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Original Research Paper

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# COMPERSION OF PLATELET PARAMETERS AND LIVER ENZYMES IN PREECLAMPSIA WOMEN AT TERTIARY CARE CENTER

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**ABSTRACT** **Background** The determination of Platelet Parameters Like Immature Platelet Fraction (IPF), Mean Platelet Volume (MPV), and Aspartate Aminotransferase to Platelet Ratio Index (APRI) score holds significant potential for clinical application, particularly in managing hypertensive disorders of pregnancy such as pre-eclampsia. The aim of our Prospective Study is To study immature platelet fraction (IPF), mean platelet volume (MPV), and aspartate aminotransferase to platelet ratio index (APRI) score in preeclampsia. In our study among 160 preeclampsia patients , 5 patients had HELLP syndrome, while 155 did not. The mean Immature Platelet Fraction (IPF%) was higher in the HELLP group (12.2 ± 2.3) compared to the non-HELLP group (11.7 ± 2.32), though the difference was not statistically significant ($p = 0.06$), indicating a possible trend toward increased platelet production. In contrast, Mean Platelet Volume (MPV) was significantly elevated in HELLP patients (8.8 ± 0.12) versus those without HELLP (7.2 ± 0.22), with a p-value of 0.01, suggesting increased platelet activation and consumption. Significantly higher levels of IPF, MPV, and APRI were observed in preeclamptic women compared to normotensive controls, suggesting their potential as early markers for the detection of preeclampsia.

**KEYWORDS :** Immature Platelet Fraction, Mean Platelet Volume, Preeclamptic women

## INTRODUCTION

Preeclampsia is defined as new onset of hypertension at or after 20 weeks of gestation (>140/90 mmHg) and proteinuria (>300 mg/24 h).3 Early-onset preeclampsia is defined as onset before 34 weeks of gestation, and after 34 weeks it is called late-onset preeclampsia. Even if patients may not notice any symptoms initially, vision disorders, upper abdominal pain or headache might present at later stages4. HELLP syndrome is a severe variant of pre eclampsia characterized by hemolysis, elevated liver enzymes, and low platelet counts. The determination of Immature Platelet Fraction (IPF), Mean Platelet Volume (MPV), and Aspartate Aminotransferase to Platelet Ratio Index (APRI) score holds significant potential for clinical application, particularly in managing hypertensive disorders of pregnancy such as pre-eclampsia. Despite recent advances in understanding the progression of these conditions, no causal treatment has been established. Current interventions, such as the use of antiplatelet medications like aspirin, only help reduce the risk, but do not eliminate the condition. Delivery remains the only definitive way to protect both the mother and child from severe complications. Therefore, early and accurate diagnosis is crucial for identifying women at risk before serious maternal complications arise.

In pre-eclampsia compared to normal pregnancy.14 Studies suggest that platelet activation plays a central role in the procoagulant state observed in pre-eclampsia. Our own prospective study, involving 207 serial and single measurements, has established reference values for IPF in pregnancy, showing that IPF levels in healthy pregnant women typically remain below 10%, and in most cases, below 7-7.5%.15 In addition to IPF, Mean Platelet Volume (MPV) provides insight into platelet function and activation. MPV measures the average size of platelets, with larger platelets being more reactive and prone to aggregation. This increased platelet activity is believed to contribute to endothelial damage, a hallmark of pre-eclampsia. Research has demonstrated that women with pre-eclampsia often exhibit higher MPV values, reflecting the heightened platelet activation that could be driving the vascular abnormalities associated with the condition.16 The Aspartate Aminotransferase to Platelet Ratio Index (APRI) is another useful marker, calculated by dividing the levels of the liver enzyme aspartate aminotransferase (AST) by the platelet count. Originally developed as a non-invasive marker for liver fibrosis, the APRI score has gained relevance in pre-eclampsia due to the frequent involvement of liver dysfunction and the coagulopathic state that accompanies severe cases. Elevated APRI scores may therefore reflect both liver damage and thrombocytopenia, two prominent features of advanced pre-eclampsia. The Immature Platelet Fraction (IPF) measures the percentage of young, newly formed platelets in the blood. In healthy conditions, platelets play a key role in hemostasis and tissue repair, but in preeclampsia, increased platelet consumption and turnover occur due to systemic endothelial damage and vascular abnormalities. As the body compensates for heightened platelet consumption, immature platelets are released from the bone marrow at an elevated rate.Studies examining IPF in preeclampsia show that IPF levels tend to be higher in preeclamptic women than in normotensive pregnant women. For example, research by Kurt et al. (2014) found that elevated IPF correlates with increased platelet turnover, highlighting its role as a marker for disease progression. The utility of IPF lies in its sensitivity to changes in platelet production, which can reflect disease severity and serve as a non-invasive measure. However, while IPF can help identify early platelet activation in preeclampsia, the values may vary widely across studies, and more standardized cut-off values are needed to solidify its diagnostic value

