than the control group (0.19±0.05). But no statistically significant difference was seen between the groups.

Conclusion: Platelet indices, including platelet count, mean platelet volume, platelet distribution width, and Plateletcrit, can serve as promising markers for predicting preeclampsia in pregnant women.

Keywords: Pre eclampsia, Plateletcrit, Mean Platelet Volume (MPV), Platelet distribution Width(PDW).
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Introduction

Pre eclampsia is one of the major health problems causing maternal morbidity and mortality, with an incidence of 3–8% pregnancies.[1]The American College of Obstetricians and Gynecologists' diagnostic criteria for pre-eclampsia are blood pressure elevation greater as than or equal to 140/90 mm Hg on two occasions 4 hours apart after 20 weeks of pregnancy, and proteinuria, or new onset of any of the following: thrombocytopenia, renal insufficiency, impaired liver function, pulmonary edema, cerebral or visual disturbances [2]. The pathogenesis in pre eclampsia involves endothelial dysfunction which causes vasoconstriction, aggregation and adhesion of platelets, and further triggers coagulation. This leads to hypoxic damage to the endothelium. [3,4] This over consumption of platelets leads to stimulation of bone marrow and increased production of platelets. The younger platelets formed are larger in size and posses more aggregating potency than the older platelets. [5] This platelet turnover presents as change in number, volume and function of platelets. [6,7] This can be assessed by platelet function tests like platelet count, mean platelet volume, plateletcrit and platelet distribution width.[7] In the present study we aim to find a relationship between the platelet indices, namely platelet count, plateletcrit,mean platelet volume and platelet distribution width with preeclampsia, and assess the role of these markers for early diagnosis of pre eclampsia.

Methodology

The case control study was conducted in the department of obstetrics and gynaecology in SMS Medical College, Jaipur. The study was conducted over a duration of 6months from July, 2023 to January, 2024 and 110 participants were enrolled and divided into case and control

Case (n=55): Pregnancy with pre eclampsia(SBP > 140mmHg)
Control (n=55): Normotensive pregnant female.

All patients attending the antenatal clinic the careful history was taken and examination was performed. A blood sample was taken and labeled. An\automated hematological analyzer was used toexamine the blood sample. Under a microscope, the sample with the low PLT count wasinspected. The value of PLT, MPV, PDW, and Platelatecrit(PCT) was recorded. The data was entered, processed, and the outcome was deduced.

Inclusion Criteria

1. Patient giving written informed consent
2. Pre-eclamptic pregnant women (Blood Pressure >140/90mmHg)
3. Healthy normotensive pregnant women,
4. Period of gestation 20-week gestation or more

Exclusion Criteria

1. Pregnant women with Poor past obstetric history (recurrent miscarriage, pre-term labor, intrauterine growth restriction)
2. Gestational diabetes mellitus
3. Chronic hypertension
4. History of renal or hepatic dysfunction,
5. Disseminated intravascular coagulation,
6. Symptomatic infectious disease
7. Autoimmune conditions such as lupus
8. History of drug intake that alter the platelet function such as heparin, corticosteroid,

The Blood Pressure (BP) was measured and recorded using a mercury sphygmomanometer according to the recommendation of Guideline for the management of Hypertensive disorders[8] and as a marker of preeclampsia severity; Mean Arterial Pressure (MAP) was calculated as Diastolic Blood Pressure (DBP) plus 1/3 of the difference between Systolic Blood Pressure(SBP) and DBP[9]. Then after those pregnant women with a SBP of > 140 mmHg or DBP of > 90 mmHg recorded twice 4 hours apart or a single measurement of >160/110 mmHg, accompanied by significant proteinuria was considered as preeclamptic(cases) and out of this pregnant women, those with the blood pressure of > 160 mmHg (SBP) or 110 mmHg (DBP)and associated proteinuria of > 0.3 grams(+1 on dipstick) and with severity signs in a clinical examination such as new-onset cerebral or visual disturbance, epigastric or right upper quadrantpain and pulmonary edema considered as severe preeclamptic and those whose blood pressure less than 160 mmHg (SBP) or 110 mmHg (DBP) with proteinuria greater than > 0.3,grams(+1 on dipstick), was considered as non-severe preeclampsia but those pregnant womenwithout this feature of hypertension and proteinuria were considered as normotensive(controls). The samples of both preeclamptic and normotensive pregnant women that fulfill the inclusion criteria were recruited consecutively. The data was filled in preformed proformas and entered into excel. The data was analysed using appropriate statistical tools using SPSS.