## AIM & OBJECTIVES

Aim To study immature platelet fraction (IPF), mean platelet volume (MPV), and aspartate aminotransferase to platelet ratio index (APRI) score in preeclampsia.

### Primary Objectives

1. To measure immature platelet fraction in normotensive and preeclamptic pregnant women.

2. To measure mean platelet volume in normotensive and preeclamptic pregnant women. 3. To measure APRI score in normotensive and preeclamptic pregnant women. 4. To compare IPF, MPV, and APRI score between both groups.

### Secondary Objectives

1.To assess the association between IPF, MPV, and APRI score.
2. To observe trends in IPF, MPV, and APRI score with increasing severity of preeclampsia and gestational age.

### Observations and results

**Table. 1** Comparison of IPF % between preeclampsia and normal pregnancy

| IPF% | Group A Mean ± SD | Group B Mean ± SD | P- value |
|---|---|---|---|
| At Recruitment | 12.31 ±3.33 | 7.88 ±3.5 | <0.05 |
| At admission | 12.4 ± 2.74 | 7.90 ±3.5 | <0.05 |
| P value | >0.05 | >0.05 | |

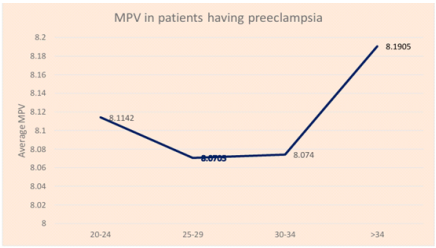
In our study, the mean IPF% at recruitment was significantly higher in preeclamptic women compared to normotensive women, with values of 12.31 ± 3.33 in Group A and 7.88 ± 3.5 in Group B. At admission, the IPF% remained elevated in Group A at 12.4 ± 2.74, while it was 7.90 ± 3.5 in Group B. However, within-group changes over time (from recruitment to admission) were not statistically significant ($p > 0.05$). The rise in IPF% among hypertensive women can be attributed to increased platelet destruction and consumption due to endothelial dysfunction, a key feature of preeclampsia. Endothelial damage triggers platelet adhesion and aggregation, leading to a greater demand for platelet production and the subsequent release of immature platelets from the bone marrow. Moreover, the prothrombotic state associated with preeclampsia, driven by inflammatory mediators such as TNF- and interleukins, further accelerates platelet turnover. Additionally, oxidative stress and elevated thromboxane A2 levels enhance platelet aggregation, resulting in increased platelet depletion and a compensatory rise in IPF%. These findings are supported by several studies. Our results align with the study conducted by Everett et al.12 2014 reported a significant difference in IPF%, with preeclamptic women showing values of 3.8% (9.6/nl), whereas normotensive pregnant women had lower levels of 0.9% (3.4/nl), with a p-value of 0.01. These findings further support the link between increased platelet turnover and preeclampsia.