Result

The study was conducted over a period of 6 months. A total of 110 patients were enrolled, including the cases(n=55) patients with with pre eclampsia with BP> 140/90mm Hg and 55 healthy pregnant female as control. The mean age in control group was 24.87±3.67 and in cases was 25.43±3.54. The mean gestational age among cases was 28 weeks with maximum patients belonging to the 20-25 week group.

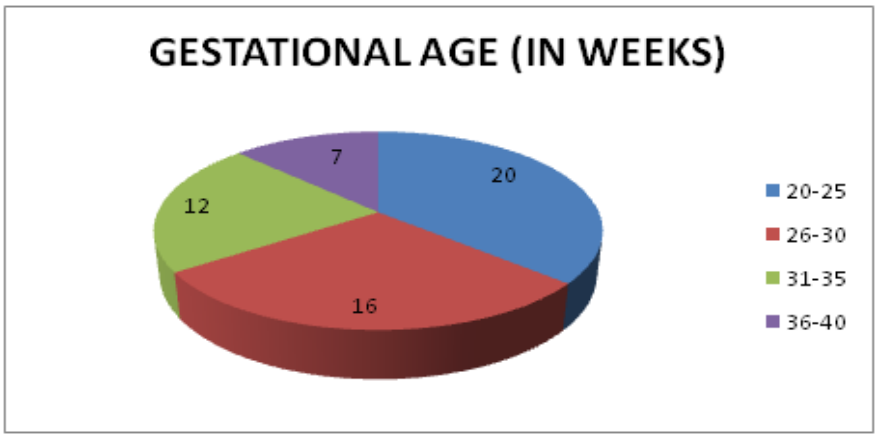

Figure 1: The pie chart showing the distribution of gestational age (in weeks) in patients with pre eclampsia(cases)

The cases had a mean systolic blood pressure as 160.18±13.85 mmHg while the controls had a systolic blood pressure of 114.50±8.27 mmHg

Table 1: The blood pressure records in two groups

	Case	Control
SBP (in mmHg)	160.18±13.85	114.50±8.27
DBP (in mmHg)	102.07±10.21	102.07±10.21

Table 2: Platelet Indices in Two Groups

Parameter	Case	Control	P Value (Student T Test)
PLATECRIT	0.18±0.11	0.19±0.05	0.54 (not statistically significant)
MPV	12.66±6.72	8.76±3.94	0.0003 (statistically significant)
PDW	16.04±1.53	13.88±1.53	<0.0001 (statistically significant)
PLATELET	155.21±18.10	235.05±22.05	<0.001 (statistically significant)

The table 2 shows the platelet indices in the two groups. The mean platelet count in patients with pre eclampsia (cases) was 155.21±18.10 as compared to normotensive healthy pregnant women(control) with mean platelet value of 235.05±22.05 and the difference was statistically significant. The plateletcrit was lower among the cases (0.18±0.11) than the control group (0.19±0.05). But no statistically significant difference was seen between the groups. The platelet indies mean platelet volume(MPV) and platelet distribution width (PDW) showed a statistically significant difference. The MPV in cases was 12.66±6.72 as compared to 8.76±3.94.

The PDW was increased in cases suggestive of a wide variation in platelet sizes among pre eclampsia patients. The PDW among cases was 16.04±1.53 as compared to 13.88±1.53 in control group. The difference between the two groups was statistically significant.

A high Area under the curve of 0.84 (95% CI- 0.767– 0.913) indicates that PDW can serve as a good predictor of pre eclampsia. Using Youden's index, the critical cutoff for PDW was calculated to be 15 U/ml, for this cutoff the sensitivity and specificity for predicting pre eclampsia was 78.2% and 76.4% respectively.

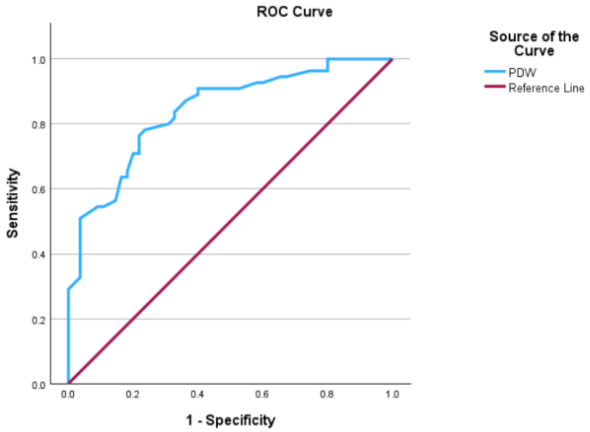

Figure 2: ROC Curve for PDW in women with Pre eclampsia

Table 3: Sensitivity, Specificity Of Platelet Distribution Width In Women With Pre Eclampsia.

	AUC(95% CI)	Cut off value	Sensitivity	Specificity
PDW	0.84	15.0	78.2%	76.4%

Discussion

Pregnancy induced hypertension is a significant cause of maternal and fetal morbidity and mortality in developing countries. The current study was undertaken to study the role of platelet indices in predicting preeclampsia.

The mean age in control group was 24.87±3.67 years and in cases was 25.43±3.54 years. The mean gestational age among cases was 28 weeks with maximum patients belonging to the 20-25 week group.

The cases had a mean systolic blood pressure as 160.18±13.85 mmHg while the controls had a systolic blood pressure of 114.50±8.27 mmHg.

Increased vascular reactivity and platelet activation following increased strain on placental endothelium

due to preeclampsia, which results in platelet consumption [10], could be the underlying cause for platelet indices' variance between preeclamptic and non-preeclamptic women

The plateletcrit values was lower in the pre eclampsia patients than normotensive pregnant women but the difference was not statistically significant. A significant difference between the two groups was seen with mean platelet volume and platelet distribution width.

The ROC for platelet distribution width shows a high Area under the curve of 0.84 (95% CI- 0.767–0.913) indicates that PDW can serve as a good predictor of pre eclampsia. The critical cutoff for PDW was calculated as 15 U/ml, for this cutoff the sensitivity and specificity for predicting pre eclampsia was 78.2% and 76.4% respectively.

A similar result was seen in study conducted by Thalor N. et al [11] (2019) which showed significant difference in MPV and PDW between the two groups.

Gogoi P. [12] (2019) conducted a study including 67 women in each group. The MPV were higher in the study group compared with the control group(9.45 ± 1.19 vs 9.02 ± 1.1; *P*=0.029). The platelet count was lower in pre-eclamptic women compared with the control group (188 ± 89.7 vs 200.1 ± 62.36; *P*=0.014). In the study conducted by Kim M. et al [13] (2018) showed a decline in Platelet count and plateletcrit levels with increasing severity of pre eclampsia. In contrast, the mean platelet volume and platelet distribution widths were significantly increased with the severity of preeclampsia (P<0.001). The best metric for predicting preeclampsia was platelet distribution width (AUC = 0.986; 95%CI; 0.970, 1).

Conclusion

The platelet indices mean platelet volume and the platelet distribution width can serve as easily available, as well as economical potential markers for early prediction and diagnosis of pre eclampsia.

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