**Table. 2** Comparison of MPV (fL) between preeclampsia and normal pregnancy

| MPV (fL) | Group A Mean ± SD | Group B Mean ± SD | P- value |
|---|---|---|---|
| At Recruitment | 8.47 ± .82 | 6.89 ±.16 | <0.05 |
| At admission | 8.49 ±.87 | 6.09 ± .16 | <0.05 |
| P value | >0.05 | >0.05 | |

In our study at the time of recruitment, the MPV in Group A was 8.47 ± 0.82 fL, whereas in Group B it was lower at 6.89 ± 0.16 fL, with a p-value of less than 0.05, indicating a significant difference. Similarly, at the time of admission, Group A had an MPV of 8.49 ± 0.87 fL, while Group B showed a further reduced MPV of 6.09 ± 0.16 fL; this difference was also statistically significant with a p-value of less than 0.05. However, the intra-group comparisons—comparing MPV at recruitment and admission within each group—showed no statistically significant changes over time, with p-values greater than 0.05 for both groups. These findings suggest that although MPV values were consistently higher in Group A compared to Group B at both time points, there was no significant change in MPV within each group over the study period. The increase in MPV in preeclampsia is due to endothelial dysfunction, which leads to platelet activation, adhesion, and aggregation. Excessive platelet consumption triggers the release of larger, immature platelets, raising MPV. Oxidative stress, inflammatory cytokines (TNF- , interleukins), and an imbalance between thromboxane A2 (pro-aggregatory) and prostacyclin (anti-aggregatory) further enhance platelet activation, contributing to the hypercoagulable state observed in preeclampsia.

**Fig 1** Trends in MPV (fL) in patients having Preeclampsia with Gestational age




In our study, mean platelet volume (MPV) among preeclamptic patients across different gestational age groups show slight variations. The MPV values were 8.1142 ± 0.18544 fL at 20–24 weeks, slightly decreasing to 8.0705 ± 0.15109 fL at 25–29 weeks and 8.0740 ± 0.16597 fL at 30–34 weeks. However, beyond 34 weeks, MPV increased to 8.1905 ± 0.11673 fL. Although there is an upward trend in MPV as gestational age progresses, particularly after 34 weeks, the difference among the groups was not statistically significant ($p = 0.053$). Pickel et al.15 2018 reported that MPV was significantly higher in women who developed preeclampsia compared to those with normal pregnancies at 12 weeks ($p = 0.029$), 24 weeks ($p = 0.011$), 28 weeks ($p = 0.037$), 32 weeks ($p = 0.002$), and 36 weeks ($p = 0.015$). A cut-off MPV of 10.85 fL was identified for predicting preeclampsia, with a sensitivity of 65.6% and a specificity of 26.2%.

## CONCLUSION

This study highlights the diagnostic and prognostic value of Immature Platelet Fraction (IPF), Mean Platelet Volume (MPV), and Aspartate Aminotransferase to Platelet Ratio Index (APRI) score in preeclamptic pregnancies. Significantly higher levels of IPF, MPV, and APRI were observed in preeclamptic women compared to normotensive controls, suggesting their potential as early markers for the detection of preeclampsia. Although changes in these parameters from recruitment to admission were not statistically significant within groups, their consistently elevated levels in preeclamptic women underscore their diagnostic utility. Furthermore, increasing severity of preeclampsia was associated with progressively higher IPF, MPV, and APRI values, all showing statistically significant differences between mild and severe cases. Among patients with HELLP syndrome, MPV was significantly elevated, while IPF showed a non-significant upward trend, indicating increased platelet turnover and activation in this subgroup. Although IPF, MPV, and APRI scores showed mild variations across different gestational age groups, these trends were not statistically significant, suggesting that while these indices are elevated in preeclampsia, their levels may remain relatively stable across gestation. Overall, the findings support the clinical relevance of IPF, MPV, and APRI as supplementary tools for the assessment and stratification of preeclampsia, particularly in identifying severe disease. Their integration into routine antenatal evaluation could enhance risk prediction and improve maternal-fetal outcomes.

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